

Environmental Report

Severn Trent Water Resources Management Plan 2019 Strategic Environmental Assessment

Final Report for Severn Trent Water Ltd

Customer:

Severn Trent Water Ltd

Customer reference:

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Non-Technical Summary

Introduction

Water companies in England and Wales are required to produce a Water Resources Management Plan (WRMP) every five years. Severn Trent's Final WRMP 2019 (WRMP19) sets out how the company intends to maintain a balance between the supply and demand for water over the long-term planning horizon in each of the water resource zones making up its water supply area.

A Strategic Environmental Assessment (SEA) Environmental Report has been prepared in support of the development of Severn Trent's Final WRMP19. The SEA has been undertaken in parallel with the Habitats Regulations Assessment (HRA) and Water Framework Directive (WFD) assessment to ensure an integrated approach to environmental assessment of the Final WRMP19.

SEA became a statutory requirement in the UK following the adoption of Directive 2001/42/EC (the SEA Directive) on the assessment of effects of certain plans and programmes on which could have significant environmental implications. The SEA helps to identify where there are potential impacts and how any negative impacts might be mitigated. The Government has produced SEA guidance which sets out the stages of the SEA process. This, along with specific water industry national guidance for undertaking SEA (and HRA) of WRMPs, has been used to inform this SEA.

Background to the Final WRMP19

Severn Trent is one of the largest water and wastewater companies in England and Wales, providing high quality water and wastewater services over an area of 21,000km² in the Midlands and the Chester area, and stretching west to east from the Bristol Channel to the Humber. Severn Trent provides water to 8 million people, supplying some 1,800 million litres of water per day (MI/d) to homes and businesses. Water is supplied through nearly 47,000km of water mains fed from multiple sources including impounding reservoirs, rivers and groundwater sources. Overall, groundwater sources, river sources and impounding reservoirs provide 35%, 35% and 30%, respectively, of the total volume of water put into supply. For water resource planning purposes, Severn Trent's water supply area is divided into 15 independent Water Resources Zones (WRZs) reflecting the different characteristics of the supply area and associated risks to meeting demand in dry weather conditions. The 15 WRZs are shown in the map overleaf. The WRMP19 also considered a range of feasible options beyond the company's water supply area boundary, such as within parts of the upper River Severn and River Wye catchment areas, including within Wales.

In developing its WRMP19, Severn Trent has examined the supply/demand balance for each WRZ and determined how any deficits between forecast demand and reliable water supplies should be addressed for the selected planning period over next 25 years (2020-2045).

In developing the plan, a very large number of alternative options were identified and assessed to understand their costs, the benefits to the supply-demand balance, the effect on carbon emissions and the environmental and social effects (through the SEA process and associated HRA and WFD assessments, along with monetisation of carbon effects and a certain number of other environmental effects that could be monetised). The options were subsequently compared through advanced investment modelling techniques to derive an optimised investment programme to meet future supply-demand challenges over the planning period. The models allowed Severn Trent to test the very long term, holistic investment decisions required to both maintain the performance of the water distribution network and improve the balance between future supply and demand. The approach means that the supply-demand solutions for the Final WRMP19 can be fully integrated into the company's broader investment plans for future water services.

Role of SEA in Development of the Final WRMP19

Severn Trent has followed national water industry guidance on applying SEA to the development of WRMPs. The figure overleaf summarises the overall approach to the application of SEA to the evolution of the Final WRMP19, from the initial screening of a large number of 'unconstrained' list of options through to the application of SEA in considering a wide range of alternative programmes produced through the investment modelling approach.



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Initially, SEA screening was carried out on the very large set of options in the unconstrained list. The screening included consideration of key environmental and social criteria, including: HRA and WFD compliance risks; key risks to the water environment; key risks to important landscape, recreation and heritage features. This identified options with unacceptable adverse environmental effects which were rejected from the options list and were not taken further in the option appraisal process.

More detailed environmental and social assessment was then applied to the screening of the 'constrained' list of options. HRA and WFD risks were assessed on a scale from negligible to high; other potential effects were assessed against the SEA effects scale ranging from major beneficial to major adverse – beneficial and adverse effects were assessed separately in line with best practice. The screening assessment of the constrained options list was also discussed with the Environment Agency and Natural England, and feedback from these regulatory bodies was used to refine assessment. Options assessed as having unacceptable adverse environmental or social effects were removed from the list; remaining options were then included in the 'Feasible' List. The Feasible list options were included in the investment model for consideration for inclusion within a set of options that would make up the Final WRMP19 Programmes; for each option, the carbon costs and some monetised environmental and social costs were input to model, alongside the construction and operational costs.

SEA was carried out of all of the options on the Feasible List, along with HRA and WFD assessments, to provide Severn Trent with information on the environmental performance of each option to help inform the appraisal of the various alternative programmes produced from the investment model. In this way, environmental and social effects of different alternative programmes could be assessed and considered by Severn Trent in its decision-making process to determine the recommended plan for the Final WRMP19.

Through the decision-making process, Severn Trent arrived at three feasible alternative supply-demand investment programmes that could be used to secure the long-term supply-demand requirements at very similar overall programme costs but involving different options. These programmes were assessed for their environmental performance as well through SEA, HRA and WFD assessment, and the findings were used to help reach the final decision on which programme to adopt for the Final WRMP19.



Approach to the Assessment of Environmental Effects

An 'objectives-led' approach to the SEA was adopted. The SEA scoping process included a review of relevant environmental and social objectives established in law, policy or other relevant plans, programmes. A review was also carried out of the baseline environmental information for the area covering all of Severn Trent's WRZs, as well as the river and/or groundwater catchments of water sources that serve the WRZs but which lie outside their boundaries. The review derived more than 80 key policy objectives to be taken into account in the development of SEA objectives. The SEA objectives were categorised under the following topic areas: biodiversity, flora and fauna; population and human health; material assets and resource use; water; soil, geology and land use; air and climate; archaeology and cultural heritage; and landscape and visual amenity. The proposed objectives were subject to public consultation through the SEA Scoping Report and feedback from the consultation was taken into account in developing the final objectives used to assess each option and alternative programme.

Consideration and assessment of environmental and social effects (both beneficial and adverse) of the wide range of alternatives for maintaining water supply reliability in each water resource zone was undertaken at each stage of WRMP evolution, with an increasing level of assessment detail applied as the refinement of the list of options progressed through the planning process (see figure overleaf). Detailed SEA, HRA and WFD assessments were carried out for all of the options included in the Feasible List. These assessments have been documented in appraisal framework tables for each option with a colour coded effects summary (ranging from major beneficial effects to major adverse effects) providing a comparative assessment of the residual environmental effects. The findings were used to inform the development of the final programme of measures included in the Final WRMP19. Assessment of the cumulative effects of the option included in the final programme, and in-combination effects with other projects, plans and programmes, was also carried out.

Assessment of Feasible List Options

Each of the options in the Feasible List was fully assessed against each of the SEA objectives and in compliance with statutory requirements and associated national SEA guidance. The assessments were also supported by the HRA and WFD assessments.

The SEA considered both beneficial and adverse effects of each of the options. Where applicable, mitigation measures were identified as part of the option design and development process to prevent or reduce any identified significant adverse environmental or social effects. Opportunities for enhancing identified benefits were also considered. The assessments were therefore based on the residual effects of each option after application of the mitigation measures and/or enhancement opportunities.

The SEA involved detailed consideration of the potential adverse and beneficial effects of the construction/development of each option and its operation against each of the SEA topics and objectives using an effects magnitude scale ranging from major beneficial to major adverse. Beneficial and adverse effects were kept separate in line with SEA best practice. A summary of the key findings of the SEA of the Feasible List options is provided below.

Demand Management Options

Demand management serves to reduce pressure on water resources by reducing customer demand for water (e.g. through water efficient devices, water metering and tariffs, customer behavioural changes) and reducing water leakage from the water supply network and customer properties. In turn, these options help reduce the volumes of water required to be abstracted from the water environment and therefore reduce the amount of energy needed for water abstraction, treatment and distribution. Most of these options have limited and temporary adverse effects associated with vehicle movements during their commissioning phases. They may also cause temporary disruption or nuisance effects because of street works, for example associated with meter installations and leak repair activities.

Water Supply Options

The findings of the assessments for different types of water supply options in the Feasible List are summarised overleaf.



Bulk Water Supply, Water Trading and Water Transfer options range from those that involve minor upgrades to existing water supply assets (e.g. pumping stations and pipelines) to those that require the construction of new, significant lengths of pipeline (and pumping stations where necessary) to make connections between assets, water resource zones and/or with other water companies. The construction activities generate temporary nuisance impacts such as dust emissions and noise/vibration with potential for temporary adverse effects on biodiversity, flora and fauna; population and human health; archaeology and cultural heritage; and landscape and visual amenity. In some cases, there is potential for permanent adverse effects of construction, for example habitat loss or loss of some public open space.

Operationally, adverse effects associated with these types of options depend on the source of water for the transfer or trade, including whether this involves making more optimal use of existing water sources, increasing abstraction from existing water sources, or requires the development of new water sources. Adverse effects may also be associated with the actual transfer of water from the source to the area of need where this involves using rivers or canals or developing new water pipelines. Where increases to abstraction from existing sources or the development of new water sources is necessary to provide the water transfer or trade, there is the potential for adverse effects (e.g. reductions in river flows and levels in groundwater or reservoirs). Any new abstraction (or increase to abstraction beyond existing abstraction licence conditions) would be subject to environmental assessment and abstraction licensing conditions which should avoid significant adverse effects arising. For transfers or trades by pipeline, operational effects may be limited to those relating to carbon emissions associated with pumping and treatment of water. If the option requires the water to be transferred by a watercourse in the wider environment (e.g. from a reservoir discharging into a river for subsequent re-abstraction downstream), there may be adverse effects on the water environment as well those relating to carbon emissions. Adverse effects on the water environment include changes to flows (including depleted reaches downstream of the abstraction), changes to the quality of receiving waters, the risk of introduction/spreading of invasive non-native species (INNS) or changes in the conditions of the receiving waters that may spread INNS. Such changes may have knock on effects (which may be adverse of beneficial) to the ecology of the receiving waters and other uses such as recreation.

Beneficial effects of such schemes generally reflect the improved use and optimisation of existing water resources, transferring water from areas of water resource surplus to those where resources are already fully utilised and supply deficits are forecast. They also improve flexibility in the supply network and therefore contribute to a more resilient, sustainable water resource system which helps to address the effects of climate change.

Groundwater Abstraction options include direct abstractions from groundwater for treatment, and commissioning/recommissioning of boreholes. Where these options involve the use of 'confined' aquifers that are not connected to rivers or wetlands, the operational adverse effects are often only negligible to minor in magnitude. However, in some cases, it has been identified that some groundwater options may adversely influence local groundwater levels and connected surface water bodies with a risk to water-dependent habitats.

Surface Water Abstraction options can be designed to only operate at times of high river flows to minimise adverse effects on the river environment, but otherwise there is a risk of adverse effects on the river flow regime and associated aquatic habitat.

Reservoir options range from minor, small-scale expansion of existing reservoirs and the conversion of disused quarries to water storage facilities, through to the construction of large new reservoirs or significant expansion of existing reservoirs. Reservoirs can provide significant water storage for winter rainfall for use in dry summers with low risks to the water environment once operational and therefore provide benefits in respect of resilience to adverse effects of climate change. However, as the size of the reservoir expansion or development increases, the potential for significant adverse effects relating to construction increases along with risks of the potential for permanent adverse effects on landscape, biodiversity, local communities and heritage features. However, reservoirs also provide opportunities for environmental and social enhancement through careful design (e.g. habitat creation, recreational and educational facilities).

Options to make maximum use of existing assets include asset enhancements, abstraction licence variations, conjunctive use of existing surface and groundwater, and water treatment works improvements. The temporary construction effects of these options vary considerably according to the scale and location of the scheme and whether any additional infrastructure is required. Larger schemes have a greater potential to result in significant, but temporary, nuisance effects on nearby sensitive receptors during the construction phase. However, in operation, many of these options would improve the flexibility and resilience of the supply network, contribute to sustainable resource management and provide beneficial effects in respect of the risks of climate change impacts.

Options to make use of treated effluent from wastewater treatment works can involve some temporary adverse effects during construction to provide enhanced treatment facilities to ensure highly treated water is discharged to rivers to augment low flow conditions in rivers. During operation, there may be adverse effects on the water environment due to changes to the river flow regime and river

channel characteristics. These options provide beneficial effects through the use of water that would otherwise not be available for abstraction, reducing the pressure on rivers and groundwaters for additional abstraction, and increasing the resilience of the water supply system to climate change.

Overall, the assessment of the Feasible list of options revealed a wide spectrum and scale of beneficial and adverse effects. Large reservoirs (new or expanded) and large long-distance water transfer pipelines through sensitive environments mostly exhibited the greatest significance of adverse effects, but equally they provide major beneficial effects in respect of securing significant water supplies that are more resilient to climate change effects than river abstractions. Other options generally have a lower significance of adverse effects but also a lower significance of beneficial effects. Option location is an important factor in determining the significance of adverse effects: those options in proximity to sensitive environmental, built or human receptors will have a greater significance of adverse effect.

The findings of the detailed environmental assessment of each of the Feasible options was used to help inform the appraisal of alternative options and alternative programmes and subsequent decision-making on the WRMP19 Programme for the Final WRMP19.

SEA and Programme Appraisal

Severn Trent used its Water Infrastructure and Supply/Demand investment Model (WiSDM) to test the long term, holistic investment decisions required to maintain the performance of the water distribution network and improve the balance between future supply and demand. The investment modelling process produced a range of different feasible investment programmes which were explored to test the cost implications of maintaining the supply/demand balance while meeting stakeholder expectations. Through this approach, including consideration of the environmental performance of the options within each programme, Severn Trent arrived at three feasible supply/demand investment programmes that would meet the future supply/demand requirements but using different combinations of options. The environmental performance of these three alternative programmes was considered, alongside other factors such as resilience and customer acceptability, by Severn Trent to reach a decision on the Final WRMP19 programme for maintaining a supply/demand balance across the Severn Trent region over the planning period (see table below).

| Options Reference | Options included in the Final WRMP19 | Supply- Demand Benefit (MI/d) |
|----------------------|--|-------------------------------------|
| | Demand Management | |
| WE003B | Enhanced Household Water Efficiency Audit | 0.3 |
| WE004B | Enhanced Social Housing Water Efficiency Audit | 0.2 |
| WE005 | Leakage Reduction (50% reduction) | 211.7 |
| WE006 | Increase in Metering | 29.9 |
| | Water Supply Options | |
| OGS01 | Site J WTW expansion | 15 |
| NOT04 | Heathy Lea to North Nottinghamshire transfer solution | 25 |
| GRD18 | Peckforton Group BHs rehabilitation and treatment enhancement | 36 |
| BAM03 | Site R WTW to Grindleford pipeline capacity increase | 7.5 |
| CRO06 | River Soar to support Site B WTW | 17 |
| DOR08 | Site B WTW enhancements | 3.6 |
| DOR02 | Site I WTW enhancements | 2 |
| WIL05 | Site E WTW expansion and transfer main supported by raw water augmentation ¹ of the River Trent | 35 |
| WTW05 | East Midlands raw water storage including new WTW | 45 |
| CRO05 | Thornton Reservoir to support Site B WTW | 8 |

¹ Following consultation on the Environmental Report for the Draft WRMP between February and April 2018 and responses concerning this solution, alternative approaches regarding raw water flow augmentation have been investigated. This solution has been re-designed for the Final WRMP and no longer involves the use of effluent from the Barnhurst sewage treatment works. The source of the raw water for the flow augmentation is currently being finalised.

| Options Reference | Options included in the Final WRMP19 | Supply- Demand Benefit (MI/d) |
|----------------------|--|-------------------------------------|
| DAM07 | Draycote Reservoir capacity increase (Size A) with transfer main from Site C WTW to Coventry | 9 |
| MEL29 | River Trent support to Site Q WTW with WTW enhancements | 26 |
| BHS06 | Maximise deployment from Diddlebury WTW and Munslow BH | 0.9 |
| DOR05 | Site C WTW enhancements | 8 |
| LIT01 | Site F WTW expansion | 10 |
| DAM01 | Stanford Reservoir capacity increase (Size A) | 2.5 |
| NOT01 | Ambergate to Mid Nottinghamshire transfer solution | 30 |
| DAM03 | Whitacre Reservoir capacity increase (Sub-option A) | 2.5 |
| BHS07 | Ladyflatte BHs recommissioning | 2.7 |
| DAM02 | Lower Shustoke capacity increase (Size A) | 2.5 |
| NOT05 | Church WIIne to South Nottinghamshire transfer solution | 30 |
| UNK07 | Improve Site L WTW outputs during low raw water periods | 7 |

Assessment of the Final WRMP19 Programme

The Final WRMP19 programme was subject to SEA (and HRA and WFD assessment) to evaluate cumulative environmental and social effects of the different options within the programme acting in combination with each other, as well as in combination with other programmes, plans and projects. Assessment has taken account of the residual effects after the application of standard best practice construction and operational mitigation measures in accordance with national SEA guidance. Visual evaluation matrices have been prepared to summarise the detailed SEA of all the options included in the Final WRMP19 programme, presenting the magnitude of the identified adverse and beneficial effects.

The water demand management options (water efficiency audit, metering and leakage options) included in the Final WRMP19 programme will be implemented across the Severn Trent supply area and will in aggregate bring major beneficial effects in respect of reducing demand for water and contributing to sustainable water management objectives. Other beneficial effects are generally negligible to minor. Given the scale of demand management programme, some temporary moderate adverse effects are anticipated with respect to temporary street works to repair leaks and install external meters, as well as associated vehicle movements and traffic congestion; remaining effects are negligible to minor). These measures are not shown in the summary visual evaluation matrices (overleaf) which focus on the water supply options included in the preferred programmes for each WRZ. The colour coding in these matrices reflects the following significance of effect:

Red = Major adverse; Amber = Moderate adverse; Yellow = Minor adverse

Grey = Negligible adverse

Light Green = Minor beneficial; Green = Moderate beneficial; Dark Green = Major beneficial

Nottinghamshire WRZ

As shown in the visual evaluation matrix, three water transfer options (NOT01, NOT04 and NOT05) are included in the Final WRMP19 to bring treated water supplies into the zone from the Strategic Grid WRZ. Options NOT01 and NOT04 involve significant construction activities which are associated with adverse effects on biodiversity, flora and fauna; population and human health; archaeology and cultural heritage; and landscape and visual amenity. Both (NOT01 and NOT04) are identified as having major adverse effects on biodiversity, flora and fauna as they involve pipelines that intersect areas of Ancient Woodland, Sites of Special Scientific Interest (SSSI) and Local Nature Reserves. These options would also have minor to major adverse effects on archaeology and cultural heritage as well as landscape and visual amenity as they either intersect or are in close proximity to sensitive receptors. For example,

major adverse effects for landscape and visual amenity are identified for option NOT04 mainly due to the fact that the associated pipeline intersects the Peak District National Park. Option NOT04 would include some construction in proximity to the South Pennine Moors SAC and the Peak District Moors SPA and within the Natural England Impact Risk Zone for these designations. The proposed pipeline intercepts five watercourses. The HRA identified that Likely Significant Effects (LSE) could arise from the release of suspended sediments and pollution incidents. HRA Stage 2 Appropriate Assessment was therefore completed which concluded that sufficient mitigation measures could be effectively implemented to avoid adverse effects to the integrity of these two European sites. Although option NOT05 involves some significant works, this option is identified as having moderate adverse effects on biodiversity, flora and fauna, resource use and carbon emissions. The proposed mitigation measures for these transfer schemes will need to be further developed as part of the next stage of the development of these options to minimise the identified major and moderate adverse effects, such as optimisation of pipeline routes to avoid areas of Ancient Woodland, SSSIs and Local Nature Reserves.

All the options in this WRZ have negligible residual adverse effects on the SEA water environmental objectives, subject to careful pipeline design and best practice construction methods to avoid any adverse effects. The abstraction of water in the Strategic Grid WRZ to provide the treated water transfers will take place from a variety of existing water sources and within existing abstraction licence conditions.

In terms of beneficial effects, the options would have moderate beneficial effects on population and human health by providing a significant volume of water for the Nottinghamshire WRZ, increasing the resilience of the water supply system for customers.

North Staffordshire

Two water treatment works (WTW) upgrade options (GRD18 and UNK07) are proposed for this WRZ to increase water treatment capacity to the zone. These options are relatively benign in terms of their potential for adverse effects across the SEA objectives. The options would result in minor adverse effects relating to resource use and moderate adverse effects relating to carbon emissions due to the infrastructure upgrades required to implement the options (borehole rehabilitation and treatment upgrades). Both of these options would deliver minor beneficial effects relating to population and human health through the provision of a more resilient and reliable supply of water to customers in the zone.

Final WRMP19 Programme Visual Evaluation Matrix: Nottinghamshire and North Staffordshire Water Resources Zones

| | SEA Topics and Objectives | | | | | | | | | | | | | | | | | |
|---|---------------------------|---------------|---------------|-----|-----|------------------------------|-----|-----------|--------------|-------|-----|-----|-----|-----|-----|-----------------------------|-----|--|
| Solutions | | Biodiversity, | flora & fauna | | | Population & human health | | M aterial | resource use | Water | | | | | | Soil, geology & land use | | |
| | F | 1.2 | 1.3 | 4.1 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | |
| NOT04 - Heathy Lea to North Nottinghamshire | | | | | | | | | | | | | | | | | | |
| transfer solution (25 Ml/d) | | | | | | | | | | | | | | | | | | |
| NOT01 - Heathy Lea to North Nottinghamshire | | | | | | | | | | | | | | | | | | |
| transfer solution (30 Ml/d) | | | | | | | | | | | | | | | | | | |
| GRD18 - Peckforton Group BHs rehabilitation | | | | | | | | | | | | | | | | | | |
| and treatment enhancement (36 Ml/d) | | | | | | | | | | | | | | | | | | |
| UNK07 - ImproveTittesworth | | | | | | | | | | | | | | | | | | |
| VV I VV outputs during low raw water periods (7 MI/d) | | | | | | | | | | | | | | | | | | |
| NOT05 - Site E to South Nottinghamshire | | | | | | | | | | | | | | | | | | |
| transfer solution (30 Ml/d) | | | | | | | | | | | | | | | | | | |

Key:

| Negligible adverse | Negligible beneficial |
|--------------------|-----------------------|
| Minor adverse | Minor beneficial |
| Moderate adverse | Moderate beneficial |
| Major adverse | Major beneficial |



Strategic Grid

The findings of the SEA for the Strategic Grid zone are presented in spatial groupings (northern, western, eastern and southern parts of the zone) to facilitate the understanding of potential cumulative, in combination effects of the options that might be constructed and/or operated in proximity to each other.

There are five options in the northern part of the Strategic Grid includes (MEL29, LIT01, BHS07, BAM03 and OGS01) that involve increasing water treatment and water transfer capacity, recommissioning boreholes and enabling support from an existing reservoir to augment water supplies in the Strategic Grid zone. These options give rise to adverse effects ranging from minor to moderate significance. Option BAM03 has negligible adverse effects on all SEA objectives and a minor beneficial effect on sustainability and adaption to climate change. Options MEL29 and OGS01 have moderate adverse effects relating to resource use and carbon emissions. Options LIT01 and OGS01 have been identified as having potential moderate adverse effects on biodiversity, flora and fauna due to construction activities taking place in close proximity to some areas of Ancient Woodland and some SSSIs; construction mitigation measures will need to be further developed as part of the detailed design of these schemes to ensure no damage to these features. The recommissioning of a borehole for option (BHS07) may lead to the risk of potential moderate adverse effects on river flow and river water quality in a river due to its hydrological connection to the aquifer from which water will be abstracted. This presents a risk of WFD status deterioration of the affected surface water body which will be investigated further and, if necessary, mitigation measures will be identified to prevent WFD status deterioration. All of these options provide moderate beneficial effects on human health and population associated with a reliable supply of water, with the exception of the option (BHS07) which would only deliver minor beneficial effects to supply reliability.

There are four options in the Strategic Grid (DAM02, DAM03, BHS06, and WIL05) that include reservoir expansion, increasing water transfer capacity, increasing water treatment capacity and a water conjunctive use scheme. Adverse effects identified for these options range from minor to major significance. Option WIL05 has the potential for major adverse effects on biodiversity, flora and fauna due to the risk of habitat loss/fragmentation in a SSSI and a Local Nature Reserve during construction only. Mitigation measures will need to be developed during the detailed design of this option to reduce the magnitude of these construction effects, particularly in relation to designated sites, such as through the optimisation of pipeline routes to avoid areas of Ancient Woodland, SSSIs and Local Nature Reserves. In operation, there is the potential for increases in flows and changes in water quality in the River Trent upstream of the abstraction intake due to the flow augmentation component, although this is a provisional, precautionary assessment pending finalisation of the precise source of the flow augmentation. Changes in flows are considered to be negligible to minor depending on the location of flow augmentation in the catchment. It is noted that as the augmentation would only operate during periods of prolonged dry weather when there are low flows in the River Trent. There is the potential for beneficial effects to watercourses that would be affected by the augmentation in dry weather or drought conditions. The risk of introducing or spreading invasive non-native species (INNS) as a result of the flow augmentation depends on the exact source of raw water, but as part of the detailed design of this component a full INNS risk assessment will be carried out and any required mitigation measures developed in consultation with the Environment Agency.

The adverse effects for options DAM02 and BHS06 are limited to no greater than minor effects. Option DAM03 may have moderate adverse effects on a SSSI in close proximity to proposed construction activities and the pipeline route should be optimised during the detailed design phase to avoid such adverse effects. These options provide generally minor beneficial effects while option WIL05 would deliver moderate beneficial effects on human health and well-being due to the greater volume of reliable water supplies provided.

| | SEA Topics and Objectives | | | | | | | | | | | | | | | | | | | | | |
|--|---------------------------|---------------|---------------|---|------------------------------|-----|-----|--------------------------------------|-----|-------|-----|-----|-----|-----|----------------------------|-----|-----|---------------|-----|-----|---------------------------------------|-----------|
| Solutions | | Biodiversity, | flora & fauna | | Population & numan health | | | Material assets & resource use | | Water | | | | | Soil, geology 8 and use | | | Air & climate | | | Archaeology & cultural heritage | Landscape |
| | ÷ | 1.2 | 6. L | 4 | 2.1 | 2.2 | 2.3 | 3.1 1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 8.1 |
| MEL29 - River Trent to Site Q WTW | | | | | | | | | | | | | | | | | | | | | | |
| MI/d) | | | | | | | | | | | | | | | | | | | | | | |
| LIT01 - Site F WTW expansion (10 | | | | | | | | | | | | | | | | | | | | | | |
| Mi/d) | | | | | | | | | | | | | | | | | | | | | | |
| BHS07 - Ladyflatte BHs recommissioning (2.7 Ml/d) | | | | | | | | | | | | | | | | | | | | | | ļ |
| | | | | | | | | | | | | | | | | | | | | | | |
| DAM02 - Lower Shustoke capacity | | | | | | | | | | | | | | | | | | | | | | |
| increase (Size A) (2.5 MI/d) | | | | | | | | | | | | | | | | | | | | | | |
| DAM03 - Whitacre Reservoir capacity | | | | | | | | | | | | | | | | | | | | | | |
| increase (Size A) (2.5 Ml/d) | | | | | | | | | | | | | | | | | | | | | | |
| BHS06 - Maximise deployment from | | | | | | | | | | | | | | | | | | | | | | |
| (0.9 MI/d) | | | | | | | | | | | | | | | | | | | | | | |
| WIL05 - Site E WTW expansion and transfer main supported by raw water | | | | | | | | | | | | | | | | | | | | | | |
| augmentation of the River Trent (35 MI/d) | | | | | | | | | | | | | | | | | | | | | | |
| BAM03 - Site R WTW to Grindleford | | | | | | | | | | | | | | | | | | | | | | |
| pipeline capacity increase (7.5 MI/d) | | | | | | | | | | | | | | | | | | | | | | |
| OGS01 - Site J WTW expansion (15 | | | | | | | | | | | | | | | | | | | | | | |
| MI/d) | | | | | | | | | | | | | | | | | | | | | | |

Final WRMP19 Programme Visual Evaluation Matrix Strategic Grid (northern and western parts of the zone)

Key:

| Negligible adverse | Negligible beneficial |
|--------------------|-----------------------|
| Minor adverse | Minor beneficial |
| Moderate adverse | Moderate beneficial |
| Major adverse | Major beneficial |

Three options in the eastern part of the Strategic Grid (DOR08, CRO06 and CRO05) relate to B Water Treatment Works (WTW), including upgrading the WTW and transferring more water to it for the treatment. There is a fourth option (WTW05) for using a large disused third-party asset for raw water storage. These options have the potential for minor to major adverse effects across the SEA objectives. The construction activities required to deliver options CRO05 and WTW05 have the potential for major adverse effects on biodiversity, flora and fauna. This is due to the potential loss/fragmentation of Ancient Woodland and SSSI habitats. The construction phase of option CRO05 would also have moderate adverse effects on the setting of a Registered Park and Garden. Additional mitigation measures or design modifications will need to be developed through the detailed design stage to avoid adverse effects on these designated features, such as optimisation of pipeline routes to avoid areas of Ancient Woodland, SSSIs and Local Nature Reserves. Operationally, option CRO05 will require a new abstraction from the wider Rothley Brook catchment. Rothley Brook experiences issues with elevated phosphate concentrations due to diffuse phosphate inputs and hence alterations in flows may potentially lead to a risk of deterioration in WFD status (currently at moderate status). Appropriate mitigation measures will need to be developed as part of the detailed design of this option, for example, the provision of a compensation flow for Rothley Brook and the implementation of specific abstraction licence conditions. Further investigations will be undertaken to understand the impact of the proposed abstraction on the flow regime within Rothley Brook and whether these will have adverse effects on its biology.

Option WTW05 is presented in the final programme to represent a group of similar options associated with the conversion of large, disused third-party quarries for the strategic storage of water abstracted from rivers during periods of high river flow. Several quarries have been investigated and the SEA has identified the need to carefully develop such options to avoid adverse effects on geological (and some biological) SSSIs that associated with some disused quarries (as reflected in the precautionary major adverse rating for the related SEA objectives (Objectives 1.1 and 5.1 in the visual evaluation matrix overleaf). Further investigations will be required to develop this innovative option in a sustainable manner so as to minimise adverse environmental effects whilst maximising the potential beneficial effects associated with using large disused quarries for substantial and sustainable water supply benefit. Additional potential beneficial effects include recreational and biodiversity enhancement opportunities, including habitat creation. Mitigation measures may include funding a study on the geological features of interest prior to the development of the storage facility and providing habitat to link the new facility with existing SSSIs adjacent to the asset. This future use of disused quarries accords with the County Council's core policies for the sustainable reclamation of former mineral workings.

Options DOR08 and CRO06 are generally characterised by negligible to minor adverse effects, with the exception of material assets and resource use and greenhouse gas emissions associated with construction and operational pumping and treatment of water. In terms of beneficial effects, CRO06 provides moderate beneficial effects for population and human health and minor beneficial effects relating to recreation and landscape.

Four options (DAM01, DAM07, DOR02 and DOR05) are located in the southern part of the Strategic Grid. Two options (DAM07 and DOR05) relate to increasing the deployable output of Site C WTW through upgrading the treatment capacity and increasing the Draycote reservoir capacity. The remaining two options (DAM01 and DOR02) relate to Stanford reservoir expansion and recovery of deployable output at the Site I WTW. The potential adverse effects identified for these options are mostly limited to minor effects, with the exception of moderate adverse effects relating to material assets and resource use and carbon emissions for options (DAM01, DAM07 and DOR05) may give rise to greater adverse effects relating to population and human health; water quality; landscape and visual amenity; and archaeology and cultural heritage. The adverse effects in respect of recreation and landscape objectives associated with the reservoir options (DAM01 and DAM07) are of minor magnitude only due to the small scale of the proposed expansion (6-10% increase in storage capacity).

Operationally, option DAM07 will require raising of the reservoir level, and there is a risk that this could adversely affect aquatic plants in the reservoir due to an increase in water levels. Further assessment is required to assess this risk, including a study of the existing plant population, assessment of the sensitivity of these plants to changes in water levels and consultation with the Environment Agency about any required mitigation measures.

Option DAM01 (increase the capacity of Stanford Reservoir) has the potential for a risk of contamination from site runoff and pollution during construction, due to the reservoir being partially drawn down to allow works to the existing reservoir embankments. Where potential adverse effects are identified, mitigation measures including standard good practices to avoid pollution of the reservoir and watercourses and control of earthworks drainage will be implemented

The reservoir expansion options provide a greater range of beneficial effects relative to some of the other options as the additional water storage they provide will bolster resilience drought events which will become more prevalent due to climate change. In addition, as with option WTW05, they offer opportunities for habitat creation and careful landscape design to support biodiversity gain and provide additional recreational amenity.

Mitigation measures

As discussed above, further mitigation measures will be necessary to address the risks of major adverse effects identified for biodiversity, flora and fauna; archaeology and cultural heritage; and landscape and visual amenity. The majority of these adverse effects are associated with the construction of new pipelines which have currently only been designed at an outline level. As detailed design of these pipeline proceeds, optimisation of the pipeline routes will take place to, wherever feasible, avoid designated sites and features to reduce the magnitude of environmental effects. Similarly, construction activities associated with other options will need to be carefully planned, with detailed mitigation measures to address the environmental risks identified by the SEA. Design and mitigation measures will be carefully considered as part of the further investigations of the third-party asset option as highlighted earlier.

Delivering on national environmental policy objectives

Net environmental gain has been included as a policy principle in the Government's 25 year plan to improve the environment (published in January 2018). References to achieving net gains across the three overarching objectives for sustainable development (economic, social and environmental), along with achieving net gain in biodiversity, are also set out in the updated National Planning Policy Framework (NPPF) published in July 2018. The National Infrastructure Commission (NIC) report on water infrastructure (published in April 2018) also emphasises the economic and social benefits of improving water supply resilience.

The SEA incorporates these key policy principles within the various topic area objectives against which each option and the Final WRMP19 as a whole has been assessed. Severn Trent will continue to embed the principles of achieving net gain across the three overarching objectives for sustainable development (economic, social and environmental) in line with the government's 25 Year Plan and the NPPF as it delivers the plan.

The SEA has also had regard to Severn Trent's statutory duties under the Water Industry Act 1991, Wildlife and Countryside Act 1981 and Countryside and Rights of Way Act 2000 to further the conservation and enhancement of SSSIs, along with the Water Industry Strategic Environmental Requirements (WISER) for delivery of these obligations.

| | | | | | | | | | | SEA | Topics a | nd Obje | ctives | | | | | | | | | |
|--------------------------------------|-----|--------------|----------------|-----|---------------------------------|-----|-----|----------------------|---|-----|----------|---------|--------|-----|-----|-----------------------------|-----|-----|---------------|-----|---------------------------------------|-----------|
| Solutions | | Biodiversity | flora & fauna | | Population & human health | | | Material assets & | Material assets & resource use | | Water | | | | | Soil, geology & land use | | | Air & climate | | Archaeology & cultural heritage | Landscape |
| | 1.1 | 1.2 | د . | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 8.1 |
| DOR08 - Site B WTW enhancements | | | | | | | | | | | | | | | | | | | | | | |
| (3.6 MI/d) | | | | | | | | | | | | | | | | | | | | | | |
| CRO06 - River Soar to support Site B | | | | | | | | | | | | | | | | | | | | | | |
| WTW (17 Ml/d) | | | | | | | | | | | | | | | | | | | | | | |
| CRO05 - Thornton Reservoir to | | | | | | | | | | | | | | | | | | | | | | |
| support B WTW (8 MI/d) | | | | | | | | | | | | | | | | | | | | | | |
| WTW05 - East Midlands raw water | | | | | | | | | | | | | | | | | | | | | | |
| MI/d) | | | | | | | | | | | | | | | | | | | | | | |
| DAM01 - Stanford Reservoir capacity | | | | | | | | | | | | | | | | | | | | | | |
| increase (Size A) (2.5 Ml/d) | | | | | | | | | | | | | | | | | | | | | | |
| DAM07 - Draycote Reservoir capacity | | | | | | | | | | | | | | | | | | | | | | |
| from Site C WTW to Coventry (9 Ml/d) | | | | | | | | | | | | | | | | | | | | | | |
| DOR02 - Site I WTW enhancements | | | | | | | | | | | | | | | | | | | | | | |
| (2 MI/d) | | | | | | | | | | | | | | | | | | | | | | |
| DOR05 - Site C WTW enhancements | | | | | | | | | | | | | | | | | | | | | | |
| (8 Ml/d) | | | | | | | | | | | | | | | | | | | | | | |

Final WRMP19 Programme Visual Evaluation Matrix – Strategic Grid (eastern and southern parts of the zone)

Key:

| Negligible adverse | Negligible beneficial |
|--------------------|-----------------------|
| Minor adverse | Minor beneficial |
| Moderate adverse | Moderate beneficial |
| Major adverse | Major beneficial |

Cumulative Effects within Severn Trent's Final WRMP19 Programme

Cumulative beneficial effects have been identified for all demand management options in the Final WRMP19. In-combination implementation of these options will increase the overall demand savings, thereby contributing to sustainable abstraction. The cumulative benefits will help reduce stress on the water environment and the water settings of heritage and landscape features, as well as reducing energy use for water pumping and treatment.

Identified potential cumulative effects of the different water supply options in the Final WRMP19 include:

Draycote SSSI

The Site C WTW Enhancements (DOR05) and Draycote Reservoir capacity increase (Size A) with transfer main from Site C WTW to Coventry (DAM07) options have been identified as having the potential for cumulative effects on Draycote SSSI. Upgrades to the WTW only involve minor works confined to the actual site boundary. The reservoir expansion requires the raising of the existing overflow weir and the bridge in addition to modifications to assets around the dam. The cumulative construction effects (noise disturbance and dust emissions) would not significantly increase the minor adverse effects posed by the options individually. Best practice construction techniques and the implementation of specific additional mitigation measures in dialogue with Natural England (such as noise abatement barriers and dust suppression measures) would minimise adverse effects on the SSSI during construction.

River Blythe SSSI

The Lower Shustoke capacity increase (DAM02) and Whitacre Reservoir capacity increase (DAM03) options have been identified as having potential cumulative adverse effects on nearby environmental receptors. Construction activities required for option (DAM03) were identified as having the potential for moderate adverse effects on the River Blythe SSSI due to the risk of nuisance effects such as noise disturbance and dust emissions, for which additional specific mitigation measures will need to be developed as part of the detailed design of the option in dialogue with Natural England. However, construction activities involved for the option (DAM02) would be over one kilometre away and unlikely to have cumulative effects with the option (DAM03) on the SSSI.

Carsington Water

The simultaneous operation of three options (WIL05, LIT01 and OGS01) has the potential for cumulative adverse effects on Carsington Water. All three options will involve releasing more water from Carsington Water during their operation compared to the current situation. The cumulative assessment concluded that there is a risk of adverse effects on the Carsington Water reservoir WFD heavily modified water body due to the cumulative releases from the reservoir in periods of dry weather leading to lower water levels in the reservoir than historically. It should be noted that concurrent release for all three options would be rare and only temporary in nature. The releases will not be made on a continuous basis throughout the year and will only be required in periods of prolonged dry weather. The total volume of water released will remain within exiting abstraction licence limits for Carsington Water.

Although lower water levels in the reservoir could lead to a risk of impacting on aquatic plants, it is considered that such effects can be mitigated to minimise the magnitude of any adverse effects to a minor magnitude. Further investigations will be carried out as part of the detailed design of the schemes that may affect water levels in Carsington Water, including modelling to assess the change in reservoir levels, surveys of the aquatic plants relative to the revised water level pattern, and consideration of the mitigation measures to protect adverse effects on aquatic plants. Mitigation measures could include the creation of refuge areas within the reservoir that will continue to hold water when the water levels fall below a pre-determined level and the use of floating islands or rafts. Severn Trent will discuss the findings of the further investigations with the Environment Agency and agree any necessary mitigation measures prior to implementation of the options. Should these investigations indicate that adverse effects cannot be avoided, Severn Trent will review the alternative options available to reduce the scale of river flow support from Carsington Water while still addressing the forecast supply deficit in the Strategic Grid zone.

The HRA concluded that there would be no in-combination likely significant effects on any European site from the concurrent construction and/or operation of these options.

River Trent from Dove to Derwent

The simultaneous operation of options WTW05, WIL05 and MEL29 has the potential for cumulative adverse effects on the River Trent from Dove to Derwent. Abstraction for option WTW05 will only take place at high flows in accordance with an abstraction licence hands-off flow condition to ensure no adverse effects on the River Soar or downstream River Trent. Abstraction from the River Trent for option WIL05 will be supported by raw water augmentation. Abstraction from the River Trent for MEL29 will be subject to hands-off flow conditions to protect the downstream River Trent. Given these operational measures, the cumulative assessment concluded that there would be a negligible risk of adverse impact on the flow regime and ecology of the River Trent from Dove to Derwent.

River Derwent from Amber to Bottle Brook

Options WIL05, LIT01 and OGS01 expand the Derwent Valley System conjunctive use scheme. In-combination, these options optimise the use of existing abstraction licences, taking water from the River Derwent at Ambergate when flows are high for storage in Carsington Water reservoir for subsequent release in dry weather conditions to support abstractions from the River Derwent and the River Dove so as to protect the river environment at times of low flow. The cumulative effects of these additional reservoir releases will be the consequent need to abstract more water from the Derwent at Ambergate at times of high flows to replenish the storage in Carsington Water. Option NOT05 (treated water transfer to the Nottinghamshire water resource zone,) will also partly be enabled through a small increase in abstraction from the River Derwent at Ambergate. These five options will maximise the use of the existing abstraction licence hands-off flow conditions to protect the River Derwent from Amber to Bottle Brook.

It should also be noted that options NOT01, NOT04 and BAM03 involve the transfer of treated water produced within the Strategic Grid Water Resource Zone which covers a large part of the Severn Trent region and is not limited to water produced from the River Derwent, and therefore no material additional cumulative effects will arise on the River Derwent from Amber to Bottle Brook due to the concurrent operation of these three options.

The cumulative assessment of the effects of the concurrent additional abstraction from the River Derwent at Ambergate to replenish storage in Carsington Water concluded that there will be no greater than minor adverse effects on the River Derwent from Amber to Bottle Brook. There may be some minor adverse effects from the changes to the flow regime, but these are not considered to be of a magnitude that would lead to any WFD deterioration of this water body. The increased releases from Carsington Water to the River Derwent at Ambergate as a result of concurrent operation of these options at times of low flow conditions will also not lead to any WFD deterioration of the water body.

Cumulative Effects with Severn Trent's Drought Plan

Severn Trent is currently in the process of updating its Drought Plan. The current Drought Plan was published in 2013, however, Severn Trent published an updated Draft Drought Plan for consultation in May 2018. The Drought Plan identifies demand side and supply side measures which could be employed in the event of a drought. The purpose of the Drought Plan is to bring about adaptations to manage drought and its implications effectively.

The implementation of the current 2013 Drought Plan or the updated Drought Plan (once finalised) alongside the Final WRMP19 may lead to both beneficial and adverse cumulative impacts, the latter particularly in terms of environmental water stress. However, the assessment identified that there would be no concurrent operation of supply-side Drought Plan options with supply options in the Final WRMP19. The Drought Plan supply-side options will only be implemented in severe drought conditions and will effectively replace some normal supply sources which will cease operation in drought due to abstraction licence conditions that prevent abstraction at low flows or low water levels. No cumulative adverse effects between the Severn Trent Drought Plan and the Final WRMP19 are therefore anticipated.

The Drought Plan demand-side measures complement the demand management options included in the Final WRMP19. Whilst their concurrent implementation might exacerbate some of the potential adverse effects of the leakage management measures, specifically in relation to vehicle movements and associated effects on air quality, transport, community and nuisance, such additional effects are considered negligible and, overall, there should be an overall beneficial cumulative effect on water resources (with indirect beneficial effects on environmental receptors such as biodiversity) because of the reduced consumption use of water.

Cumulative Effects with Other Water Company Plans

Severn Trent took account of the developing draft or revised draft 2019 WRMPs of other water companies (as available) to inform decisions on its Final WRMP. This included the decision to exclude the Vyrnwy Reservoir import from United Utilities from its Final plan on the basis that this supply had already been included in the revised draft WRMP19 of Thames Water. The cumulative assessment has been updated with the draft or final draft 2019 WRMPs (as available at February 2019) for the Final WRMP publication. The updated assessment has concluded that no cumulative adverse effects are anticipated between the WRMPs of the neighbouring water companies and Severn Trent's Final WRMP19.

All of the neighbouring water companies are including demand management programmes in their 2019 WRMPs, similar to those included in Severn Trent's Final WRMP19. Improved water efficiency and leakage reduction across England and Wales will result in beneficial in-combination effects in terms of reducing the need for, or scale of, new water resources thereby helping protect the water environment as well as reducing energy use through reduced water pumping and treatment.

Severn Trent will continue to communicate with neighbouring companies regarding the options in their 2019 WRMPs as these are finalised during 2019 and the subsequent implementation over the next few years prior to the next WRMP submission. In particular, small scale developments (e.g. new pipelines) constructed at a distance from each other by different water companies can still lead to incremental effects resulting in gradual loss of natural areas and woodland, resulting in impacts on designated landscapes. Prior to the implementation of the WRMP options, Severn Trent will consult with other water companies to identify any potential for such incremental cumulative effects on designated landscapes and consider developing Protected Landscape Mitigation Strategies in partnership with the relevant other water company, Natural England and relevant Protected Landscape officers, as appropriate.

No cumulative adverse effects have been identified in relation to the current published Drought Plans of neighbouring water companies. Beneficial effects may arise in respect of the Drought Plan measures for water efficiency and demand management with similar activities in the Final WRMP19.

Cumulative Effects with Relevant Plans, Programmes and Projects

Environment Agency Drought Plans

Assessment of the potential for in-combination impacts of the preferred plan with drought options listed in the Environment Agency Midlands Drought Plan has been undertaken. The information used to carry out these assessments is the most up to date information available at February 2019, but the assessments should be reviewed at the time of option implementation to ensure that no changes to the Environment Agency's Drought Plan have been made in the intervening period, and that this assessment therefore remains valid.

Drought actions and triggers are given in the Environment Agency's Drought Plan. Actions described include communications (internal and external), monitoring and potential drought order applications to protect the environment. Of these actions, those which are applicable for in-combination assessment with Severn Trent's Final WRMP19 are external water efficiency communications with the public and potential environmental drought orders.

External communications will have positive in-combination effects with Severn Trent's demand management options in the Final WRMP19, as drought communication messages may reinforce the need for water efficiency audits and for new metered customers to use water wisely, thereby resulting in increased demand savings and greater recognition by the public to conserve their use of water.

No cumulative adverse effects have been identified in relation to the current Environment Agency Drought Plan. The Environment Agency's drought order for the River Severn Regulation scheme is compatible with the options set out in Severn Trent's Final WRMP19 options and no cumulative adverse effects are anticipated.

Land Use and Spatial Plans

Potential cumulative effects with Local Plans and similar spatial plans have been assessed based on the plans available at February 2019. Local Plans and other spatial plans are relatively high-level policy documents and, whilst they identify potential areas for future development and zones for particular activities, the certainty of developments, the precise spatial location and their timing make it difficult to identify any specific potential cumulative effects with the Final WRMP19. However, following review of the available Local and spatial plans that may be affected by the options within the Final WRMP19, the potential for cumulative effects was identified in relation to three options: NOT05, NOT04 and CRO06 as summarised below.

The proposed pipeline route for option NOT05 intersects the following sites identified in the latest spatial plans for the districts of Erewash and Gedling:

- The Regeneration Area at Stanton by Dale
- The Breaston, Risley and Stanton by Dale conservation areas
- Bestwood Village and Calverton strategic housing sites, with up to 560 and 1055 housing units proposed, respectively. The NOT05 proposed pipeline runs through Bestwood Country Park (adjacent to Bestwood Village) and within 1km of Calverton.

The proposed pipeline for NOT04 intersects the following strategic sites in the districts of Bolsover and Chesterfield:

- Planned housing allocations at the southern boundary of Clowne
- Employment land allocations at the Industrial Park in Worksop •
- Local conservation areas to the north of Barlborough
- Residential development allocated sites (urban areas in Chesterfield)
- Sites allocated for economic growth (urban areas including Old Whittington).

There are two strategic sites located within 1km of CRO06 in the district of Charnwood. These include one large housing allocation site located in Rothley to the south of the option and a proposed New Employment Allocation in Rothley, located just to the north of the option.

As the WRMP19 options are brought forward for promotion, an assessment will need to be carried out of possible construction and/or operational cumulative effects with known local developments, including strategic sites and sites of local importance, as indicated above, in dialogue with the relevant local planning authorities.

The relevant County Council Minerals Development Frameworks have also been considered in respect of the third-party asset storage option (WTW05) and this demonstrates compatibility with the Council's core policy on asset reclamation, subject to appropriate mitigation and enhancement package being developed and agreed with the Council and other statutory bodies.

National Policy Statements and National or Regional Infrastructure Plans

No in-combination effects have been identified with National Policy Statements (including the consultation draft National Policy Statement for Water Resources Infrastructure issued in January 2018), or with national or regional infrastructure plans (including energy and transport sector plans).

Major projects

The potential for in-combination effects with known significant projects and developments identified in the Severn Trent supply area include: High Speed Two (HS2) Phases 1 and 2; M42 Junction 6 Improvement Scheme, M54 to M6 Link Road; Avonmouth Deep Sea Container Terminal; Hinkley Point C Nuclear Power Plant and the Wednesbury to Brierley Hill Metro Extension.

The assessment indicated that only one option - option NOT05 – has the potential for cumulative effects with the identified projects. Small sections (0.8km) of the NOT05 pipeline intersect the HS2 Phase 2b Safeguarded Route at two locations immediately to the west of Nottingham, parallel to the M1, and large sections (6.2km) are in close proximity to the HS2 Phase 2b Safeguarded Route of the East Midlands Branch within the Broxtowe and Nottingham Borough districts. There remains uncertainty as to the precise timing of HS2 Phase 2b in relation to the timing of the construction of the NOT05 pipeline, but currently the HS2 construction is scheduled between 2024 and 2030, so there is the potential for construction overlap with NOT05. Close consultation will therefore take place between Severn Trent and HS2 Limited to agree appropriate measures to manage any concurrent construction and ensure environmental protection. Subject to careful design, best practice construction methods by both parties and, if necessary, the development of environmental mitigation measures, there is unlikely to be greater than minor cumulative temporary adverse effects on the environment but there may be some localised moderate to major cumulative temporary adverse effects on recreation and local communities due to construction traffic and site construction activities, despite best practice construction methods. No cumulative operational effects are anticipated.

No cumulative, in-combination effects with the other identified projects are considered likely as the zones of influence largely do not overlap with the Final WRMP19 schemes and/or there are differing construction periods, or otherwise the impacts have been identified as small-scale and geographically distributed. No cumulative operational effects are anticipated with these other identified projects.

Habitats Regulations Assessment (HRA)

With one exception, the HRA screening assessment concluded that the supply-side options included in the preferred programme would have no likely significant effects on any European site. The screening assessment could not rule out likely significant effects from implementation of the NOT04 option (Heathy Lea to North Nottinghamshire transfer solution (component 305)), and consequently an Appropriate Assessment was carried out of this option. The Appropriate Assessment concluded that implementation of option NOT04 would not have any adverse effects on the integrity of any European site.

None of the Final WRMP19 options were shown to have in-combination effects on any European site with any other options included in final plan, or with any other plans or projects. The HRA concluded that the Final WRMP will have no adverse effects on any European site, either alone or in combination with any other plans or projects.

Water Framework Directive (WFD) Assessment

The vast majority of the options included in Severn Trent's final WRMP19 preferred programme have demonstrated compliance with WFD objectives and statutory requirements. There are two proposed options where further investigations are required to confirm WFD compliance: the Ladyflatte groundwater abstraction option and the Thornton Reservoir abstraction option. These investigations will be carried out, and the findings discussed with the Environment Agency, before any applications for abstraction licences or environmental permits are sought for these options. Should the investigations determine that WFD compliance cannot be secured, even after development of mitigation measures, there are sufficient WFD compliant alternative options available to address the forecast supply deficit.

The provisional assessment of the WIL05 option (Site E WTW expansion and transfer main supported by raw water augmentation of the River Trent) flow augmentation component indicates no WFD compliance risks are likely from the options under consideration once mitigation measures have been considered (if necessary). The flow augmentation will be subject to environmental permitting which will include any necessary conditions to ensure WFD compliance. This provisional assessment will need to be confirmed once the source of the flow augmentation has been finalised.

Cumulative effects of several options relying on flow releases from Carsington Water reservoir requires further investigation in relation to the effects on marginal vegetation from increased water level drawdown during prolonged dry weather. Should the investigations determine that WFD compliance cannot be secured, even after development of mitigation measures, there are sufficient WFD compliant alternative options available to address the forecast supply deficit.

Potential risks of cumulative adverse effects between other water companies draft or revised draft WRMP19s (as available at February 2019) were investigated and no such impacts were identified. No cumulative effects with any other plans or projects were identified.

Consideration of Reasonable Alternatives

Through the assessment of several alternative programmes, the SEA has identified that feasible alternative schemes exist that could be developed with acceptable environmental and social effects that are comparable to the environmental and social effects of the schemes included in the Final WRMP 2019. In this way, substitute schemes are available for consideration if this becomes necessary over the long-term implementation of the Final WRMP19. In particular, two other alternative programmes were assessed which included differing levels of leakage reduction and metering ambition, but both included an option to develop a new water supply from United Utilities from Vyrnwy Reservoir via the River Severn. The overall magnitude of environmental and social effects of this alternative supply option is broadly comparable to the effects associated with the third party asset option which it would be a substitute for.

Mitigation Measures

Options have been assessed in the SEA on the basis of residual effects on environmental and social receptors after taking account of the standard mitigation measures included within the outline design of each option. This includes measures such as best practice construction methods, flood storage compensation for options constructed in flood plains and standard noise, screening and pollution control measures during operation. Air quality effects are assumed to be mitigated through transport logistics and routing to avoid sensitive areas such as Air Quality Management Areas (AQMAs). Opportunities to generate energy from renewable sources are already being taken by Severn Trent and further energy recovery and renewable energy opportunities will be explored as part of the detailed development of the strategies during the lifetime of the Final WRMP19.

The SEA has however identified some specific additional mitigation measures as described above in relation to some of the options included in the Final WRMP19. These particularly include the need for mitigation where major adverse effects have been identified in respect of biodiversity, designated conservation sites, archaeology and cultural heritage, and landscape and visual amenity.

Effects on archaeology and cultural heritage due to construction disturbance would be mitigated through detailed design to refine and optimise pipeline routes so as to avoid the identified potential impacts on archaeology or heritage assets, as well as through further site investigations and liaison with Historic England, local authorities and local heritage organisations to develop feature-specific mitigation measures.

Effects on landscape and visual amenity will need to be addressed during the detailed design and optimisation of pipeline routes and location of above ground assets so as to avoid adverse effects on key landscape features (natural and built assets) and working with planners and local interest groups to return the visual and physical integrity of the landscape as closely as possible to its previous condition following construction. Where options result in the development of permanent facilities within the landscape, the detailed designs will carefully consider ways to blend the facilities in with the existing landscape as far as possible, including through careful selection of construction materials and appropriate screening and landscaping of the site.

The mitigation measures described above would, in some cases, be implemented through Environmental Impact Assessment where required, and through the town and country planning processes. Construction Environmental Management Plans would be developed to ensure the mitigation measures (and associated effects monitoring) are in place during construction activities. In this way, effective mitigation plans can be developed to minimise many of the residual major adverse effects currently identified in the SEA. In some cases, uncertainty remains around the scale and magnitude of potential effects and therefore further investigations will be needed first before determining the precise nature of the mitigation measures that may be required.

Monitoring of Effects During Plan Implementation

The natural, built and human receptors potentially impacted by development and operation of the options included in the Final WRMP19 strategies and possible indicators of effects have been set out in the table below. These proposed indicators would form the core component of a monitoring programme to assess whether the identified effects in the SEA are occurring as anticipated, or whether it is giving rise to greater or lesser effects (adverse or beneficial). In turn, the monitoring may identify changes to the mitigation measures necessary to minimise adverse effects and/or modifications to scheme design or operation to further augment beneficial effects.

The monitoring programme will be refined through the detailed planning and environmental approvals stage. The plan will include:

- Scheme-specific monitoring requirements and targets that focus on scheme-specific risks, habitats, species and sites; and
- Strategic, regional and local monitoring requirements and targets to ensure that monitoring is conducted at a suitable spatial scale that reflects the scale and risks of each scheme and the overall plan. ٠

The monitoring plan will be owned and implemented by Severn Trent and will be developed to reflect phasing of the plan. The monitoring plan will be further developed beyond this report during the implementation of this plan in consultation with the Environment Agency and Natural England to make best use of available data, to share existing monitoring locations and locate new monitoring sites where possible in locations that not only meet scheme-specific requirements but provide additional value to the Environment Agency and Natural England's monitoring programmes.

| Impacted Receptor | Monitoring Indicator | Information Source | Responsibility |
|--|---|---|----------------|
| | Proportion of surface waters and groundwater waterbodies at 'Good' WFD status | Environment Agency online Catchment Data Explorer for RBMP2 (River Basin Management Plan 2) for the year 2015 and any updates | Environment A |
| | Protected species and habitats surveys | Site specific during detailed design stage to confirm presence/likely absence of protected species | |
| | | Environment Agency database, monitoring completed by Severn Trent | Severn Trent |
| | Biological monitoring (macrophytes, macroinvertebrates, fish) | Natural England favourable condition assessment tables | |
| Water resources, water quality, biodiversity | Condition of European Sites and SSSIs according to Natural England condition assessments | | Environment A |
| | Progress against the Severn Trent's biodiversity action plan | Biological monitoring and surveys | Natural Englan |
| | Surface water and groundwater levels | Monitoring and comparison with historic records | |
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| Impacted Receptor | Monitoring Indicator | Information Source | Responsibility |
|-------------------------------------|--|---|------------------------------------|
| Climate Factors | Net greenhouse gas emissions per MI (million litres) of treated water (kg CO2 equivalent emissions per MI) | Reported annually by Severn Trent | Severn Trent |
| Transport | Transport fleet fuel consumption, emissions and mileage | Routinely monitored by Severn Trent | Severn Trent |
| Nuisance/ Community Amenity Effects | Scheme level community disruption due to construction works / during operation (where applicable) | Monitored through an Environmental Management Plan | Severn Trent |
| | Complaints logged during construction | Compile data held by Severn Trent (and contractors) and Local Authority Environmental Health Officer | |
| | Customer satisfaction surveys | Responses gauged through and reported in Severn Trent's annual performance processes | Severn Trent, L |
| | Surveys of recreational and other amenities likely to be affected | Survey responses pre- and post- construction | Severn Trent |
| | | | Severn Trent |
| Air Quality | Scheme-specific monitoring during construction works / during operation (where applicable) | Environmental Management Plan | Severn Trent |
| | Changes in background air quality | | |
| | | Defra Automatic Urban and Rural Network, Local Authority monitoring | Defra, Local Au |
| Resource Use | Proportion of demolition materials sent to land fill or recycled | Part of Construction Environmental Management Plan | Severn Trent (c |
| | Proportion of construction build materials derived from recycled materials | Part of design criteria for new builds | Severn Trent |
| Landscape and visual amenity | Loss of land within AONB (Areas of Outstanding Natural Beauty), National Park or protected views | Landscape and Visual Impact Assessments | Complete asses England, Local |
| | Changes to townscape and views | - | As above |
| | Changes to townscape and views | Townscape assessment | |
| Cultural Heritage | Loss or change in condition of buried archaeology | Archaeological Written Scheme of Investigation | Complete asses and Local Author |
| | | Environmental Management Plan | Severn Trent |
| | Change in condition of existing heritage assets | Monitoring of heritage assets such as Listed Buildings and Scheduled Monuments, Registered Battlefields, Registered | Historic England |

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| Impacted Receptor | Monitoring Indicator | Information Source | Responsibility |
|-------------------|----------------------|---|----------------|
| | | Parks and Gardens, in particular the 'Heritage at risk' register. | |

As options are brought forward for development, further specific monitoring requirements may be set out in detailed designs and plans accompanying scheme development (including, where applicable, formal applications for any required environmental permits or abstraction licences, planning permission, as well as any scheme-specific HRA and WFD assessments). These will be discussed with relevant regulatory and statutory bodies and stakeholders to agree the appropriate scale and duration of such scheme-specific monitoring activities proportionate to the assessed environmental risks.

Conclusions

Through application of the SEA process (and associated HRA and WFD assessments) from the very outset, Severn Trent has actively considered environmental and social effects throughout the development of its Final WRMP19 and consulted regularly with regulators, stakeholders and customers to seek their views on the emerging findings from the effects assessment. The SEA process complies with the regulatory requirements and national best practice guidance. The assessments have been based on a broad range of objective environmental and social criteria, developed through public consultation, to ensure all options were considered on a consistent basis, in line with the meeting the requirements of the SEA Directive and national SEA Regulations.

By integrating environmental and social assessment into the development of the WRMP19 from the very outset of the planning process, a long-term, sustainable plan has been produced that maintains water supply reliability for Severn Trent's customers without unacceptable adverse effects on the environment or local communities, subject to the application of appropriate, specific mitigation measures as identified by the SEA findings.

As well as protecting the environment, the Final WRMP19 provides opportunities for environmental enhancement through various measures, in particular:

- reducing water abstraction from a number of existing water sources where there is a risk of adverse effects on the water environment. ٠
- including a new scheme to purchase a third-party asset and develop it into raw water storage to help meet long term supply / demand needs. This is an innovative option to develop strategic raw water storage and there are • opportunities, through careful planning and dialogue with stakeholders, to develop recreational amenities and enhance biodiversity through asset reclamation activities in line with County Council policies.
- actively pursuing further water efficiency measures to substantially reduce leakage from the water supply system and customer properties, reducing the amount of water required to be abstracted from the environment.
- significantly extending water metering to more customers and helping customers reduce their demand for water to achieve a material reduction in water consumption

Severn Trent will seek opportunities for net environmental, social and economic gain in implementing its WRMP, as well as opportunities for net biodiversity gain, in line with government policy.

Consultation

Severn Trent started engagement with the Environment Agency, Natural England and Natural Resources Wales on the unconstrained list of options and associated screening criteria in December 2016. Meetings were then undertaken to review the screening process and comments on the constrained list of WRMP options. In January 2017, the constrained list was reissued with supporting assumptions to for comment, Comments provided in response were used to inform the ongoing WRMP options screening and scoping process. Additionally, a series of stakeholder consultation workshops have been held during the development of the WRMP19 to share emerging findings from the SEA, HRA and WFD assessment processes. Customer engagement activities have also been held to explain the key features of the WRMP19 and to seek feedback on the alternative options available to balance supply and demand.

SEA statutory consultation bodies, stakeholders and the public were invited to express their views on the Scoping Report in January and February 2017. The feedback from this consultation helped to shape and finalise the assessment methodology and SEA objectives, as well as informing the appraisal of the Final WRMP19 options.

The public, SEA statutory consultation bodies, regulatory bodies and stakeholders were invited to express their views on the draft SEA Environmental Report between February and April 2018. A Statement of Response to the comments received during the consultation, and how they have been addressed was published in early September 2018. The representations on the Environmental Report and draft Water Resources Management Plan have been taken into account and addressed where applicable in this Final WRMP19 SEA Environmental Report. As part of the finalisation of the WRMP19, a representation from the Environment Agency led to a modification to Solution MEL29 to replace supported abstraction (from Carsington Water) from the River Derwent with a direct abstraction from the River Trent. The SEA (and associated HRA and WFD assessment) for Solution MEL29 was updated accordingly within this final Environmental Report.

SEA Statement

Following publication of the Final WRMP19, Severn Trent will also publish a SEA 'Post Adoption' Statement setting out how the SEA, and any views expressed by the consultation bodies or the public, influenced the development of the Final WRMP 2019.

1 Introduction

1.1 Background and Purpose of Report

Water companies in England and Wales are required to produce a Water Resources Management Plan (WRMP) every five years. The Plan sets out how the company intends to maintain the balance between supply and demand for water over the long-term planning horizon in order to ensure security of supply in each of the water resource zones making up its supply area.

This Strategic Environmental Assessment (SEA) Environmental Report has been prepared in support of the development of Severn Trent's 2019 Final WRMP (WRMP19) which is being issued for public consultation in early 2018. Habitats Regulations Assessment (HRA) and Water Framework Directive (WFD) has also been carried out in parallel.

SEA is a statutory requirement for plans or programmes which could have significant environmental implications and helps to identify where there are potential impacts and how any negative impacts might be mitigated. More information about SEA, and its role in supporting the development of the Final WRMP, is provided in Section 1.2.

This Environmental Report is the second output of the SEA process. In January 2017, the SEA Scoping Report was issued for consultation which summarised the environmental baseline and set out the proposed assessment framework. The comments and issues raised by consultees are provided in Appendix A and have been considered in preparing this Environmental Report. Comments on the Environmental Report accompanying the Draft WRMP19 issued in December 2017 have also been taken into consideration for this Environmental Report for the Final WRMP19. The Statement of Response published by Severn Trent in September 2018 details these comments and how they have been addressed.

The Environmental Report summarises the review of relevant policies and plans (Section 2, presented in full in Appendix B) and the baseline environment information (Section 3) that set the context for the assessment that has been carried out in accordance with the assessment methodology (Section 4). High level environmental screening to establish the constrained and feasible list of options is described in Section 5. The potential effects of alternative Water Resources Management Plan options are described in Section 6, with assessment of the Final WRMP19 Programme and a review on the role of the SEA in informing the WRMP in Section 7. The assessment of cumulative effects between options and other activities, programmes and plans is set out in Section 8. Information regarding mitigation and monitoring is provided in Section 9. Section 10 discusses the conclusions of this Environmental Report. The SEA quality assurance is discussed in Section 11 and provided in Appendix C.

This SEA Environmental Report accompanies the publication of Severn Trent's Final Water Resources Management Plan 2019.

1.2 Application of SEA to Water Resource Management Planning

1.2.1 Overview of Strategic Environmental Assessment

SEA became a statutory requirement in the UK following the adoption of Directive 2001/42/EC (the SEA Directive) on the assessment of effects of certain plans and programmes on the environment. The Directive was transposed into national legislation by The Environmental Assessment of Plans and Programmes Regulations 2004 (referred to as the SEA Regulations)².

The objectives of SEA are set out in Article 1 of the SEA Directive as follows:

² The Environmental Assessment of Plans and Programmes Regulations 2004 (Statutory Instrument 2004 No. 1633) apply to any plan or programme which relates solely or in part to England.

'to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans with a view to promoting sustainable development'.

The SEA Directive requires preparation of an Environmental Report in which the likely significant effects on the environment of implementing the plan or programme, and reasonable alternatives taking into account the objectives and geographical scope of the plan or programme, are identified, described and evaluated. It should be noted that, as stated in the Office of the Deputy Prime Minister (ODPM) SEA Guidelines³, 'it is not the purpose of the SEA to decide the alternative to be chosen for the plan or programme. This is the role of the decision-makers who have to make choices on the plan or programme to be adopted. The SEA simply provides information on the relative environmental performance of alternatives and can make the decisions making, including the selection of options, and the timing and implementation of Water Resources Management Plan options within the plan, as well as the consideration of appropriate monitoring and mitigation of identified environmental and social effects.

The range of environmental and social issues to be included in a SEA is set out in the SEA regulations, and includes biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage, and landscape.

As identified above, the Government has produced SEA guidance which sets out the stages of the SEA process. This, along with specific guidance for undertaking SEA and Habitats Regulations Assessment (HRA) of WRMPs⁴, are used to inform the SEA of Severn Trent's WRMP19. The 2016 Final Water Resources Planning Guideline⁵ (WRPG) also provides guidance on the role of SEA within the water resources management planning process.

These guidance documents and regulations have all informed Severn Trent's Final Water Resources Management Plan 2019 and the SEA.

1.2.2 Requirement for SEA and HRA of Severn Trent's Water Resources Management Plan

The SEA Scoping Report issued in 2017 set out the reasons why a SEA of the Severn Trent's Water Resources Management Plan was required. The conclusion was that SEA is required taking into account a precautionary approach and uncertainties associated with whether the plan is likely to set a framework for future development consent and the risk that the Habitats Regulations Assessment (HRA) would identify the potential for likely significant effects on certain Natura 2000 sites. A HRA has since been undertaken which accompanies the Final Water Resources Management Plan and which has informed the SEA.

Undertaking a SEA of the Water Resources Management Plan has aided its development and Severn Trent's decision-making on the options to be included in the plan, their timing and phasing taking account of the assessed environmental and social effects (adverse and beneficial). The application of the SEA (and HRA) have helped ensure strategic decisions affecting the environment have been made early on in the Water Resources Management Planning process.

³ Office of the Deputy Prime Minister (2005) A Practical Guide to the Strategic Environmental Assessment Directive.

⁴ UKWIR (2012) Strategic Environmental Assessment and Habitats Regulation Assessment – Guidance for Water Resources Management Plans & Drought Plans (12/WR/02/A).

⁵ Environment Agency and Natural Resources Wales (2017) Water Resources Planning Guideline: Interim Update

1.3 Severn Trent Supply Area and Water Resources Management Planning

1.3.1 Severn Trent Supply Area

Severn Trent is one of the largest water and wastewater companies in England and Wales, providing high quality water and wastewater services over an area of 21,000km² in the Midlands and the Chester area, and stretching west to east from the Bristol Channel to the Humber. Severn Trent provides water to 8 million people, supplying some 1,800 million litres of water per day (MI/d) to homes and businesses. Water is supplied through nearly 47,000km of water mains fed from multiple sources including 28 impounding reservoirs and 181 groundwater sites. Groundwater sources, river derived sources and impounding reservoirs provide 35%, 35% and 30% respectively of the total volume of water put into supply. For water resource planning purposes, Severn Trent's water supply area is divided into 15 independent Water Resources Zones (WRZs) reflecting the different characteristics of the supply area and associated risks to meeting demand in dry weather conditions. The 15 WRZs are shown in **Figure 1.1**. The following sections summarise the characteristics of each WRZ.

1. Strategic Grid

By far the largest WRZ, the Strategic Grid extends from the Peak District in the north, encompassing most of Derbyshire and Leicestershire. The WRZ then extends south-west through Warwickshire to Gloucester, and then north-west covering most of Worcestershire and some of Shropshire. The strategic grid is made up of 14 major water treatment works (WTW), five reservoir complexes, three major grid booster pumping stations and a number of strategic pipeline network connections and aqueducts. The WRZ serves a population of 5.08 million (64.9% of the total population supplied by STW).

2. Nottinghamshire

The Nottinghamshire WRZ is supported by inter-linked groundwater sources and can also receive transfers from the Strategic Grid. The zone is largely supplied from a sandstone aquifer, which is a large unit that responds slowly to abstraction and drought pressures. The WRZ serves 1.04 million people (13.3% of the total).

3. Newark

The Newark WRZ is supplied from local boreholes and imports from Nottinghamshire WRZ. The WRZ serves a population of 45,530 (0.6% of the total).

4. North Staffordshire

This WRZ extends from Tittesworth reservoir in the Peak District south-west towards Market Drayton. The WRZ is well connected and flexible. Water is routinely transferred from Site L WTW to support the groundwater supplied areas to the south-west of the zone. Similarly, when Site L WTW output is reduced, demand in the North Staffordshire area can be met by increased output from the groundwater sources. This allows the conjunctive use of ground water and surface water resources. The WRZ serves a population of 534,890 (6.8% of the total).

5. Stafford

There are four borehole groups which supply the distribution reservoirs in the zone, allowing an even distribution of water throughout the zone. The zone has no defined connections to the surrounding WRZs under normal operation. The WRZ serves a population of 95,330 (1.2% of the total).

6. Whitchurch and Wem

This WRZ lies on the English side of England-Wales border and extends from Whitchurch southwards to Wem. The WRZ is supplied from local boreholes. There are no connections with surrounding WRZs under normal operation. The WRZ serves a population of 29,190 (0.4% of the total).

7. Kinsall

This WRZ lies to the west of the Whitchurch and Wem WRZ. The WRZ is supplied from local boreholes. There are no connections with surrounding WRZs under normal operation. The WRZ serves a population of 12,370 (0.2% of the total).

8. Mardy

This WRZ runs along the Welsh border encompassing Oswestry. The zone is supplied from a local borehole. There are no connections to the surrounding WRZs under normal operation. The WRZ serves a population of 8,190 (0.1% of the total).

9. Ruyton

The zone is supplied from a local borehole and a limited connection from the Shelton WRZ. The WRZ serves a population of 12,830 (0.2% of the total).

10. Shelton

This WRZ is centred on the Shelton area and extends westwards to the England-Wales border and eastwards towards Wolverhampton. The zone is connected by a strategic link from Shelton to Telford that allows water resources to be effectively utilised throughout the zone from Shropshire to west Staffordshire. The WRZ serves a population of 460,920 (5.9% of the total).

11. Wolverhampton

The zone is supplied with water from Severn Trent's shared South Staffordshire Asset, with support from a number of local groundwater sources. The WRZ serves a population of 238,700 (3.1% of the total).

12. Bishops Castle

The zone is supplied from local boreholes. There are no connections to the surrounding WRZs under normal operation. The WRZ serves a population of 6,170 (0.1% of the total).

13. Chester

This zone is supplied predominantly by the River Dee (85%), with 10% from impounding reservoirs and 5% from a spring source at Llangollen and a groundwater source at Mickle Trafford. The WRZ serves a population of 99,760 (1.3% of the total).

14. Rutland

This zone on the eastern edge of the supply area receives all of its water from bulk supply transfers from Anglian Water. The WRZ serves a population of 31,240 (0.4% of the total).

15. Forest and Stroud

This zone is supplied with water from Site K WTW, which can be distributed throughout the zone, and local groundwater and spring sources. The WRZ serves a population of 134,070 (1.7% of the total).

Further details about the Severn Trent water supply system are provided on the Severn Trent website (<u>www.stwater.co.uk</u>).





Ref: Ricardo/ED62813/Issue Number 4

1.3.2 Area under consideration for the SEA

Development of the WRMP has involved a sequential process to determine the Final WRMP19 programmes of water supply and demand management schemes to maintain a supply-demand balance in each WRZ. The Final WRMP19 Programmes for each WRZ together make up the WRMP. Sections 4, 5 and 6 explain in more detail the Feasible List of options under consideration for the WRMP. Some of the options considered lie outside of the Severn Trent supply area: consequently, the spatial scope of the SEA is larger than the company's water supply area to cover potential locations for new sources of water that may be considered through the water resource planning process, as well as reflecting the fact that Severn Trent is supplied – either directly or indirectly – from several water sources located within Wales. The full area under consideration for the SEA is shown in **Figure 1.2**.

1.3.3 Temporal scope of the SEA

The temporal scope of the WRMP covers a minimum planning period of 25 years (2020-2045). The SEA covers the full duration of this planning period, however, as the statutory process requires WRMPs to be produced at least every five years, the schemes and programmes for balancing supply and demand for water will be reviewed again and subject to SEA in 2023-24 at latest.

In Section 3 of this Environmental Report and Appendix D, the current environmental and social baseline for the SEA geographical area under consideration is described together with the likely future changes to this baseline as currently understood. Over the long-term planning horizon of the WRMP, there is uncertainty as to how the future baseline will evolve. Consequently, it is sensible to adopt a scenario approach to test the sensitivity of the WRMP against the central assessment of environmental and social effects based on the known or likely changes to the baseline conditions. In this way, the resilience of the WRMP options, programmes and the overall plan can be assessed and used to inform decision-making as well as recommendations for future monitoring to provide data for subsequent WRMPs and the associated SEA.

In considering this approach to the future environmental and social baseline, it is important to recognise that WRMP options for implementation beyond 2025 will be further assessed by Severn Trent through the next statutory WRMP due to be published in 2024; this will also be subject to SEA. This process is currently assumed to be repeated every subsequent five years. This regular statutory update and review will ensure that actual changes to the baseline and updated forward projections can be taken into account in subsequent WRMPs and SEAs.

Figure 1.2 SEA Area Under Consideration



Ref: Ricardo/ED62813/Issue Number 4

1.4 Severn Trent's Water Resource Management Planning Process

1.4.1 Overview and Timetable

Water resources management planning is undertaken by all water companies in England and Wales in order to ensure reliable, resilient water supplies over the long-term planning horizon. The process includes working out and forecasting how much water customers will need over the planning period (assessing demand) and how best to provide it (assessing options to reduce or constrain demand growth and/or augment reliable supplies of water) in an efficient, timely manner (programme appraisal). Companies seek to identify the preferred, 'best value' programme of demand management and water supply options to maintain a balance between reliable supply and demand in each WRZ and for their supply area as whole (the WRMP).

Water companies in England and Wales have a statutory requirement to prepare a WRMP every five years. Severn Trent's draft WRMP19 was submitted to the Secretary of State on the 1 December 2017 and was approved for public consultation in February 2018. Following representations made by stakeholders on the draft plan during spring 2018, a Statement of Response was published in September 2018 by Severn Trent on its website setting out how stakeholder comments have been considered in preparing a revised draft WRMP19, which was submitted to the Secretary of State. Following review, the Plan was approved by the Secretary of State in July 2019 for publication as the Final WRMP19. The WRMP also informs the regulatory water company business planning Price Review process through which the Water Services Regulation Authority (Ofwat) sets the prices that water companies can charge their customers for water (and wastewater) services. The latest price review will be completed by December 2019.

Engagement with government, regulators, other licensed water suppliers and water companies, customers and a wide range of stakeholders is key to the WRMP process. Severn Trent's WRMP19 consultation programme commenced in 2016 and included a wide range of stakeholders and regulators. Consultation continued throughout the development of the plan, including through the public consultation on the Draft WRMP and associated SEA Environmental Report in spring 2018. A Statement of Response was prepared by Severn Trent in September 2018 setting out how it intended to take account of the comments received from stakeholders on the draft plan in finalising its WRMP. The Final WRMP19 was approved for publication by the Secretary of State in July 2019.

In developing its WRMP19, Severn Trent examined the supply/demand balance for each WRZ and determine how any deficits between forecast demand and reliable water supplies should be addressed for the selected planning period.

The planning process considered key issues which affect future water supply reliability and demand for water, such as:

- population and housing growth
- water consumption behaviour and how these may change in the future
- climate change implications for reliability of water supplies
- reductions to the availability of water supplies due to environmental impact of existing water source abstractions ('sustainability reductions')
- raw water quality deterioration due to land use and/or climate change

A wide range of alternative options were considered by Severn Trent to address any forecast supply shortfalls, including:

- alternative water tariffs to encourage water efficiency (linked to Severn Trent's strategy to continue extending water metering to its household customers)
- promotion of water efficiency measures
- reducing water leakage from the water supply network or at customers' properties

- water transfers from other water companies or other owners of water sources
- water reuse
- changes to river or groundwater abstraction
- raising the level of existing reservoir
- increased transfer of water between WRZs

Each of these options was assessed to understand the costs, customer preferences, the benefits to the supply-demand balance, the effect on carbon emissions and the environmental and social effects (through the SEA process and associated HRA and WFD assessments). The options were subsequently compared through a comprehensive programme appraisal process to determine the 'best value' programme of options to maintain a supply-demand balance over the planning period for each WRZ. Decisions on the best value programme took account of a range of factors, such as the implications for water bills, the resilience to future risks and uncertainties (e.g. climate change), deliverability considerations and the environmental and social effects of the programme (adverse and beneficial, as informed by the SEA).

The UKWIR Guidance on integrating SEA into WRMPs and the WRPG provide clear direction on how SEA outputs should be used in options and programme appraisal. **Figure 1.3** summarises the overall approach to the evolution of the Severn Trent WRMP19, from the initial "unconstrained" list of options through to the Final WRMP19 Programme. Costing of options in the second step of screening involved both engineering; and environmental and social costing. Sections 5, 6 and 7 of this Environmental Report explain in more detail how the SEA has actively informed the WRMP decision-making processes at each key stage.



Figure 1.3 WRMP Options and Programme Appraisal

1.4.2 Water Resource Management Plan Development

There are several future key challenges faced by Severn Trent in providing reliable and secure water supplies to its customers. These include increasing population in some areas, the potential effects of climate change, and possible "sustainability reductions" to the availability of water supplies from various

existing water sources to help meet Water Framework Directive (WFD) requirements to deliver good ecological status for waterbodies.

As a result of these various pressures, actions are likely to be required by Severn Trent to maintain sustainable and secure water supplies to customers. These actions could include measures to reduce the demand for water and/or develop additional water supply availability. A wide range of demand and supply measures were considered initially, and then were narrowed down to a smaller number of options for more detailed evaluation.

1.4.3 Severn Trent's Feasible List of Options

Severn Trent investigated a wide range of potential options to balance future supply and demand. These were assessed as to their practicability and feasibility from which a Feasible List of scheme options was produced. The Feasible List options were grouped according to the following two categories:

- Supply-side measures
- Demand-side measures

The individual measures in each group are documented in **Table 1.1**. For each measure, baseline information was collated to permit SEA, WFD and HRA assessments to be completed, focusing on:

- Analysis of the environmental and hydrological issues
- Strategic assessment of the residual environmental effects after mitigation (including construction/implementation and operational effects)
- Identification of potential monitoring requirements.

Table 1.1 Feasible List of Options for Final WRMP19

| Option Reference | Option Name | Supply-Demand Benefit (Ml/d) | | |
|---------------------|--|---------------------------------|--|--|
| Demand-side Options | | | | |
| WE003A | Enhanced Household Water Efficiency Audit | 0.15 | | |
| WE003B | Enhanced Household Water Efficiency Audit | 0.30 | | |
| WE004A | Enhanced Social Housing Water Efficiency Audit | 0.08 | | |
| WE004B | Enhanced Social Housing Water Efficiency Audit | 0.21 | | |
| WE005 | Leakage Reduction (50% reduction) | 211.7 | | |
| WE006 | Increased Metering | 29.9 | | |
| Supply-side options | | | | |
| BAM01 | Site R WTW to Ambergate pipeline capacity increase | 7.5 | | |
| BHS10 | Elmhurst BH asset enhancements and transfer to Site L WTW | 2 | | |
| UNK01 | New WTW on the River Weaver near Nantwich | 20 | | |
| BHS02 | Waverly Road BHs asset and water treatment enhancements | 2 | | |
| GRD10 | North Staffs WRZ to Stafford WRZ transfer solution | 7 | | |
| BHS09 | Elmhurst BH asset and water treatment enhancements | 2 | | |
| RAW07 | Potable water import to Kinsall WRZ at Whittington | 1 | | |
| GRD11 | Site U WTW to North Staffs WRZ transfer solution | 15 | | |
| MEL39 | BH raw water transfer to Site Q WTW with Site Q WTW enhancements | 5 | | |
| RIV01 | Potable water import to Chesterfield | 20 | | |

| Option Reference | Option Name | Supply-Demand Benefit (Ml/d) |
|---------------------|--|---------------------------------|
| UNK03 | Support Site L WTW from the River Weaver | 20 |
| WTW29 | New WTW on the River Trent near Stafford, Staffordshire | 22.5 |
| WTW28 | New WTW on the River Trent near Stoke Bardolph, Nottinghamshire | 30 |
| WTW08 | New WTW on the River Severn near Ombersley, Shropshire | 15 |
| WIL05 | Site E WTW expansion and transfer main supported by raw water augmentation of the River Trent | 35 |
| WTW16 | New WTW on the River Severn near Buildwas, Shropshire | 15 |
| LIN01 | New source and treatment at Linacre reservoir | 5 |
| MEL29 | River Trent support to Site Q WTW with WTW enhancements | 26 |
| BHS12 | New GW source in the Hopton GWMU | 3.5 |
| GRD19 | DVA to Nottingham transfer pipeline capacity increase | 15 |
| RAW08 | Site C WTW output increase using additional and supported abstractions from the River Avon | 10 |
| BHS11 | Haseley Spring source asset and WTW enhancement | 2 |
| LIT01 | Site F WTW expansion | 10 |
| DAM01 | Stanford Reservoir capacity increase (Size A) | 2.5 |
| BHS13 | Croxton BH output increase and transfer to Hob Hill DSR | 2.5 |
| MEL23 | River Trent to Site Q WTW transfer with Site Q WTW enhancements | 15 |
| UNK06 | Maximise outputs from the shared South Staffordshire Asset | 30 |
| BHS01 | Watery Lane BHs asset and water treatment enhancements | 3 |
| BHS04 | Swynnerton BHs asset and water treatment enhancements | 7 |
| DOR07 | Site Q WTW enhancements | 0 |
| GRD09 | Shelton WRZ to Ruyton WRZ transfer solution | 1 |
| GRD12 | Site Q WTW to North Staffs WRZ transfer solution | 7 |
| MEL37 | Raw water augmentation of Staunton Harold Reservoir with Site Q WTW enhancements | 5 |
| WTW01 | New WTW on the River Trent near Little Haywood supported by raw water augmentation of the River Trent | 13 |
| BHS05 | Broomleys BHs asset and water treatment enhancements | 1.1 |
| CRO06 | River Soar to support Site B WTW | 17 |
| DOR02 | Site I WTW enhancements | 2 |
| DOR05 | Site C WTW enhancements | 8 |
| GRD07 | Shelton WRZ to Mardy WRZ transfer solution adapting existing assets (Solution 2) | 1 |
| GRD08 | Nottingham WRZ to Newark WRZ transfer solution | 5 |
| CRO04 | Blackbrook Reservoir to support Site B WTW | 12 |
| CRO05 | Thornton Reservoir to support Site B WTW | 8 |
| DAM05 | Tittesworth Reservoir capacity increase (Size A) | 5 |
| Option Reference | Option Name | Supply-Demand Benefit (Ml/d) |
|---------------------|--|---------------------------------|
| WTW07 | East Midlands existing raw water storage including new WTW and infrastructure | 18 |
| BHS06 | Maximise deployment from Diddlebury WTW and Munslow BH | 0.9 |
| BHS17 | Shelton WRZ to Mardy WRZ transfer solution adapting existing assets (Solution 1) | 3 |
| GRD16 | Clungunford / Oakley Farm BH enhancements | 2 |
| UNK07 | Improve Site L WTW outputs during low raw water periods | 7 |
| BHS18 | Shelton WRZ to Mardy WRZ transfer solution using new assets | 3 |
| GRD17 | Strategic Grid to Bishops Castle WRZ transfer solution | 1.3 |
| CARSC01 | Carsington to Site L, J and F WTWs | 100 |
| CARSC02 | Carsington to Site L, F and E WTWs | 100 |
| CARSC03 | Carsington to Site L, J, F and E WTWs | 100 |
| DAM06 | Tittesworth Reservoir capacity increase (Size B) | 14 |
| BAM02 | Potable water import to Site R WTW with Site R to Ambergate pipeline capacity increase | 60 |
| CLYWB01 | Site U and Site P WTW upgrades supported by River Severn raw water storage capacity increase | 90 |
| RAW11 | River Severn to Draycote mutual support solution with supported River Avon abstractions - Size AA (Upper) | 84.5 |
| RAW12 | River Severn to Draycote mutual support solution - Size BC (Upper) | 78.5 |
| RAW13 | River Severn to Draycote mutual support solution with supported River Avon abstractions - Size CB (Mid) | 79 |
| RAW14 | River Severn to Draycote mutual support solution with supported River Avon abstractions - Size DA (Lower) | 64.5 |
| RAW15 | River Severn to Draycote mutual support solution - Size EB (Mid) | 59 |
| RAW16 | River Severn to Draycote mutual support solution - Size FA (Lower) | 44.5 |
| BHS15 | Birmingham BHs conversion to potable supply | 9 |
| MIT01 | Site O WTW to Site K WTW raw water transfer main | 15 |
| DAM07 | Draycote Reservoir capacity increase (Size A) with transfer main from Site C WTW to Coventry | 9 |
| BHS14 | Croxton BH Output Increase and transfer to Hanchurch DSR | 2.5 |
| DAM02 | Lower Shustoke capacity increase (Size A) | 2.5 |
| GRD15 | Whaddon (Strategic Grid WRZ) to Forest & Stroud WRZ transfer solution | 5 |
| RAW17 | Carsington reservoir to Tittesworth transfer solution | 10 |
| DAM03 | Whitacre Reservoir capacity increase (Sub-option A) | 2.5 |
| RAW09 | Site C and Site U WTW output increase using additional and 20 | |
| BHS07 | Ladyflatte BHs asset and water treatment enhancements | 2.7 |
| GRD13 | Potable water import to Peckforton and North Staffs WRZ | 5 |
| GRD18 | Peckforton Group BHs asset and water treatment enhancements | 36 |
| OGS01 | Site J WTW expansion | 15 |
| GRD06 | Cross Wolverhampton strategic transfer solution | 15 |

| Option Reference | Option Name | Supply-Demand Benefit (MI/d) |
|---------------------|--|---------------------------------|
| GRD22 | Cross Wolverhampton strategic transfer solution | 10 |
| GRD05 | Leek to Stoke trunk main enhancements 5 | |
| RAW01 | Raw water import from CRT to Milford WTW | 15 |
| RAW02 | Raw water import from CRT to Site C WTW | 15 |
| MEL41 | Site Q WTW enhancements with new supported abstractions from the River Derwent | 15 |
| GRD01 | Site U WTW transfer to Wolverhampton and Telford WRZ | 21.5 |
| SHE01 | Site M WTW Expansion | 18 |
| SHE05 | Site M WTW expansion | 10 |
| DAM11 | West area new raw water storage with Site U WTW enhancement and deployment infrastructure upgrades | 180 |
| WTW05 | East Midlands raw water storage including new WTW | 45 |
| WTW06 | East Midlands raw water storage including new WTW | 45 |
| WIL02 | Site E WTW expansion and transfer main | 21 |
| BHS08 | New GW Source in Coven GWMU | 3.5 |
| MIL01 | Milford BH output enhancements | 2 |
| DOR08 | Site B WTW enhancements | 3.6 |
| WTW30 | Site P WTW expansion | 15 |
| BHS03 | Preston Brockhurst BH asset and water treatment enhancements | 1.5 |
| BHS16 | Much Wenlock BH treatment enhancements 0.7 | |
| VYR01 | River Severn raw water import to Site U and Site P WTWs 60 | |
| VYR02 | River Severn raw water import to Site U WTW | 60 |
| GRD20 | New WTW on River Dove near Uttoxeter supported by Carsington reservoir and deploying to Stoke (Size A) | 18 |
| GRD21 | New WTW on River Dove near Uttoxeter supported by Carsington reservoir and deploying to Stoke (Size B) | 27 |
| NOT01 | Ambergate to Mid Nottinghamshire transfer solution | 30 |
| NOT04 | Heathy Lea to North Nottinghamshire transfer solution | 25 |
| NOT05 | Site E to South Nottinghamshire transfer solution | 30 |
| SHE04 | Shared South Staffordshire Asset to Nurton Transfer (High Flow) | 18 |
| SHE06 | Shared South Staffordshire Asset to Shelton WRZ transfer solution (Low flow) | 10 |
| MEL47 | Site Q WTW enhancements supported by raw water augmentation of the River Trent | 20 |
| BAM03 | Site R WTW to Grindleford pipeline capacity increase | 7.5 |
| BAM04 | Site R WTW to Baslow pipeline capacity increase | 20 |
| BAM05 | Site R WTW to Ambergate transfer solution | 50 |
| CRO07 | Blackbrook Reservoir and Thornton Reservoir to support Site B WTW | 17 |
| SHE02 | Potable water import to Shelton WRZ (localised) | 12 |
| SHE03 | Potable water import to Shelton WRZ (WRZ wide) | 18 |
| DAM12 | New WTW on the River Severn near Ombersley with raw water imports into the River Severn | 30 |

1.5 Stages of Strategic Environmental Assessment

SEA incorporates the following stages:

- Stage A: Setting the context, identifying objectives, problems and opportunities, and establishing the baseline Scoping Report published in January 2017.
- Stage B: Developing and refining options and assessing effects (impact assessment)
- Stage C: Preparing the Environmental Report (recording results)
- Stage D: Consulting on the Final Plan and the Environmental Report (seeking consensus)
- Stage E: Monitoring the significant effects of the plan or programme on the environment (verification)

This Environmental Report encompasses Stages B and C of the SEA process.

Table 1.2 is an extract from the ODPM Practical Guide⁶ that sets out the main stages of the SEA process and the purpose of each task within the process. Specific guidance on the application of the SEA process to WRMPs is provided by UKWIR (2012)⁷.

Table 1.2 SEA Stages and Tasks

| Stage / Task | Purpose | | |
|--|---|--|--|
| Stage A: Setting the context and objectives, establishing the baseline and deciding on the scope | | | |
| Task A1. Identifying other relevant plans, programmes and environmental protection objectives | To establish how the plan or programme is affected by outside factors to suggest ideas for how any constraints can be addressed, and to help identify SEA objectives. | | |
| Task A2. Collecting baseline information | To provide an evidence base for environmental problems, prediction of effects, and monitoring; to help in the development of SEA objectives. | | |
| Task A3. Identifying environmental problems | To help focus the SEA and streamline the subsequent stages, including baseline information analysis, setting of the SEA objectives, prediction of effects and monitoring. | | |
| Task A4. Developing SEA Objectives | To provide a means by which the environmental performance of the plan or programme and alternatives can be assessed. | | |
| Task A5. Consulting on the scope of the SEA | To ensure the SEA covers the likely significant environmental effects of the plan or programme. | | |
| Stage B: Developing and refining alternatives and assessing effects | | | |
| Task B1. Testing the plan or programme objectives against SEA objectives | To identify potential synergies or inconsistencies between the objectives of the plan or programme and the SEA objectives and help in developing alternatives. | | |
| Task B2. Developing strategic alternatives | To develop and refine strategic alternatives. | | |

⁶ Office of the Deputy Prime Minister (2005). A Practical Guide to the Strategic Environmental Assessment Directive.

⁷ UKWIR (2012) Strategic Environmental Assessment and Habitats Regulation Assessment – Guidance for Water Resources Management Plans & Drought Plans (12/WR/02/A).

| Stage / Task | Purpose | |
|---|---|--|
| Task B3. Predicting the effects of the plan or programme, including alternatives | To predict the significant environmental effects of the plan or programme and its alternatives. | |
| Task B4. Evaluating the effects of the plan or programme, including alternatives | To evaluate the predicted effects of the plan or programme and its alternatives and assist in the refinement of the plan or programme. | |
| Task B5. Mitigating adverse effects | To ensure that adverse effects are identified and potential mitigation measures are considered. | |
| Task B6. Proposing measures to monitor the environmental effects of plan or programme implementation | To detail the means by which the environmental performance of the plan or programme can be assessed. | |
| Stage C: Preparing the Enviror | nmental Report | |
| Task C1. Preparing the environmental report | To present the predicted environmental effects of the plan or programme, including alternatives, in a form suitable for public consultation and use by decision-makers. | |
| Stage D: Consulting on the Dra | aft Plan or programme and the Environmental Report | |
| Task D1. Consulting the public and consultation bodies on the draft plan or programme and | To give the public and the consultation bodies an opportunity to express their opinions on the findings of the Environmental Report and to use it as a reference point in commenting on the plan or programme. | |
| the Environmental Report | To gather more information through the opinions and concerns of the public | |
| Task D2. Assessing significant changes | To ensure that the environmental implications of any significant changes to the draft plan or programme at this stage are assessed and taken into account. | |
| Task D3. Making decisions and providing information | To provide information on how the Environmental Report and consultees opinions were taken into account in deciding the final form of the plan or programme to be adopted. | |
| Stage E: Monitoring the significant effects of the plan or programme on the environment | | |
| Task E1. Developing aims and methods for monitoring | To track the environmental effects of the plan or programme to show whether they are as predicted; to help identify adverse effects. | |
| Task E2. Responding to adverse effects | To prepare for appropriate responses where adverse effects are identified. | |

1.6 Structure of the Environmental Report

This SEA Environmental Report presents the findings of Tasks B1 to C1 set out in **Table 1.2**, and provides the public, stakeholders and regulatory bodies with an opportunity to express their opinions on the findings of the assessment. The Environmental Report is structured as follows:

- Section 1 (this section): describes the requirement for, purpose and process of the SEA, and its context in relation to the Water Resources Management Plan.
- Section 2 Policy Context: identifies key messages and environmental protection objectives from other relevant plans and programmes.

- Section 3 Environmental Baseline Review: draws out the key environmental issues Severn Trent considered in the SEA.
- Section 4 Methodology: provides details of the methods employed in undertaking the assessment including the cumulative effects assessment methodology.
- Section 5 Describes the Environmental Screening of Water Resources Management Plan options undertaken that was undertaken and summaries the results.
- Section 6 Assessment of Water Resources Management Plan Feasible List: presents the potential impacts of the various options against the SEA framework.
- Section 7 Assessment of the Final WRMP19, summary of related integrated environmental assessments (HRA and WFD), and a review of the role of the SEA in informing the Final WRMP19.
- Section 8 Cumulative Effects Assessment: presents the potential impacts of the various options in the Final WRMP19 Programme against the SEA framework and discusses the potential cumulative effects of options with one another and with other plans, programmes and projects in the region.
- Section 9 Mitigation and Monitoring: discusses measures envisaged to prevent, reduce and
 offset any significant adverse effects of implementing the Final Water Resources Management
 Plan and monitoring to track the environmental effects to show whether they are as predicted, to
 help identify any adverse impacts and trigger deployment of mitigation measures.
- Section 10 Conclusions: discusses the key outcomes of this report.
- Section 11 Quality Assurance: provides the SEA Quality Assurance Checklist.

1.7 Consultation

Severn Trent started engagement with the EA and NRW on the criteria for screening of options in December 2016. Meetings with the Environment Agency were then undertaken to review the screening process and comments on the constrained list of WRMP options. In January 2017, the constrained list was reissued with supporting assumptions to the Environment Agency for comment. Comments provided in response were used to inform the ongoing WRMP options screening and scoping process.

As a result of input from the Environment Agency during the consultation process, six schemes were screened out and comments informed the scope and design of 28 schemes.

Additionally, Severn Trent consulted on the development of its plan with a wide range of stakeholders through stakeholder workshops as well as with its customers, including through online engagement approaches to gain feedback on customer preferences with respect to different options for balancing supply and demand in the future. The stakeholder and customer feedback helped shape the development of the plan as described in the Final WRMP19.

Consultation bodies, stakeholders and the public were invited to express their views on the Scoping Report in accordance with SEA Regulation 12(5). The Scoping Report was issued on 20th January 2017 to the Environment Agency, Historic England and Natural England, and was made available to the public and stakeholders on the Severn Trent website. The consultation period ran until Friday 28th February 2017. The responses to comments provided on the Scoping Report and how these were taken into account in carrying out the SEA are presented in Appendix A.

This Environmental Report has been produced taking into consideration the responses received from consultation bodies during the Scoping consultation. It provides assessments of the potential effects (adverse and beneficial) of the range of options considered for the WRMP19 and sets out how the findings were used to inform the development of the plan.

The public, regulatory bodies and stakeholders were invited to express their views on the Environmental Report accompanying the Draft WRMP between February and April 2018. Comments were taken into consideration for the Final WRMP19 as documented in Severn Trent's Statement of Response documents published in September 2018, and where applicable, have been incorporated in this updated SEA Environmental Report accompanying the Final WRMP19. As part of the finalisation of the

WRMP19, a representation from the Environment Agency led to a modification to Solution MEL29 to replace supported abstraction (from Carsington Water) from the River Derwent with a direct abstraction from the River Trent. The SEA (and associated HRA and WFD assessment) for Solution MEL29 was updated accordingly within this final Environmental Report.

2 Policy Context

2.1 Introduction

Annex 1 of the SEA Directive (Directive 2001/42/EC) requires the following specific information to be included within the Environmental Report:

- 'an outline of the...relationship with other plans and programmes'
- 'the relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan or programme'
- 'the environmental characteristics of areas likely to be significantly affected'
- 'any existing environmental problems which are relevant to the plan or programme including, in particular, those relating to any areas of a particular environmental importance, such as areas designated pursuant to Directives 79/409/EEC (the 'Birds Directive') and 92/43/EEC (the 'Habitats Directive')'
- 'the environmental protection objectives, established at international, (European) Community
 or Member state level, which are relevant to the plan or programme and the way those
 objectives and any environmental considerations have been taken into account during its
 preparation.'

In accordance with the Directive, a review of relevant plans, policies and programmes is presented in Appendix B. A summary of key messages derived from the review is presented in **Table 2.1** of this section.

2.2 Review of Policies, Plans and Programmes

Identifying other relevant plans, policies and programmes, as well as environmental protection and social objectives, is one of the first steps in undertaking SEA, forming part of Stage A of the SEA process. The review identified how Severn Trent's WRMP19 might be influenced by other plans, policies, programmes and other objectives which the WRMP should take into account. This information helped to set the objectives for the SEA process.

Relevant plans, policies and programmes were identified from the wide range that has been produced at an international, national, regional and local level. The emphasis is on '*relevant*': plans and programmes that have no likely interaction with the WRMP (i.e. they are unlikely to influence the WRMP, or be influenced by it), have been excluded from the review. Important relevant plans, policies and programmes and strategic level plans that fall within the area under consideration have been considered, including relevant plans, policies and programmes in Wales as some key water sources used by Severn Trent are located within Wales.

The key policy objectives derived from the review of policies, plans and programmes are documented below in **Table 2.1**. Appendix B provides a detailed summary of all the policies, plans and programmes identified through the review.

| SEA Topic | Key Policy Objectives |
|-----------------|---|
| | Conservation and enhancement of the natural environment and of biodiversity, particularly internationally and nationally designated sites, whilst taking into account future climate change and ability to adapt. |
| | Promote a catchment-wide approach to water use to ensure better protection of biodiversity. |
| | To achieve favourable condition for priority habitats and species. |
| | Avoidance of activities likely to cause irreversible damage to natural heritage. |
| Biodiversity, | Support well-functioning ecosystems, respect environmental limits and capacities, and maintain/enhance coherent ecological networks, including provision for fish passage and connectivity for migratory/mobile species. |
| flora and fauna | Strengthen the connections between people and nature and realise the value of biodiversity. |
| | • Ensure maintenance and/or support provision of fish passage for migratory fish. |
| | Protection, conservation and enhancement of natural capital. |
| | Ecosystem services from natural capital contributes to the economy and therefore should be protected and, where possible, enhanced. |
| | Avoidance of activities likely to cause the spread of Invasive Non-Native species (INNS). |
| | A need to protect the green infrastructure network. |
| | To ensure secure, safe, reliable, dependable, sustainable and affordable supplies of water are provided for all communities and all business sectors. |
| | Access to high quality open spaces and opportunities for sport and recreation can make an important contribution to the health and well-being of communities. |
| | To provide a clean, healthy environment that benefits both people and the economy. |
| Population and | Water resources play an important role in supporting the health and recreational needs of local communities. |
| numan nealth | Increase awareness of sustainability, the true value of water and its efficient use. |
| | Promotion of well-being and healthy communities and protection from risks to these. |
| | Promotion of a sustainable economy supported by universal access to essential utility and infrastructure services. |
| | Protection and improvement of drinking water quality. |
| | Promote sustainable production and consumption whilst seeking to reduce the amount of waste generated by using materials, energy and water more efficiently. |
| | Consider issues of water demand, water supply and water quality in the natural environment and ensure a sustainable use of water resources. Government expects water companies to continue reducing overall demand for water. |
| and resource | Contribute to a resource efficient, green and competitive low carbon economy. |
| use | Maintain a resilient, reliable public water supply and ensure there is enough |
| | water for human uses, as well as providing an improved water environment. |
| | Minimise the production of waste, maximise resource benefits from waste and ensure waste management is in line with the 'waste hierarchy': eliminate waste sent to landfill. |
| | Promote the sustainable management of natural resources. |
| Water | Promote sustainable production and consumption whilst seeking to reduce the amount of waste generated by using materials, energy and water more efficiently. |
| | Consider issues of water demand, water supply and water quality in the natural environment and ensure a sustainable use of water resources. Government |

Table 2.1 Key Policy Objectives derived from the Review of Policies, Plans and Programmes

| SEA Topic | Key Policy Objectives | | |
|-------------------------------|---|--|--|
| | expects water companies to continue reducing overall demand for water. | | |
| | Contribute to a resource efficient, green and competitive low carbon economy. | | |
| | Maintain a resilient, reliable public water supply and ensure there is enough water for human uses, as well as providing an improved water environment. | | |
| | Minimise the production of waste, maximise resource benefits from waste and ensure waste management is in line with the 'waste hierarchy': eliminate waste sent to landfill. | | |
| | Promote the sustainable management of natural resources. | | |
| | Balance the abstraction of water for supply with the other functions and services the water environment performs or provides. | | |
| | Steer new development to areas with the lowest probability of flooding and manage any residual flood risk, taking account of the impacts of climate change. | | |
| | Promote measures to enable and sustain long-term improvement in water efficiency. | | |
| | Ensure a sustainable balance between the supply and demand for water. | | |
| | Reduce flood risk to people, residential and non-residential properties | | |
| | Reduce flood fisk to people, residential and horresidential properties, community facilities and key transport links, as well as designated nature conservation sites and heritage assets and landscapes of value. | | |
| | Reduce risk of flooding from reservoirs. | | |
| | Support achievement of River Basin Management Plan objectives. | | |
| | Protect and enhance the quality and diversity of geology (including geological Sites of Special Scientific Interest) and soils including geomorphology and geomorphological processes. | | |
| | Ensure that soils will be protected and managed to optimise the varied ecosystem service functions that soils perform for society (e.g. supporting agriculture and forestry, protecting cultural heritage, carbon sequestration, supporting biodiversity, as a platform for construction), in keeping with the principles of sustainable development. | | |
| Soil, geology and land use | Promote catchment-wide approach to land management by relevant stakeholders, in order to benefit natural resources, reduce pollution and develop resilience to climate change. | | |
| | Promote mixed use developments and encourage multiple benefits from the use of land in urban and rural areas, recognising that some open land can perform many functions. | | |
| | Encourage the effective use of land by reusing land that has been previously developed (brownfield land), provided that it is not of high environmental value. | | |
| | Minimise coastal erosion. | | |
| | Conservation and enhancement of geological SSSIs. | | |
| | Reduce greenhouse gas emissions. Targets include: reduce the UK's greenhouse gas emissions by at least 80% (relative to 1990 levels) by 2050. In Wales, target is to achieve an 80% reduction in emissions. | | |
| | Reduce the effects of air pollution on ecosystems. | | |
| | Improve overall air quality. | | |
| Air and climate | Sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. | | |
| | Minimise energy consumption, support the use of sustainable/renewable energy and improve resilience to climate change. | | |
| | Build in adaption to climate change to future planning and consider the level of urgency of associated risks of climate change impacts accordingly. | | |

| SEA Topic | Key Policy Objectives | | |
|-----------------------------------|--|--|--|
| | Need for adaptive measures to respond to likely climate change impacts on water supply and demand. | | |
| | Built development in the vicinity of historic buildings and Scheduled Monuments could have implications for the setting and/or built fabric and cause damage to any archaeological deposits present on the site. | | |
| | Ensure active management of the Region's environmental and cultural assets. | | |
| | Ensure effects resulting from changes to water level (surface or sub-surface) on all historical and cultural assets are avoided. Consider effects on important wetland areas with potential for paleo-environmental deposits. | | |
| Archaeology and cultural heritage | Promote the conservation and enhancement of the historic environment, including the promotion of heritage and landscape as central to the culture of the region and conserve and enhance distinctive characteristics of landscape and settlements. | | |
| | Conserve and enhance the historic environment, heritage assets and their settings. | | |
| | Protect, enhance and manage the character and appearance of historic and cultural assets and their settings including maintaining and strengthening local distinctiveness and sense of place. | | |
| | Protection and enhancement of landscape (including designated landscapes, landscape character, distinctiveness and the countryside). | | |
| Landscape and visual amenity | Take account of the different roles and character of different areas, promoting the vitality of main urban areas, protecting the Green Belts around them, recognising the intrinsic character and beauty of the countryside and supporting thriving rural communities within it. | | |
| | Enhance the value of the countryside by protecting the natural environment for this and future generations. | | |
| | Improve access to valued areas of landscape character in sustainable ways to enhance its enjoyment and value by visitors and stakeholders. | | |

3 Environmental Baseline Review

3.1 Introduction

An essential part of the SEA process is to identify the current baseline environmental conditions and their likely evolution during the life of the plan (in this case, a maximum of five years). The SEA Directive (Directive 2001/42/EC) also requires that the evolution of baseline conditions of the plan area (that would take place with or without implementation of the plan) is identified. This is useful when determining impact significance, particularly with regards to baseline conditions that may already be improving or worsening and the rate of such change.

Full environmental baseline data are presented in Appendix D and have been drawn from a variety of sources, including a number of the plans and programmes reviewed as part of the SEA process (as set out above in **Table 2.1**). This environmental baseline review also summarises the likely future trends for the environmental issues being considered (as far as information is available). The key issues arising from the review of baseline conditions are summarised in Section 2.2. The best available projections for environmental and social characteristics have been considered and summarised, but there is significant uncertainty which increases with time.

With knowledge of existing conditions and how these may evolve in the absence of the WRMP19, the potential effects (adverse and beneficial) of the WRMP19 can be identified, mitigated where necessary and subsequently monitored.

3.2 Limitations of the data and assumptions made

The principal limitations surround the future social and environmental baseline where there is substantial differences in the availability and temporal resolution of robust projections across the various SEA topic areas: for example, whilst water companies are planning up to 25 years ahead or more and climate change estimates extend to an 80 year horizon, regional population and housing forecasts rarely go beyond a 20 year horizon and forecasts of how the natural environment may change are very limited. As discussed above, a scenario based approach will therefore be adopted to test central forecasts (and 'best view' assumptions where forecasts are lacking or do not extend sufficiently far ahead) as part of the assessment process.

The study area for the SEA is relatively large and covers a number of different geographical and political regions, which makes establishing a baseline at the sub-regional level challenging. There are also challenges around extrapolating information from data collated at differing spatial resolutions. Spatial data have been obtained for most of the SEA topics, and the baseline is presented graphically as mapped information where appropriate. In some instances, reporting cycles mean that available information is dated.

SEA is a high-level assessment aimed at highlighting potential environmental concerns. The environmental data to be used in this assessment is based on that which is readily available from existing sources (e.g. statutory bodies and government agencies). No primary research or survey work has been carried out specifically to inform the SEA and therefore it is possible that at the individual option level, there may be additional environmental issues that could have an influence on a WRMP option.

3.3 Key issues

The baseline was set out in the Scoping Report and has been updated based on feedback provided through consultation, as well as to take account of the inclusion of the Chester Water Resource Zone and the removal of the Llandinam and Llanwrin Water Resource Zone from the Severn Trent licensed water supply area during 2018. The baseline is detailed further in Appendix D. Key issues arising from the review of baseline conditions for each of the SEA topics are summarised in **Table 3.1**. These key issues have been used to support the development of the SEA objectives in Section 4.

| SEA topic | Key issues |
|----------------------------------|--|
| Biodiversity, flora and fauna | The need to protect or enhance the region's biodiversity, particularly protected sites designated for nature conservation. |
| | The need to avoid activities likely to cause irreversible damage to natural heritage. |
| | The need to take opportunities to improve connectivity between fragmented habitats to create functioning habitat corridors |
| | The need to recognise the importance of allowing wildlife to adapt to climate change. |
| | The need to control the spread of Invasive Non-Native Species (INNS) |
| | The need to engage more people in biodiversity issues so that they personally value biodiversity and know what they can do to help, including through recognising the value of ecosystem services. |
| Population and human health | The need to ensure water supplies remain affordable especially for deprived or vulnerable communities, reflecting the importance of water and sewerage services for health and wellbeing. |
| | The need to ensure continued improvements in levels of health across the region, particularly in urban areas and deprived areas. |
| | The need to ensure continuing safe, reliable and resilient provision of water and sewerage services to maintain health and wellbeing of the population. |
| | • The need to ensure a balance between different aspects of the built and natural environment that will help to provide opportunities for local residents and tourists, including opportunities for access to, protecting and enhancing recreation resources, green infrastructure and the natural and historic environment. |
| | The need to accommodate an increasing population. |
| | Sites of nature conservation importance, heritage assets, water resources, important landscapes and public rights of way contribute to recreation and tourism opportunities and subsequently health and well- being and the economy. |
| Material assets and resource | The need to minimise the consumption of resources, including water and energy. |
| use | • The need to reduce the total amount of waste produced in the region, from all sources. The need to recognise waste as a potential resource and reuse waste productively where possible to support development of the circular economy. |
| | The need to reduce the proportion of waste sent to landfill. |
| | • The need to continue to actively control leakage from the water supply system and promote the efficient use of water to help reduce future demand for water. |

Table 3.1 Summary of key sustainability issues

| SEA topic | Key issues |
|---|---|
| Water | The need to further improve the quality of the regions' river and estuarine waters taking into account WFD objectives. |
| | The need to maintain the quantity and quality of groundwater resources taking into account WFD objectives. |
| | The need to improve the resilience, flexibility and sustainability of water resources in the region, particularly in light of potential climate change impacts on surface water and groundwater. |
| | The need to ensure sustainable abstraction to protect the water environment and meet society's needs for a resilient water supply. |
| | The need to reduce and manage flood risk. |
| | • The need to ensure that people understand the value of water. |
| Soil, geology and land use | The need to protect geological features of importance (including geological SSSIs) and maintain and enhance soil function and health. |
| | The need to manage the land more holistically at the catchment level, benefitting landowners, other stakeholders, the environment and sustainability of natural resources (including water resources). |
| | • The need to make use of previously developed land (brownfield land) and to reduce the prevalence of derelict land in the region. |
| Air and climate | The need to reduce air pollutant emissions (industrial processes/transport) and limit air emissions to comply with air quality standards. |
| | The need to reduce greenhouse gas emissions (industrial processes and transport). |
| | The need to mitigate against climate change through the reduction in greenhouse gas emissions in order to contribute to risk reduction over the long term. |
| | • The need to adapt to the impacts of climate change for example through, sustainable water resource management, water use efficiencies, specific aspects of natural ecosystems (e.g. connectivity), as well as accommodating potential opportunities afforded by climate change. |
| Archaeology and cultural heritage | • The need to conserve or enhance sites of archaeological importance and cultural heritage interest, and their settings, particularly those which are sensitive to the water environment. |
| Landscape and visual amenitv | The need to protect and improve the natural beauty of the region's AONBs, National Parks and other areas of natural beauty. |
| | The need to protect and improve the character of landscapes and townscapes. |

4 Assessment Methodology

4.1 Assessment Methodology and SEA Framework

The environmental and social assessment of the alternative WRMP19 options adopted an 'objectivesled' approach. Establishing assessment objectives is a recognised way of considering the environmental effects of a plan and comparing the effects of alternatives. The SEA objectives were derived from environmental and social objectives established in law, policy or other plans and programmes, as well as from the review of baseline information and environmental problems associated with the SEA topics.

An assessment framework of objectives was developed based on:

- The key policy objectives and environmental and social protection objectives identified in the review of policies, and other plans and programmes (see Section 2). This helps to highlight any area where the Water Resources Management Plan will support or hinder the achievement of the objectives of policies, other plans and programmes.
- The current state of the environment in the area under consideration, its likely future evolution and the key environmental issues identified (see Section 3).

The SEA objectives and key indicator questions are set out in **Table 4.1** and take account of the comments received on the Draft SEA objectives presented in the SEA Scoping Report (see Appendix A). The following amendments were made following the Scoping Report:

- The key indicator questions that support the SEA objectives relating to biodiversity, flora and fauna were amended to reflect consideration for creating habitats and protecting species.
- A new objective (1.4) was added to account for the risk of spreading/introducing invasive nonnative species.
- Objective 7.2, concerning archaeology and cultural heritage, was merged with objective 7.1 as they overlap.

The following sections describe how these SEA objectives were used in the assessment of the environmental and social effects of the potential WRMP19 options. By assessing each option against these objectives, the effects of the different water resources management options could be objectively compared and the findings were used to help determine the options to be included in the Final WRMP19, their timing and phasing of implementation.

The assessment of each option included consideration of the following information:

- Details of each potential option
- Likelihood and predicted frequency of deployment of the option
- Construction (where applicable) and operational/implementation details
- Benefits to the water supply-demand position in a drought (taking uncertainty into account); and
- Key elements of the baseline environment, such as, location of designated sites, priority habitats and species, landscape areas or heritage assets, recreational facilities and other environmental features.

Table 4.1 SEA objectives and indicator questions

| SEA topic | SEA objective | Key indicator questions |
|-------------------------------------|--|---|
| Biodiversity, fauna and flora | 1.1 To conserve and enhance biodiversity, including designated sites of nature conservation interest and protected habitats and species (with particular regard to avoiding the effects of over-abstraction on sensitive sites, habitats and species). 1.2 To protect, conserve and enhance natural capital and the ecosystem services from natural capital that contribute to the economy. 1.3 To strengthen the connections between people and nature and realise the value of biodiversity and ecosystem services. 1.4 To avoid introducing or spreading INNS. | Will it protect and enhance the most important sites for nature conservation? Will it protect and enhance aquatic habitats? Will it protect and enhance aquatic, transitional and terrestrial species and habitats? Will it introduce or allow the spread of Invasive Non-Native Species (INNS)? Will it avoid the spread of non-native invasive species? Will it contribute to the sustainable management of natural habitats and ecosystems, i.e. within their limits and capacities taking into account climate change adaptability? Will it affect WFD compliance e.g. good ecological potential/status? Will it ensure maintenance or support provision of fish passage with respect to migratory fish functioning habitat connectivity? Will it protect or enhance natural capital and ecosystem services? Will it provide educational or information resources for the public? Will it create areas of improved biodiversity in urban or deprived areas? Does it take account of climate change adaptation? Will it introduce or allow the spread of Invasive Non-Native Species (INNS)? |
| Population and human health | 2.1 To protect and enhance health and well- being (including raising awareness of the importance and value of the water environment for health and well-being). 2.2 To protect and enhance the water environment for other users including recreation and navigation, as well as terrestrial recreational resources (including National Trails and Public Rights of Way) 2.3 To promote a sustainable economy with good access to essential services, including a resilient, high quality and affordable supply of water over the long term. | Will it help to ensure provision of access to a secure resilient and affordable supply of drinking water particularly where additional water resources may not be available? Will it help to protect or improve drinking water quality? Will it raise awareness of the importance and value of the water environment for health and well-being? Will it protect or enhance opportunities for recreation and tourist activities such as public rights of way and including navigation? Will it help to promote healthy communities and avoid risks to health and wellbeing (for example through nuisance or resulting from traffic or transport changes, disruption to safe and reliable water/sewerage services)? Will it assist in ensuring provision of essential infrastructure and services to support health and well-being a sustainable economy? Is it located in an area considered to be significantly more deprived than others in the region? Will it improve access to open spaces, the natural and historic environment? Does it protect and enhance the green infrastructure network? |

| SEA topic | SEA objective | Key indicator questions |
|---|--|---|
| Material assets and resource use | 3.1 To reduce, and make more efficient, the domestic, industrial and commercial consumption of resources, minimise the generation of waste, encourage its re-use and eliminate waste sent to landfill. 3.2 To promote the sustainable management of natural resources including efficient and sustainable use of water; ensure resilient water supplies for homes and industry in the area is maintained. | Will it help to minimise the demand for resources (including water)? Will it minimise the use of energy and promote energy efficiency? Will it make use of existing infrastructure? Will it help to encourage sustainable design or use of sustainable materials (e.g. supplied from local resources)? Will it reduce the amount of waste generated and increase the proportion sent to reuse or recycling? Will it enable efficient water resource management to help maintain a supply-demand balance? Will it encourage the productive reuse of waste including energy recovery? |
| Water | 4.1 To avoid adverse impact on surface and groundwater levels and flows, including when this impacts on habitats and/or navigation. 4.2 To protect and enhance surface and groundwater quality and protect and enhance estuarine waterbodies. 4.3 To ensure appropriate and sustainable water resource management whilst protecting ecosystem functions that rely on water resources, including contributing to the achievement of WFD objectives 4.4 To promote measures to enable and sustain long term improvement in water efficiency. 4.5 To reduce or manage flood risk. | Will it alter the flow regime or residence time of surface waters? Will it prevent water pollution? Will it affect water quality compliance or WFD protected areas? Will it lead to changes in river flows, wetted width or river level? Will it lead to changes in groundwater levels and recharge? Will it prevent a risk to water quality of groundwater, surface waters or estuarine waters? Will it prevent water pollution? Will it affect water quality compliance? Will it affect wFD protected areas? Will it achieve WFD compliance? e.g. good ecological potential/status, prevent deterioration of WFD status between status classes? Will it prevent the introduction of impediments to the attainment of WFD good status or potential? Will it present a risk to water quality of groundwater or surface waters? Will it present a risk to water quality of groundwater or surface waters? Will it ninimise impacts on, or contribute to achievement of, RBMP objectives? Will it contribute to meeting society's needs for a sustainable, resilient water supply? Will it contribute to meeting society's needs for a sustainable, resilient water supply? Will it contribute towards improving the awareness of water sustainability and its true value? Will it avoid reducing flood plain storage, or provide opportunities to improve flood risk management?' |

| SEA topic | SEA objective | Key indicator questions |
|---|---|---|
| Soil, geology and land use | 5.1 To protect and enhance geology, geomorphology, the quality and quantity of soils 5.2 To protect and enhance the ecosystem services functions of land, soils and geology, including carbon sequestration, flood attenuation, pollutant filtration and nutrient cycling. 5.3 To promote a catchment-wide approach to catchment land management. | Will it avoid damage to and protect geologically important sites? Will it protect and enhance geomorphology and geomorphological processes? Will it protect and enhance the quality of soils? Will it ensure efficient use of land (e.g. make use of previously developed land)? Will it contribute towards a catchment-wide approach to land management? Will it protect and enhance geological SSSIs or similar nationally protected sites? |
| Air and Climate | 6.1 To reduce air pollutant emissions.6.2 To reduce greenhouse gas emissions.6.3 To adapt and improve resilience to the threats of climate change. | Will it reduce or minimise air pollutant and greenhouse gas emissions? Will it increase emissions to air in an areas sensitive to emissions (e.g. in proximity to an AQMA or to sensitive habitat or more deprived area)? Will it reduce transport or energy requirements? Will it reduce vulnerability to risks associated with climate change effects (e.g. reduce the adverse effects of droughts and floods)? Will it improve resilience/adaptability to likely effects of climate change, e.g. by increasing resilience of water supplies? Will it create opportunities to benefit from potential effects of climate change? Will it make use of renewable energy? |
| Archaeology and cultural heritage | 7.1 To conserve and enhance the historic environment, heritage assets and their settings, and protect archaeologically important sites. | Will it avoid damage to and protect the historic environment, heritage assets and their settings, places and spaces that enhance local distinctiveness? Will it maintain and enhance the historic environment, including palaeo-environmental deposits? Will the hydrological setting of water-dependent assets be altered, such as important wetland areas with potential for paleo-environmental deposits? Will it improve access, value, understanding or enjoyment of heritage assets and culturally/historically important assets in the region? |
| Landscape and visual amenity | 8.1 To protect, enhance the quality of and improve access to designated and undesignated landscapes, townscapes and the countryside. | Will it avoid adverse effects and enhance designated landscapes? Will it help to protect and improve non-designated areas of natural beauty and distinctiveness (e.g. woodlands) and avoid the loss of landscape features and local distinctiveness? Will it improve access to valued areas of landscape character? |

4.2 Environmental Assessment Approach for WRMP19

The SEA was undertaken in parallel with the Habitats Regulations Assessment (HRA) and Water Framework Directive (WFD) assessment to ensure an integrated approach to environmental assessment, and was used to inform the development of the Final WRMP19 to ensure its overall compliance with relevant environmental legislation. **Figures 4.1** and **4.2** show the overall process for integrating the SEA into the development of the Final WRMP.

Figure 4.1 Integrating SEA into WRMP decision-making alongside HRA and WFD assessments



Figure 4.2 Integrating SEA into the WRMP development alongside HRA and WFD assessments



As described in **Figures 4.1** and **4.2**, a staged assessment approach was followed in developing the Final WRMP19. Initially, an 'Unconstrained' list of options were screened through a workshop that considered statutory/regulatory/legal constraints (including environmental and planning risks). A high-level SEA (and HRA and WFD) review was applied to the resulting Constrained list of potential options. This helped inform the development of a Feasible List of options by screening out options where SEA (HRA or WFD) assessment identified significant environmental effects that mitigation was unlikely to be able to reduce to an acceptable level. The Feasible List of options was then subject to detailed assessment in accordance with the methodology described in this Section.

4.3 SEA Methodology

This section outlines the methodology that was used to undertake the SEA of the various options considered as part of the development of Severn Trent's Final WRMP19, taking account of the relevant key parts of the SEA Regulations:

Regulation 12:

- (2) The report shall identify, describe and evaluate the likely significant effects on the environment of –
- (a) implementing the plan or programme; and
- (b) reasonable alternatives taking into account the objectives and the geographical scope of the plan or programme.

Schedule 2:

The Environmental Report should include:

- (6) The likely significant effects on the environment, including short, medium and long-term effects, permanent and temporary effects, positive and negative effects and secondary, cumulative and synergistic effects.
- (8) An outline of the reasons for selecting the alternatives dealt with, and a description of how the assessment was undertaken including any difficulties (such as technical deficiencies or lack of know-how) encountered in compiling the required information.

4.4 Assessment Framework

4.4.1 SEA Screening of Constrained Options

At the outset of developing the alternative options to be considered for the WRMP19, SEA principles were used to carry out a high-level screening assessment of the options in the 'constrained' list using the SEA topics as screening criteria. This screening helped identify several options that would likely lead to unacceptable adverse effects on the environment or society; these options were therefore excluded from the 'feasible' list of options. This included consideration of several key environmental and social criteria as listed below (key planning and societal risks were also considered):

- Risk of Water Framework Directive (WFD) water body status deterioration
- Risk of likely significant effects on European designated conservation sites under the Habitats Regulations
- Potential effects on biodiversity, flora and fauna (including invasive non-native species)
- Potential effects on the water environment (including hydrology, hydrogeology, water quality and flood risk)
- Potential effects on archaeology and cultural heritage
- Potential effects on landscape and visual amenity
- Potential effects on other SEA topics (population and human health; air and climate; material assets; soils and geology)

HRA and WFD risks were assessed on a scale from negligible to high; potential effects were assessed against the SEA topics on a scale ranging from major beneficial to major adverse.

The findings from this screening process were shared and discussed with the Environment Agency and Natural England, along with key stakeholders at stakeholder meetings. Feedback from this engagement, along with the findings of the screening assessment resulted in several options being excluded from the feasible list due to the potential for unacceptable adverse effects on the environment and/or on society.

4.4.2 Assessment of Feasible List

The appraisal framework set out in **Table 4.2** (overleaf) has been used to assess each of the potential WRMP feasible options against the SEA objectives. This table provides an example of the application of the framework to one objective area only and does not represent the complete table template. The outcomes of the assessment have been used to inform the development of the WRMP19, primarily the selection and phasing of feasible options for inclusion in Severn Trent's Final WRMP19 Programme.

The first and second columns set out the SEA topics and objectives. The third column provides commentary and evaluation of the impact of each alternative measure on the objectives for each topic, with reference to the key questions set out above in **Table 4.1**. The assessment assumes the implementation of standard industry best practice methods in implementing the options as well as any defined mitigation measures (which are set out in the commentary) such that the significance of effects relates to the residual effects after the application of any mitigation measures in line with the ODPM Practical Guide and UKWIR SEA national guidance.

The eighth column identifies the magnitude of the effect assessed against a scale of negligible to high. The effect magnitude includes consideration of the scale of the impact, likelihood, duration and permanence (fourth, fifth, sixth and seventh columns of **Table 4.2**) in compliance with criteria for determining the likely significance of effects specified in the SEA Directive Article 3(5) and Annex II, and the SEA Regulations Part 2, Regulation 9(2a) and Schedule 1.

The value and sensitivity of the receptor(s) is identified in the ninth column on a scale of negligible to high. The scale of the effect, which might relate to either geographical scale or the size of the population affected, is identified in the sixth column on a scale of negligible to large. With respect to duration, short-term effects are defined as those that last for up to six months, medium term effects are those that extend beyond six months to two years whilst long term effects are assessed as those that continue for greater than two years.

The residual adverse and beneficial effects significance (after application of best practice approaches and any appropriate, and explicitly defined, mitigation measures) are identified in the tenth and eleventh columns respectively. These are identified separately to avoid mixing adverse and beneficial effects, in line with SEA best practice, so that these are clearly understood and the transparency of the effects is maintained throughout the WRMP19 decision-making process.

Where qualitative and/or quantitative information was available (e.g. as identified by the HRA or WFD assessment processes), this was used to inform the assessment. Objectives or key questions that were not supported by available data or information for any given option were evaluated using spatial analysis, professional judgement and applicable assessment guidelines relating to that topic/objective.

Varying levels of uncertainty are inherent within the assessment process. The level of uncertainty of the option assessment for each SEA objective is included in the option-specific appraisal framework. Where there was significant uncertainty which precluded an effects assessment category being assigned for a particular SEA objective, an "uncertain" residual effects assessment label was applied to that specific SEA objective for that particular option.

| SEA topics | s and objectives | Assessment of option | | | | | | | | | | | | | |
|----------------------------------|--|--|--|--|---|---|---|---|---|--------------|--|--|--|--|--|
| Topic | SEA objective | Potential residual effect on sensitive receptors: Commentary | Scale of effect: geographical / population affected (low / medium / high) | Certainty of effect (low / medium / high) | Duration of effect (short-term / medium- term, long- term) | Permanence of effect (permanent / temporary) | Magnitude of effect (low/ medium/ high) | Value/ sensitivity of receptor (low / medium / high) | Residual adverse effect significance (negligible / minor / moderate / major) | R si m | | | | | |
| Biodiversi flora and fauna | ity, 1.1 To conserve and enhance biodiversity, including designated sites of nature conservation interest and protected habitats and species (with particular regard to avoiding the effects of over-abstraction on sensitive sites, habitats and species). | <text></text> | <low <br="" medium="">High></low> | <low <br="">Medium/ High></low> | <short-term <br="">Medium- term/ Long- term></short-term> | <permanent / temporary></permanent | <low <br="">Medium/ High></low> | <low <br="" medium="">High></low> | <negligible <br="" minor="">Moderate/ Major></negligible> | < M | | | | | |
| | 1.2 To protect, conserve and enhance natural capital and the ecosystem services from natural capital that contribute to the economy. | <text></text> | <low <br="" medium="">High></low> | <low <br="">Medium/ High></low> | <short-term <br="">Medium- term/ Long- term></short-term> | <permanent / temporary></permanent | <low <br="">Medium/ High></low> | <low <br="" medium="">High></low> | <negligible <br="" minor="">Moderate/ Major></negligible> | < M | | | | | |
| | 1.3 To strengthen the connections between people and nature and realise the value of biodiversity and ecosystem services. | <text></text> | <low <br="" medium="">High></low> | <low <br="">Medium/ High></low> | <short-term <br="">Medium- term/ Long- term></short-term> | <permanent / temporary></permanent | <low <br="">Medium/ High></low> | <low <br="" medium="">High></low> | <negligible <br="" minor="">Moderate/ Major></negligible> | < M | | | | | |
| | 1.4 To avoid introducing or spreading INNS | <text></text> | <low <br="" medium="">High></low> | <low <br="">Medium/ High></low> | <short-term <br="">Medium- term/ Long- term></short-term> | <permanent / temporary></permanent | <low <br="">Medium/ High></low> | <low <br="" medium="">High></low> | <negligible <br="" minor="">Moderate/ Major></negligible> | < M | | | | | |

Table 4.2 Example SEA appraisal framework assessment table (for the Biodiversity, flora and fauna objective only)

esidual beneficial effect significance (negligible / minor / moderate / major)

<Negligible/Minor/ Moderate/ Major>

<Negligible/Minor/ Moderate/ Major>

<Negligible/Minor/ Moderate/ Major>

<Negligible/Minor/ Moderate/ Major>

The SEA appraisal framework was used to capture the assessment for each option (one table completed per option), each alternative WRZ programme and for the preferred programme for the WRMP19.

Varying levels of uncertainty are inherent within the assessment process. The assessment minimised uncertainty through the application of expert judgement. The level of uncertainty of the option assessment for each SEA objective has been reported in the appraisal framework (**Table 4.2**). Where significant uncertainty exists which precludes an effects assessment category being assigned for a particular option and SEA objective, an "uncertain" residual effects assessment label was applied to that specific SEA objective for the specific option concerned.

The assessment of the options, alternative WRZ programmes and the overall WRMP19 was carried out using the effects assessment matrix shown in **Figure 4.3** taking account of the scale, duration and permanence of the effect. The definitions for the effect significance are explained beneath **Figure 4.3**. The colour coding shown in **Figure 4.3** was used to complete the columns for residual effects in the SEA appraisal framework.

The effects assessment took account of any proposed mitigation measures that have been incorporated into the option conceptual design and costs, i.e. it is the residual effects after the application of mitigation that was assessed.

For each option and SEA objective, a residual effects assessment was determined against a significance of effects matrix (**Figure 4.3**) which takes into account the value/sensitivity of the receptor (e.g. species, air quality, river water quality, landscape value, heritage feature) and the magnitude of the assessed effect. This significance matrix comprises effects on a scale ranging from 'major beneficial' to 'major adverse'. For the box signifying low magnitude and high receptor value/sensitivity, this could result in a greater than 'moderate' effects being assigned dependent on the sensitivity/value of the receptor. This colour coding was used to complete the columns for residual effects in the appraisal framework.

The resulting significance of effects assessment was used to help Severn Trent select the options and subsequent options (comprising one or more component) for inclusion in the Final WRMP19 Programme, and the subsequent timing and phasing of the selected options. Where major adverse effects were identified, mitigation measures envisaged to prevent, reduce (and as far as possible, offset) these effects on the environment (as a result of implementing the measure) were outlined where relevant/appropriate.



Figure 4.3 Significance of Effects Matrix

The significance of effect levels identified in **Figure 4.3** are defined as follows:

Major - effects constitute key factors in the decision-making process. They are generally associated with sites and features of international, national or regional importance. If adverse, such resources/features affected are generally those which cannot be replaced or relocated.

Moderate - effects are likely to be important considerations at a regional or district scale. If adverse, they are likely to be of potential concern.

Minor - effects are not likely to be decision-making issues. Nevertheless, the cumulative effect of such issues may lead to an increase in the overall effects on a particular area or on a particular resource.

Negligible - effects which are not perceptible, being within normal bounds of variation or the margin of forecasting error.

For the 'high' effect magnitude (top row), a major effect significance was assigned for both high and medium value receptors to reflect the magnitude of the effect.

For the 'low' effect magnitude and 'high' value receptor (bottom left box), the significance of effect could be minor, moderate or major dependent on the precise nature of the impact or benefit.

The criteria used to determine the magnitude and value/sensitivity of effects are provided in **Tables 4.3** and **4.4** below.

| Quantifiable information | Example SEA topics (objectives) | Low magnitude | Medium magnitude | High magnitude |
|---|---|--|---|---|
| Option/yield/benefit | Population and human health (2.1, 2.3) Material assets and resource use (3.1) Water Air and climate | 0-10Ml/d | 10-50MI/d | >50MI/d |
| Change in flows/levels | Biodiversity, flora and fauna Population and human health (2.2) Water (4.2) Archaeology and cultural heritage | As indicated by hydrological assessment e.g. <10% at Q95 | As indicated by hydrological assessment | As indicated by hydrological assessment |
| Risk to WFD compliance (good ecological potential/status), deterioration of WFD status/ between status classes. | Biodiversity, flora and fauna Population and human health (2.2) Water (4.2) Landscape and visual amenity | Low risk (based on results of WFD assessment objectives) | Medium risk (based on results of WFD assessment objectives) | High risk (based on results of WFD assessment objectives) |
| Total emissions based on Net average annual electricity consumption increase (kWh). | Air and climate | 100,000- 1,000,000 | 1,000,000- 10,000,000 | >10,000,000 |

Table 4.3 Effect Magnitude Criteria

| Receptors | Example SEA topics (objectives) | Low value / sensitivity | Medium value / sensitivity | High value / sensitivity |
|--|---|--|--|---|
| Conservation sites and protected areas | Biodiversity, flora and fauna | Local (e.g. LNR, county level wildlife sites) | Regional (e.g. Regional NERC habitat) | National and International (Ancient Woodland; SSSIs; N2k sites) |
| Biodiversity, flora and fauna | Biodiversity, flora and fauna | Habitats and species of local / county / metropolitan importance | Nationally Scarce species or those included in Regional NERC | European Protected Species (EPS), internationally important populations. Priority species in the UK NERC |
| Habitats/species | Biodiversity, flora and fauna | Not sensitive to water level change, flows or water quality | Moderately sensitive to water level change, flows or water quality | Water dependant, highly sensitive to water level/flow change, dependent on specific flows, specific high water quality requirements. (Or highly sensitive to other disturbances such as air quality or noise). |
| Recreational resources | Population and human health (2.2) | Local (e.g. local recreational interest sites, local fishing) | Regional-sub-regional value (e.g. public rights of way (excluding National Trails), recreational opportunities identified on maps etc.). | National value, renowned sites (National Trails; Forestry; Commission/National Trust sites; and National Cycle Routes), navigable waterways. |
| Access, open spaces, natural and historic environment | Population and human health (2.2) | Non-designated local open spaces / natural and historic environment | Regional-sub-regional value local open spaces (greenbelt/county parks) / LNR | Regional-National value open spaces (AONBs, National Parks) / NNRs and historic environment (e.g. world heritage sites, SMs, registered parks and gardens). |
| People | Population and human health | N/A | Based on population characteristics | Based on population characteristics |
| Water | Water (4.1, 4.2) | WFD Bad/Poor status | | Good or High WFD status |
| Water resources | Water (4.2) | Water available/restricted water available for licencing | Restricted water available for licencing | Water not available for licencing |
| Soil and geology | Soil, geology and land use (5.1) | ALC grade less than 4 | ALC grade 3 | RIGS, Geological SSSIs; ALC grade 1 and 2. |

Table 4.4 Receptor Value/Sensitivity Criteria

| Receptors | Example SEA topics (objectives) | Low value / sensitivity | Medium value / sensitivity | High value / sensitivity |
|--|---|---|--|--|
| Air quality (people and habitats) | Air and climate (6.1, 6.2) | More than 3km from an AQMA/ nature conservation site sensitive | Within 3km of AQMA/ nature conservation site sensitive to air quality. Proximity to sensitive human receptors - schools, parks. | Within AQMA/proximity to nature conservation site sensitive to air quality, low (traffic) emission zones. |
| Historic environment, heritage assets and their settings | Archaeology and Cultural Heritage | No connection to water environment either regarding physical setting or aesthetics. Not sensitive to presence of other nearby structures or development. | Moderate connection to water environment either regarding physical setting or aesthetics. Moderate sensitivity to presence of other nearby structures or development. | Statutory Designated sites (SMs, World Heritage Sites, Grade I (II) listed buildings, conservation areas. Water dependant, highly sensitive to water level change due to water sensitive archaeological resource or effects on setting of a heritage asset. Sensitive to presence of other nearby structures or development. |
| Landscapes, townscapes and the countryside. | Landscape and Visual Amenity | Within or partly within or is likely to impact site of local importance e.g. local landscape designation. Undesignated countryside, Low tranquillity score | Within or partly within or is likely to impact site of regional importance e.g. greenbelt, key characteristics of the relevant NCA profiles e.g. woodland, watercourse. Local landscape designations, greenbelt, Medium tranquillity score. | Within or partly within or is likely to impact a national landscape designation or its setting. National landscape designations, High tranquillity score. |

All options (both supply-side and demand management options) were assessed to the same level of detail, in line with the SEA legislative requirements, national SEA guidance and the UKWIR SEA guidance. The level of detail is consistent with the strategic nature of SEA.

4.4.3 Summarising the effects assessment

A summary of the outputs derived from the completed appraisal framework tables for each WRMP19 option is presented in Sections 6 and 7. The outputs are presented in a summary visual evaluation matrix, an example of which is provided below (**Table 4.5**).

Table 4.5 Example Structure of the Visual Evaluation Matrix

| | | SEA Topics and Objectives | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|------------|---------------------------|-----------------------|-------|-----|-----|------------------------------|-----|-------------------|--------------|-------|-----|-----|-----|-----|-----|-----------------------------|-----|-----|---------------|-----|-----|-----------|-----|-----|------------|
| Component | | | Biodiversity. flora & | fauna | | | Population & human health | | Material assets & | resource use | Water | | | | | | Soil, geology & lanc use | | | Air & climate | | | Landscape | HRA | WFD | Commentary |
| | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.4 | 8.1 | | | | |
| Component 1 | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | |
| Component 1 | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | |
| Component 2 | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | |
| Component 2 | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | |
| Component 3 | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | |

4.4.4 Secondary, cumulative and synergistic environmental effects

Schedule 2(6) of the SEA Regulations requires the assessment of "*The likely significant effects on the environment, including short, medium and long-term effects, permanent and temporary effects, positive and negative effects, and secondary, cumulative and synergistic effects...*" These can be defined as follows:

- Secondary or indirect effects are effects that are not a direct result of the plan, (e.g. an abstraction that changes local groundwater levels and thus affects the ecology of a nearby wetland).
- Cumulative effects arise, for instance, where several nearby groundwater sources each has insignificant effects but together they have a measurable effect on river flows; or where several individual effects of a water resource zone programme (e.g. traffic disruption) have a combined effect.
- Synergistic effects interact to produce a total effect greater than the sum of the individual effects. Synergistic effects often happen as habitats, resources or human communities get close to capacity. For instance, a wildlife habitat can become progressively fragmented with limited effects on a particular species until the last fragmentation makes the areas too small to support the species at all.

The term 'cumulative effects' is adopted in this Environmental Report as the collective term to include secondary, cumulative and synergistic effects (as suggested by the Practical Guide).

4.4.4.1 Programme and WRMP level cumulative effects assessment

To meet the requirements of the SEA Directive, cumulative effects were assessed within the Final WRMP19 programmes, and between the Final WRMP19 and other relevant plans, programmes or projects. These include Severn Trent's Drought Plan and neighbouring water companies' draft or revised draft 2019 WRMPs and Drought Plans. Cumulative effects with non-water resources related plans, programmes and projects were also considered where relevant, including approved but uncompleted projects, ongoing activities, plans or projects for which an application has been made and which are under consideration by consenting authorities and plans and projects which are reasonably foreseeable (i.e. projects for which an application has not yet been submitted, but which are likely to progress before completion of the development and for which sufficient information is available to assess the likelihood of cumulative and in-combination effects).

The cumulative effects assessment was carried out in order to identify if different options included in the Final WRMP19 are mutually exclusive or whether combinations of options might lead to greater adverse (or beneficial) effects. This involved examining the likely significant effects of each of the WRMP19 options individually, in combination with each other (both inter- and intra- water resource zone), and in combination with the implementation of other plans and programmes. A matrix was used to help consider interactions between the options. In assessing these effects, consideration has been given to other factors which may affect the receiving environment during implementation of the options.

The following cumulative assessments were undertaken:

- An assessment of cumulative effects of options that could potentially be implemented at the same time. Mutually exclusive options (e.g. those that draw upon the same resource or use the same site) have also been identified.
- Assessment of cumulative effects of the Severn Trent Final WRMP19 with the Severn Trent Drought Plan, other water company Drought Plans and WRMPs, Environment Agency Drought Plans and other relevant water management plans. The potential for a neighbouring company implementing options under its WRMP simultaneously with the Severn Trent WRMP19 options was also considered.
- Assessment of potential cumulative effects of the Severn Trent Final WRMP19 with any other identified relevant programmes, plans and strategic projects that may be in place / implemented during the period of the WRMP19.

Neighbouring water companies were invited to comment on the Draft Water Resources Management Plan and Severn Trent engaged in communications with neighbouring companies regarding potential options in their respective draft or revised WRMP19s (as available) to identify any new trans-boundary issues that may arise. Potential effects with other plans were identified, particularly in the context of spatial and temporal proximity.

4.4.5 Consideration of reasonable alternatives

A wide range of alternative options were considered for the WRMP19 through the SEA process, including both supply-side and demand-side options. In determining the Final WRMP19 Programme of options, Severn Trent used the findings of the option-level SEA assessments (incorporating the HRA and WFD assessments) to inform the programme appraisal process, which in turn identified a short-list of alternative programmes (comprising a range of options) for each water resource zone. These alternative programmes were assessed through the programme-level SEA to inform decisions on the Final WRMP19 Programme. Finally, the combined set of WRMP19 programmes were assessed through the WRMP19 programmes to the water resource zone programmes to inform the Final WRMP19.

4.5 Limitations of the study

SEA is a high-level assessment aimed at highlighting potential environmental concerns. The environmental data used in this assessment were based on readily available data and information from existing sources. Difficulties encountered in undertaking this SEA included the requirement to rely on varying levels of detail in design specifications of schemes, many of which are at conceptual or outline design stage only. Assessment of impacts was necessarily limited when, for example, pipeline routes are at an indicative stage only.

Where particular limitations or outstanding issues were known, these have been briefly described in the SEA appraisal framework assessment tables for the relevant option concerned. Detailed assessments of each option were conducted in project-level environmental assessments (including Environmental Impact Assessment, where applicable) once the option is brought forward for planning permission and/or environmental permitting applications (where applicable), and/or the more detailed stage of development of the option.

5 Screening of Options

5.1 Overview

Options appraisal is an overarching term for the specification and assessment of options under consideration for the WRMP. The UKWIR Guidance on integrating SEA into WRMPs, and the Environment Agency's WRPG, provide clear directions as to how SEA outputs should be used in options and programme appraisal. Severn Trent initially considered SEA (and HRA and WFD) principles in moving from the 'constrained' list of options to development of its Feasible List of options - through this process, options which were found to have unacceptable adverse effects were rejected from the 'pool' of potential options and did not reach the feasible list of options that were then subject to SEA.

From the feasible list, options were selected to create options to the forecast supply deficit. Each option could comprise one or more separate components which in turn comprise a range of individual elements (**Figure 5.1**). A series of alternative programmes of options (**Figure 5.1**) were then considered through the SEA programme appraisal process to help inform the final decision on the best value set of options for the preferred programme.



Figure 5.1 Options Development Approach for WRMP19

This section describes the methodology and the results of this process. **Figure 5.2** summarises the overall approach to the evolution of the WRMP from an initial 'unconstrained' list of options through to the Final WRMP19 programme.



Figure 5.2 WRMP Options and Programme Appraisal

5.2 Moving from the Unconstrained List to the Constrained List of Options

The unconstrained list of options consisted of a high-level list of generic option types, as well as options that took account of government policy and aspirations. It was populated with previous options and studies from past WRMPs as well as new ideas. The final unconstrained list was issued to the Environment Agency and Natural England for consultation. A high-level screening workshop on the list was undertaken in late 2016, which included consideration of statutory, regulatory and legal constraints (including environmental and planning risks), as well as engineering design, cost, customer preferences and high level resilience of options. This screening identified components with unacceptable adverse environmental effects which were rejected from the unconstrained list and were not taken further in the component appraisal process. Further information on the process can be found in Appendix D of the Final WRMP.

The resulting constrained list of options were developed further, and more detailed information gathered.

5.3 Moving from the Constrained Options List to the Feasible Options List

In January 2017, Severn Trent issued the Environment Agency and Natural Resources Wales the first iteration of a constrained list of options and supporting assumptions. Work with the Environment Agency continued through 2017 to gather the Agency's feedback on the environmental or abstraction licensing considerations, and help refine the options where necessary. As described in Section 4.3.1, high level screening assessment of the options in the constrained list included consideration of several key environmental and social criteria (e.g. HRA and WFD compliance risks; key risks to the water environment; key risks to important landscape, recreation and heritage features). HRA and WFD risks were assessed on a scale from negligible to high; potential effects were assessed against the SEA topics using a scale ranging from major beneficial to major adverse. The intent of the screening was to reject options that performed poorly on environmental grounds. The assessment criteria contributed evidence as to why any options were screened in line with the WRPG requirements that the feasible list "should not include options with unalterable constraints that make them unsuitable for promotion (e.g. unacceptable environmental impacts that cannot be overcome").

The high-level screening of the constrained list identified several options considered to have the potential for unacceptable adverse effects under SEA, HRA and/or WFD criteria. These options were screened out, resulting in a final list of supply-side and demand-side options that could be considered for inclusion in the Final WRMP19 Programme.

Appendix D of the Final WRMP presents a component and option rejection log which provides an overview of the process described above and further details on the why particular options were rejected. The SEA process therefore facilitated the review of critical environmental constraints in an agreed and consistent manner, ensuring that Severn Trent considered the full range of potential environmental impacts of the options at this stage in the process of developing the WRMP19.

The Final Feasible List of options (comprising of one or more components) was discussed with the Environment Agency and Natural England. Following this further consultation, a number of components/options were identified to have unacceptable adverse environmental effects were removed from the Feasible List. The remaining options were taken forward into the decision-making modelling processes. All these options in the Final Feasible List were then fully assessed against the SEA objectives, as described in Section 6.

6 Assessment of Feasible List

6.1 Assessment of Options Against SEA Objectives

Assessment of the options in the Feasible List was carried out in accordance with the methodology described in Section 4. The findings of the WFD assessments and the HRA were also been incorporated into the SEA assessment. Due to the very large number of options, analysis on the range of effects for each option type has been undertaken and synthesised to provide the assessment results in an informative way.

A summary of the assessment is presented in this section as colour-coded visual evaluation summary matrices (**Figures 6.1 to 6.4**). The colour coding represents a range from significant adverse effects (indicated by a red coloured box) through to significant beneficial effects (indicated by a dark green coloured box) as shown in the legend below. Commentaries on the most significant residual effects for each option are also provided in the visual evaluation summary matrices.

Legend:

| Col | our | Significance of Effect |
|-----|-------------|--|
| | Dark Green | Major Beneficial |
| | Mid Green | Moderate Beneficial |
| | Light Green | Minor Beneficial |
| | Grey | Negligible Adverse or Negligible Beneficial |
| | Yellow | Minor Adverse |
| | Orange | Moderate Adverse |
| | Red | Major Adverse |
| | None | Not Applicable |

6.1.1 Demand Management Options: Assessment Findings

A visual summary of the SEA conclusions for each of the demand-side options in the Feasible List of the WRMP19 is provided in **Figure 6.1**.

Demand management serves to reduce pressure on water resources by reducing customer demand for water (e.g. through water efficient devices, water metering and tariffs, customer behavioural changes) and reducing water losses and leakage from the water supply network and customer properties, thereby helping to reduce the volumes of water required to be abstracted from the water environment. This, in turn, also contributes to reducing the amount of energy needed for water abstraction, treatment and distribution. Most of these demand management options have limited and temporary adverse effects associated with vehicle movements during their commissioning phases. They may also cause temporary disruption or nuisance effects because of street works activities, for example associated with meter installations and leak repair activities.

6.1.2 Water Supply Options: Assessment Findings

A visual summary of the SEA conclusions for each of the water supply options in the Feasible List of the WRMP19 is provided in **Figures 6.2 to 6.4**.

Each of the supply options (see **Table 1.1**) in the Feasible List was assessed against the SEA objectives. The findings of the WFD assessments and the HRA were also been incorporated into the SEA assessment.

The findings of the assessments for different types of water supply options in the Feasible List are summarised below:

Bulk Water Supply, Water Trading and Water Transfer options range from those that involve minor upgrades to existing water supply assets (e.g. pumping stations and pipelines) to those that require the construction of new, significant lengths of pipeline (and pumping stations where necessary) to make connections between assets, water resource zones and/or with other water companies. The construction activities generate temporary nuisance impacts such as dust emissions and noise/vibration with potential for temporary adverse effects on biodiversity, flora and fauna; population and human health; archaeology and cultural heritage; and landscape and visual amenity. In some cases, there is potential for permanent adverse effects of construction, for example habitat loss or loss of some public open space.

Operationally, adverse effects associated with these types of options depend on the source of water for the transfer or trade, including whether this involves making more optimal use of existing water sources, increasing abstraction from existing water sources, or requires the development of new water sources. Adverse effects may also be associated with the actual transfer of water from the source to the area of need where this involves using rivers or canals or developing new water pipelines. Where increases to abstraction from existing sources or the development of new water sources is necessary to provide the water transfer or trade, there is the potential for adverse effects (e.g. reductions in river flows and levels in groundwater or reservoirs). Any new abstraction (or increase to abstraction beyond existing abstraction licence conditions) would be subject to environmental assessment and abstraction licensing conditions which should avoid significant adverse effects arising. For transfers or trades by pipeline, operational effects may be limited to those relating to carbon emissions associated with pumping and treatment of water. If the option requires the water to be transferred by a watercourse in the wider environment (e.g. from a reservoir discharging into a river for subsequent re-abstraction downstream), there may be adverse effects on the water environment as well those relating to carbon emissions. Adverse effects on the water environment include changes to flows changes to flows (including depleted reaches downstream of the abstraction), changes to the quality of receiving waters, the risk of introduction/spreading of invasive non-native species (INNS) or changes in the conditions of the receiving waters that may spread INNS. Such changes may have knock on effects (which may be adverse of beneficial) to the ecology of the receiving waters and other uses such as recreation.

Beneficial effects of such schemes generally reflect the improved use and optimisation of existing water resources, transferring water from areas of water resource surplus to those where resources are already fully utilised and supply deficits are forecast. They also improve flexibility in the supply network and therefore contribute to a more resilient, sustainable water resource system which helps to address the effects of climate change.

Groundwater Abstraction options include direct abstractions from groundwater for treatment, and commissioning/recommissioning of boreholes. Where these options involve the use of 'confined' aquifers that are not connected to rivers or wetlands, the operational adverse effects are often only negligible to minor in magnitude. However, in some cases, it has been identified that some groundwater options may adversely influence local groundwater levels and connected surface water bodies with a risk to water-dependent habitats.

Surface Water Abstraction options can be designed to only operate at times of high river flows to minimise adverse effects on the river environment, but otherwise there is a risk of adverse effects on the river flow regime and associated aquatic habitat.

Reservoir options range from minor, small-scale expansion of existing reservoirs and the conversion of disused quarries to water storage facilities, through to the construction of large new reservoirs or significant expansion of existing reservoirs. Reservoirs can provide significant water storage for winter rainfall for use in dry summers with low risks to the water environment once operational and therefore provide benefits in respect of resilience to adverse effects of climate change. However, as the size of the reservoir expansion or development increases, the potential for significant adverse effects relating to construction increases along with risks of the potential for permanent adverse effects on landscape, biodiversity, local communities and heritage features. However, reservoirs also provide opportunities for environmental and social enhancement through careful design (e.g. habitat creation, recreational and educational facilities).

Options that make maximum use of existing assets include asset enhancements, abstraction licence variations, conjunctive use of existing surface and groundwater, and water treatment works improvements. The temporary construction effects of these options vary considerably according to the scale and location of the scheme and whether any additional infrastructure is required. Larger options have a greater potential to result in significant, but temporary, nuisance effects on nearby sensitive receptors during the construction phase. However, in operation, many of these options would improve the flexibility and resilience of the supply network, contribute to sustainable resource management and provide beneficial effects in respect of the risks of climate change impacts.

Options to make use of treated effluent from wastewater treatment works can involve some temporary adverse effects during construction to provide enhanced treatment facilities to ensure highly treated water is discharged to rivers to augment low flow conditions in rivers. During operation, there may be adverse effects on the water environment due to changes to the river flow regime and river channel characteristics. These options provide beneficial effects through the use of water that would otherwise not be available for abstraction, reducing the pressure on rivers and groundwaters for additional abstraction, and increasing the resilience of the water supply system to climate change.

Overall, the assessment of the Feasible List options revealed a wide spectrum and scale of beneficial and adverse effects. Large reservoirs (new or expanded) and large long-distance water transfer pipelines through sensitive environments mostly exhibited the greatest magnitude of adverse effects, but equally they provide major beneficial effects in respect of securing significant water supplies that are more resilient to climate change effects than river abstractions. Other options generally had a lower magnitude of adverse effects but also a lower magnitude of beneficial effects. Location of the options is an important factor in determining the magnitude of adverse effects: those options in proximity to sensitive environmental, built or human receptors were found to have a greater magnitude of adverse effect.

The findings of the detailed environmental assessment of each of the Feasible List options was used to help inform the appraisal of alternative programmes and decision-making on the Final WRMP19 Programme.

Figure 6.1 – Demand-side Visual Evaluation Matrices

| | | | | | | | | | | SEA | Тор | ics a | nd (| Obje | ctive | s | | | | | | | | | | | | |
|-----------------------------------|------------|-----|---------------|---------------|-----|-----|------------------------------|-----|-----|----------------|-------|-------|------|------|-------|-----------------------------|-----|-----|---------------|-----|-----|---------------|------------------------------------|-----------|-----|-----|--|--|
| Options | | | Biodiversity. | flora & fauna | | | Population & human health | | | & resource use | Water | | | | | Soil, geology & land use | | | Air & climate | | | Archaeology & | Archaeology & cultural heritage | Landscape | HRA | WFD | Commentary | |
| | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | | 1.1 | 8.1 | | | | |
| WE003A - Enhanced Household | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | | The measure is anticipated to lead to predominately negligible adverse effects with one minor adverse effects relating to pollutant emissions by vehicle movements. Furthermore, it is anticipated to lead to predominately negligible effects with seven minor relating to population and human health, material assets and resource use, the sustainable | |
| Water Efficiency Audit | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | | management of water resources and adapting to climate change and with respect the promotion of water efficiency. | |
| WE003B - Enhanced Housebold | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | | The measure is anticipated to lead to predominately negligible adverse effects with one minor adverse effects relating to pollutant emissions by vehicle movements. Furthermore, it is anticipated to lead to predominately beneficial negligible effects with seven minor relating to population and human health metricipal practice and resource use. the | |
| Water Efficiency Audit | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | | sustainable management of water resources and adapting to climate change and with respect the promotion of water efficiency. | |
| WE004A - Enhanced Social | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | | The measure is anticipated to lead to predominately negligible adverse effects with one minor adverse effects relating to pollutant emissions by vehicle movements. Furthermore, it is anticipated to lead to predominately negligible effects with seven minor elistics to resultate activity durate hashing the participate and exercise and the purchicable and the product of the production o | |
| Housing Water Efficiency Audit | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | | relating to population and numan relating material assets and resource use, the sustainable management of water resources and adapting to climate change and with respect the promotion of water efficiency. | |
| WE004B - Enhanced Social | Adverse | | | | | | | | | | | | | | | | | | | | Γ | | | | | | The measure is anticipated to lead to predominately negligible adverse effects with one minor adverse effects relating to pollutant emissions by vehicle movements. Furthermore, it is anticipated to lead to predominately negligible effects with seven minor relating to population and human health. material assets and resource use the sustainable | |
| Housing Water Efficiency Audit | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | | management of water resources and adapting to climate change and with respect the promotion of water efficiency. | |
| WE005 - Leakage | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | | The measure would result in moderate adverse effects on local air quality due to the movement of vehicles in AQMAs. The measure would have minor adverse nuisance effects on population and human health; archaeology and cultural heritage; and landscape and visual due to vehicle movements and repair activities. There would also be minor adverse effects relating to resource use and GHG emissions. Numerous beneficial effects would be cenerated by the measure including major effects on population and human health due to the | |
| Leakage Reduction | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | | water saving's associated with the measure. There would also be major beneficial effects relating to the efficient use of water and bolstering resilience to climate change. moderate beneficial effects relate to reducing pressure on biodiversity, flora and fauna; and reducing GHG emissions. | |
| WE006 - Increased Metering | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | | The measure would result in moderate adverse effects on local air quality and population and human health due to the movement of vehicles in urban areas. There would also be minor adverse effects relating to resource use and GHG emissions. Numerous beneficial effects would be generated by the measure including major effects on population and human health due to the water savinors associated with the measure. There would also be major beneficial enfects | |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | I | | | | | effects relating to the efficient use of water and bolstering resilience to climate change. moderate beneficial effects relate to reducing pressure on biodiversity, flora and fauna; and reducing GHG emissions. | |

| Option | | | | | | | | | SE/ | A To | opic | cs a | nd | Obj | ect | ive | S | | | | | | | | | | |
|---|------------|-----|--------------------------------|-----|-----|------------------------------|-----|-----|-----------------|----------------|-------|------|-----|-----|-----------------------------|-----|-----|---------------|-----|-----|------------------------------------|-----------|-----|-----|------------|--|--|
| | | | Biodiversity, flora & fauna | | | Population & human health | | | Material assets | & resource use | Water | | | | Soil, geology & land use | | | Air & climate | | | Archaeology & cultural heritage | Landscape | HRA | WFD | Commentary | | |
| | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 8.1 | | | | |
| BAM01 Site R WTW to Ambergate pipeline capacity increase | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Major adverse effects on biodiversity, flora and fauna due potential for adverse effects on the qualifying features (fish populations) of European designated sites (HRA concluded Stage 2 Appropriate Assessment is required), Ancient Woodland habitat loss and construction impacts on aquatic ecology. Minor adverse effects may occur on the Peak District Dales SAC. Construction would also have moderate adverse impacts on residential areas, GHGs, energy use and archaeological sites including Derwent valley Mills World Heritage site and Chatsworth House Registered Park and Garden. | |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | Minor beneficial effects associated with delivering 7.5 MI/d to help maintain public health and well-being, a sustainable economy and improving resilience to climate change. | |
| GRD19 DVA to Nottingham | a Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Moderate adverse effects associated with the construction of pumping stations and pipeline. Habitat loss due to the pipeline intersecting Bullwell Hall Park Meadows LNR; disturbance to surrounding residential areas, commercial properties, PROWs and SAMs; and an increase GHG emissions. | |
| capacity increase | Benefici | | | | | | | | | | | | | | | | | | | | | | | | | Minor to moderate beneficial effects have been identified with respect to ensuring resilient water supplies and building resilience to climate change. | |
| RIV01 Potable water | Adv erse | | | | | | | | | | | | | | | | | | | | | | | | | Construction of the pipeline would have major adverse effects on biodiversity, flora and fauna in particular on Ancient Woodland and Totley Wood SSSI. Porter Valley Parks and Beauchief Hall Registered Parks and Gardens will also be subject to major adverse effects due to a loss of foliage. Moderate adverse effects have been identified with exercise the subject to be a loss of foliage. | |
| import to Chesterfield | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | Three moderate beneficial effects due to delivering 20MI/d to help maintain public health and well-being, a sustainable economy and improve resilience to climate change. | |
| GRD08 Nottingham WRZ to | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | One moderate adverse effect has been identified relating to the construction of the proposed mains which would result in habitat loss in Southwell Trail LNR and an area of Ancient Woodland. | |
| Nottingnam WRZ to Newark WRZ transfer solution | Beneficia | | | | | | | | | | | | | | | | | | | | | | | | | maintain public health and well-being as well as ensuring a resilient supply for customers and economic activity. | |
| GRD13 Potable water import to Peckforton and North Staffs WRZ | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Minor adverse effects have been identified relating to resource use and GHG emissions. Three minor beneficial effects were identified relating to delivering 5MI/d helping to maintain public health and well-being as well as promoting a sustainable economy and | |
| | Benefici | | | | | | | | | | | | | | | | | | | | | | | | | providing resilience to the effects of climate change. | |

Figure 6.2 – Supply-side Visual Evaluation Matrix - Nottinghamshire and North Staffordshire Water Resources Zones
| | | | | | | | | | SE/ | <u> </u> | opiq | cs a | nd | Obj | ect | ive | s | | | | | | | | | | |
|---|------------|-----|---------------|---------------|-----|-----|------------------------------|-----|-----------------|----------------|------|------|-------|-----|-----|-----|-----------------------------|-----|-----|---------------|-----|------------------------------------|-----------|-----|-----|---|--|
| Option | | | Biodiversity, | flora & fauna | | | Population & human health | | Material assets | & resource use | | | Water | | | | Soil, geology & land use | | | Air & climate | | Archaeology & cultural heritage | Landscape | HRA | WFD | Commentary | |
| | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 1.1 | 8.1 | | | | |
| UNK07 Improve Site L WTW outputs | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Two minor adverse effects relating to material assets and resource use and GHG emissions. Minor beneficial effects have been identified relating to delivering 7 MI/d helping to | |
| during low raw water periods | Beneficia | | | | | | | | | | | | | | | | | | | | | | | | | maintain public health and well-being as well as promoting a sustainable economy. | |
| GRD18 Peckforton Group BHs rehabilitation | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | One moderate adverse effect relating to GHG emissions. Minor beneficial effects have been identified relating to delivering 36 MI/d helping to maintain public health and well-being as well as promoting a sustainable economy. | |
| and treatment enhancement | Benefici | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BHS09 Elmhurst BH asset and water | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | One major adverse effect has been identified relating to biodiversity. The proposed main and waste disposal pipeline routes would intersect small sections of Heath Hey Wood Ancient Woodland, resulting in habitat loss and fragmentation. The waste disposal pipeline would also intersect 1 adderedne Country Park I NR | |
| treatment enhancements | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | Minor beneficial effects have been identified relating to delivering 2MI/d helping to maintain public health and well-being as well as promoting a sustainable economy. | |
| WTW28 New WTW on the River Trent near | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Three major adverse effects were identified relating to resource use, GHG emissions and the proposed pipeline intersecting Flintham Hall Registered Park and Garden and two Scheduled Ancient Monuments. Six moderate effects relating to biodiversity, human health, flood risk, land use and landscape and visual amenity were also | |
| Stoke Bardolph, Nottinghamshire | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | Two moderate beneficial effects have been identified relating to delivering 30 MI/d helping to maintain public health and well-being as well as promoting a sustainable economy. | |
| BHS10 Elmhurst BH asset | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Two major adverse effects related to the proposed pipeline intersecting Barns Wood, Black Hills Wood and Hind's Clough Wood resulting in habitat loss. The route also runs through an area with 3 listed buildings in very close proximity (<10m) with one of them being Grade II* Rudyard Hall. Significant impact on the setting and access to this heritage asset would be likely during construction. | |
| enhancements and transfer to Site L WTW | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | Two minor beneficial effects were identified relating to delivering 2MI/d helping to maintain public health and well-being as well as promoting a sustainable economy. | |

| | | | | | | | | | SE/ | <u>A T</u> | opi | cs a | nd | Obj | ect | ive | s | | | | | | | | | |
|--|------------|-----|---------------|---------------|-----|-----|--------------|-----|-----------------|----------------|-----|------|-------|-----|-----|-----|-----------------------------|-----|-----|---------------|-----|------------------------------------|-----------|-----|-----|---|
| Option | | | Biodiversity, | flora & fauna | | | Population & | | Material assets | & resource use | | | Water | | | | Soil, geology & land use | | | Air & climate | | Archaeology & cultural heritage | Landscape | HRA | WFD | Commentary |
| | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 8.1 | | | |
| GRD10 North Staffs WRZ to Stafford WRZ | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Construction and operational activities could impact Cannock Chase SAC. Further information is required to assess operational impacts on the site integrity of Pasturefields SAC and Cannock Chase SAC at Stage 2 AA. The pipeline will have a major adverse effect on Shugborough Registered Park and Garden since the pipeline will intersect it resulting in loss of foliage. Moderate adverse effects relative to the reduction in flows which may adversely impact on the ecological receptors and potential deterioration of WFD status in the River Trent. |
| transfer solution | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | maintain public health and well-being as well as promoting a sustainable economy. |
| GRD05 Leek to Stoke trunk | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Minor adverse effects have been identified regarding population and human health; resource use; air and climate; archaeology and cultural heritage; and landscape and visual amenity. Minor beneficial effects were identified related to delivering 5MI/d helping to maintain public health and well-being as well as promoting a sustainable economy. |
| main enhancements | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | |
| OG S01 Site J WTW | Adv erse | | | | | | | | | | | | | | | | | | | | | | | | | The new WTW unit will be a new and permanent feature of the landscape impacting on visual amenity contributing to permanent moderate adverse effects. Moderate beneficial effects were identified in relation to maintaining public health and well-being as well as promoting a sustainable economy and improving resilience to the |
| expansion | Benefi | | | | | | | | | | | | | | | | | | | | | | | | | threats of climate change. |
| BHS14 Croxton BH output increase and | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | One major adverse effect regarding Biodiversity, flora and fauna relates to a section of the proposed pipeline (800m) running directly through an area of Ancient Woodland (Harley Thorns), located immediately to the south of the Hanchurch DSR. This will result in habitat loss and have nuisance effects such as noise disturbance and dust emissions. |
| transfer to Hanchurch DSR | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | Minor beneficial effects were identified relating to delivering 2.5MI/d helping to maintain public health and well-being as well as promoting a sustainable economy and improving resilience to the threats of climate change. |
| DAM05 Tittesworth | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Moderate adverse effects relate to raising the reservoir level which would inundate the fringes of the woodland and result in habitat loss. Minor beneficial effects were identified relating to delivering 5MI/d helping to maintain |
| Reservoir capacity increase (Size A) | Benefici | | | | | | | | | | | | | | | | | | | | | | | | | public health and well-being, promoting a sustainable economy, providing a small reduction in local flood risk and resilience against the threats of climate change. |

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|---|-------------------|-----|--------------|---------------|-----|-----|--------------|--------------|-----|-----------------|----------------|------|------|-------|-----|------|------|-----------------------------|-----|-----|---------------|-----|---------------|-----------|-----|-----|---|--|--|
| Option | | | Biodiversity | flora & fauna | | | Population & | human health | | Material assets | & resource use | | | Water | | | | Soil, geology & land use | | | Air & climate | | Archaeology & | Landscape | НКА | WFD | Commentary | | |
| | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 8.1 | | | | | |
| DAM06 Tittesworth Reservoir capacity increase (Size B) | eneficial Adverse | | | | | | | | | | | | | | | | | | | | | | | | | | Major adverse effects relate to raising the reservoir level which would inundate Ancient Woodland resulting in significant habitat loss. The extent of the habitat loss is unknown but it is likely that there would be a significant loss of woodland taking into consideration potential vegetation clearance requirements. Moderate adverse effects relate to the reservoir being visible from the Peak District national park and raising it by 2.3 meters which would permanently affect landscape setting. Moderate beneficial effects were identified relating to delivering 14 MI/d helping to maintain public health and well-being and promoting a sustainable economy. Minor beneficial effects were associated with providing a small reduction in local flood risk and resilience to the tweate of climate change. | | |
| | ă | | | | | | | | | | | | | | | | | | | | | | | | | | and resilience to the threats of climate change. | | |
| RAW17 Carsington reservoir to Tittesworth transfer | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | | Major adverse effects relate to construction related effects on designated sites. Ine proposed pipeline intercepts the Peak District Dales SAC by crossing the River Dove. Construction could interrupt migration by brook lamprey (Peak District Dales SAC) and therefore a Stage 2 Appropriate Assessment is required to assess this further. In addition, a large number of SSSIs and areas of Ancient Woodland are located adjacent or in close proximity to sections of the pipeline. Moderate adverse effects relate to adverse effects on natural capital and ecosystem services associated with habitat loss/fragmentation, resource use, vehicle emissions and dust and GHG emissions during construction. Other moderate adverse effects include construction impacts on recreational resources including Park Hall Country Park where the pipeline will | | |
| solution | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | | intersect as well as the Peak District National Park where construction works may have moderate adverse affects on visual amenity. Moderate beneficial effects were identified relating to delivering 10MI/d helping to maintain public health and well-being, promoting a sustainable economy. Moderate benficial effects regarding the sustainable water management and contributing to resilience against the threats of climate change (e.g. the option addresses issues with Tittesworth drought vulnerability) | | |
| LIN01 New source and | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | | Moderate adverse construction effects relate to the new WTW and 8km pipeline to Chesterfield supply area which would have effects on four areas of Ancient Woodland surrounding the reservoirs (Birley and Lincare Woods, Baines Wood, Kitchenflat Wood, Bank Wood). Construction would result in habitat loss and temporary fragmentation with nuisance effects such as noise/vibration disturbance and dust | | |
| treatment at Linacre reservoir | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | | emissions. The new inver abstraction also has the potential to have adverse effects on water dependent habitats downstream. Minor beneficial effects were identified relating to delivering 5MI/d helping to maintain public health and well-being and promoting a sustainable economy. | | |
| RAW01 Raw water import | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | | Major adverse effects relate to Cannock Chase SSSI located 200m from the construction works. The proposed pipeline will also intersect 150 m of Ancient Woodland and result in habitat loss and fragmentation. The pipeline will also intersect Shugborough Registered Park and Garden resulting in the loss of foliage that contributes to the setting of the park. It will also have a major adverse effect on the landscape and setting of Cannock Chase AONB. Moderate adverse effects relate to | | |
| WTW | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | | resource use and GHG emissions. Moderate beneficial effects were identified relating to delivering 12.75MI/d helping to maintain public health and well-being, promote a sustainable economy and provide resilience against the threats of climate change. | | |

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|--|--------------------|-----|---------------|---------------|-----|-----|------------------------------|-----|-----------------|----------------|------|------|-------|-----|------|-----|-----------------------------|-----|-----|---------------|-----|------------------------------------|-----------|-----|-----|---|
| Option | | | Biodiversity. | flora & fauna | | | Population & human health | | Material assets | & resource use | | | Water | | | | Soil, geology & land use | | | Air & climate | | Archaeology & cultural heritage | Landscape | HRA | WFD | Commentary |
| | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 8.1 | | | |
| NOT05 Site E to South Nottinghamshire | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Moderate adverse effects relating to biodiversity, flora and fauna, as a result of the proposed pipeline route which intersects Bullwell Hall Park Meadows LNR and would result in habitat loss. Construction of the pipeline would have moderate adverse nuisance effects on the Seller's Wood and Bulwell Wood SSSIs. Moderate beneficial effects relating to population and human health through |
| transfer solution | Beneficia | | | | | | | | | | | | | | | | | | | | | | | | | contributing a DO of 30MI/d. Two minor beneficial effects related to ensuring resilient water supplies and building resilience to climate change. |
| NOT01 Ambergate to Mid Nottinghamshire transfer solution | Beneficial Adverse | | | | | | | | | | | | | | | | | | | | | | | | | One major adverse effect has been identified relating to the proposed pipeline to Whiteborough DSR passing in close proximity of Crich Chase SSSI. Furthermore, the proposed pipeline to Abbotts road intersects 100m of Teversal/Peasley Network LNR, an area of ancient woodland and 200m of Teversal Pastures SSSI. Construction would have direct adverse effects on the site such as habitat loss and fragmentation; and indirect nuisance effects such as noise disturbance and dust emissions. Six moderate adverse effects relate to construction effects on ecosystem services, population and human health; GHG emissions; archaeology and cultural heritage and landscape and visual amenity. Moderate beneficial effects have been identified relating to delivering 30MI/d helping to maintain public health and well-being and promoting a sustainable economy. |
| NOT04 Heathy Lea to North Nottinghamshire transfer solution | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Major adverse effects relate to the HRA identifying that the works have the potential for LSEs on the South Pennine Moors SAC and Peak District Moors (South Pennine Moors Phase 1) SPA (a Stage 2 Appropriate Assessment is required). Construction may also have direct adverse effects on ancient woodlands since the proposed pipeline will intersect around 400m of Whitewell wood, 200m of Nitticarhill Wood, 800m of an identified woodland north of Worksop and 400m of Baines ancient woodlands. Intersecting these sites may result in adverse effects on ecosystem services due to habitat loss and fragmentation. Furthermore, there will be moderate adverse cultural effects since the pipeline will intersect Barlborough Hall, Shireoaks Hall and will pass in close proximity of Chatsworth House Registered Park and Garden. Over 3km of the proposed pipeline is located within the Park District National Peak and it will also intersect a section of the Peak District Moors AONB and Ginny Spring AONB |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | contributing to major adverse landscape and visual amenity effects. Moderate beneficial effects have been identified relating to delivering 25MI/d helping to maintain public health and well-being and promoting a sustainable economy. |

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|---|--------------------|-----|-----|--------------------------------|---|-----|-----|--------------|--------------|-----|-----------------------------------|-----|------|------|-------|------|------|-----|-----------------------------|-----|-----|---------------|-----|---------------|-------------------|-----------|-----|-----|--|--|--|
| Option | | | | biourversity, flora & fauna | | | | Population & | human health | | Material assets & resource use | | | | Water | | | , | Soil, geology & land use | | | Air & climate | | Archaeology & | cultural heritage | Landscape | HRA | WFD | Commentary | | |
| | | 1.1 | 1.2 | 13 | 2 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 41 | | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | | 8.1 | | | | | |
| CARSC01 Carsington to Site L, Site J and Site F WTWs | Beneficial Adverse | | | | | | | | | | | | | | | | | | | | | | | | | | | | Major adverse effects relate to construction related effects on designated sites and Ancient Woodland. The proposed pipeline intercepts the Peak District Dales SAC by crossing the River Dove. Construction could interrupt migration by brook lamprey (Peak District Dales SAC) and therefore a Stage 2 Appropriate Assessment is required to assess this further. Other major adverse effects also include those to regarding population affected by the construction including effects associated with access and recreation. Major adverse effects are also anticipated regarding GHG emissions as a result of the high quantity of materials used for maintenance and additional power pumping for additional abstraction and treatment during operation. Moderate adverse effects relate to flood risk, Archaeology & cultural heritage and Landscape and visual amenity (including permanent effects of the visual setting of the surrounding landscape as a result of reservoir and WTW expansion). Major beneficial effects relating to delivering 100MI/d helping to maintain public health and well-being, promoting a sustainable economy and contributing to resilience against the threats of climate change. | | |
| CARSC02 Carsington to Site L, Site F and Site E WTWs | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | | | | Major adverse effects relate to construction related effects on designated sites and Ancient Woodland. The proposed pipeline intercepts the Peak District Dales SAC by crossing the River Dove. Construction could interrupt migration by brook lamprey (Peak District Dales SAC) and therefore a Stage 2 Appropriate Assessment is required to assess this further. Other major adverse effects also include those to regarding population affected by the construction including effects associated with access and recreation. Major adverse effects are also anticipated regarding GHG emissions as a result of the high quantity of materials used for maintenance and additional power pumping for additional abstraction and treatment during operation. Moderate adverse effects relate to flood risk. Archaenlowy & cultural beritane and | | |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | | | | Landscape and visual amenity (including permanent effects of the visual setting of the surrounding landscape as a result of reservoir and WTW expansion). Major beneficial effects relating to delivering 100MI/d helping to maintain public health and well-being, promoting a sustainable economy and contributing to resilience against the threats of climate change. | | |
| CARSC03 Carsington to Site L, Site J, Site F and Site F WTWs | Adv erse | | | | | | | | | | | | | | | | | | | | | | | | | | | | Major adverse effects relate to construction related effects on designated sites and Ancient Woodland. The proposed pipeline intercepts the Peak District Dales SAC by crossing the River Dove. Construction could interrupt migration by brook lamprey (Peak District Dales SAC) and therefore a Stage 2 Appropriate Assessment is required to assess this further. Other major adverse effects also include those to regarding population affected by the construction including effects associated with access and recreation. Major adverse effects are also anticipated regarding GHG emissions as a result of the high quantity of materials used for maintenance and additional power pumping for additional abstraction and treatment during operation. Moderate adverse effects relate to flood risk, Archaeology & cultural heritage and | | |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | | | | Landscape and visual amenity (including permanent effects of the visual setting of the surrounding landscape as a result of reservoir and WTW expansion). Major beneficial effects relating to delivering 100MI/d helping to maintain public health and well-being, promoting a sustainable economy and contributing to resilience against the threats of climate change. | | |

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|---|--------------------|-----|---------------|---------------|-----|-----|------------------------------|-----|-----------------|----------------|-----|------|-------|-----|------|-----|-----------------------------|-----|-----|---------------|-----|---------------|-----------|---|-----|-----|---|
| Option | | | Biodiversity. | flora & fauna | | | Population & human health | | Material assets | & resource use | | | Water | | | | Soil, geology & land use | | | Air & climate | | Archaeology & | Landscape | | нка | WFD | Commentary |
| | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 8.1 | 5 | | | |
| BHS04 Swynnerton BHs asset and water treatment enhancements | Beneficial Adverse | | | | | | | | | | | | | | | | | | | | | | | | | | Moderate adverse effects relate to the flows in the River Trent from Tittensor to River Sow linked to the recommissioning of the abstraction at Swynnerton. The reduction in flows may adversely impact on ecological receptors. The WFD Assessment determined that there is a risk of WFD status deterioration resulting in the need for further assessment. Minor beneficial effects were identified relating to delivering 8.5MI/d helping to maintain public health and well-being as well as promoting a sustainable economy. |
| BAM02 Potable water import to Site R WTW with Bamford to Ambergate pipeline capacity increase | Beneficial Adverse | | | | | | | | | | | | | | | | | | | | | | | | | | Major adverse effects on biodiversity, flora and fauna due potential for adverse effects on the qualifying features of European designated sites (HRA concluded Stage 2 Appropriate Assessment is required), Ancient Woodland habitat loss and construction impacts on aquatic ecology. Moderate adverse regarding construction related effects in Peak District National Park. Construction would also have moderate adverse impacts on residential areas, GHGs, energy use and archaeological sites including Derwent valley Mills World Heritage site and Chatsworth House Registered Park and Garden. Major beneficial effects associated with delivering 60 MI/d to help maintain public health and well-being, and moderate beneficial effects with respect to improving resilience to climate change. |

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|--|------------|---|---------------|---------------|-----|-----|---------------------------|-----|-------------------|--------------|------|------|-------|-----|-----|-----|-----------------------------|-----|-----|---------------|-----|------------------------------------|-----------|-----|-----|---|
| Option | | | Biodiversity, | flora & fauna | | | Population & human health | | Material assets & | resource use | | | Water | | | | Soil, geology & land use | | | Air & climate | | Archaeology & cultural heritage | Landscape | HRA | WFD | Commentary |
| | | 5 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 8.1 | | | |
| GRD01 Site U WTW | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Construction of the pipeline may have major adverse effects on Himley Hall Registered Park and Garden permanently altering its characteristics through loss of foliage. It would also have moderate effects on LNRs, Ancient Woodland, residential properties, air quality and visual amenity. |
| Wolverhampton and Telford WRZ | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | Moderate beneficial effects from delivering 21.5Ml/d to help maintain public health and well-being, a sustainable economy and improve resilience to climate change. |
| GRD06 Cross Wolverhampton | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Moderate adverse effect has been identified with regards to GHG emissions and designated heritage assets including Listed Buildings and West Park Registered Park and Garden. |
| strategic transfer solution | Benefici | | | | | | | | | | | | | | | | | | | | | | | | | Noderate beneficial effects from delivering 15 wild to help maintain public health and well-being, a sustainable economy and improve resilience to climate change. |
| RAW07 Potable water | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Minor adverse effects due to construction have been identified relating to the spread of INNS; human health; resource use; air and climate; archaeology and cultural heritage; and landscape and visual amenity. Three minor heartforcial offects were identified relating to delivering 1MI/d |
| import to Kinsall WRZ at Whittington | Benefici | | | | | | | | | | | | | | | | | | | | | | | | | ensuring a resilient supply for customers and economic activity as well as climate change resilience. |
| GRD07 Shelton WRZ to Mardy WRZ transfer | Adv erse | | | | | | | | | | | | | | | | | | | | | | | | | Minor adverse effects from construction have been identified relating to the spread of INNS; human health; recreation; resource use; GHG emissions; and the setting of Brogyntyn Registered Park and Garden. Two minor beneficial effects were identified related to delivering 1MI/d and |
| solution adapting existing assets (Solution 2) | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | ensuring a resilient supply for customers and economic activity. |
| GRD09 Shelton WRZ to | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Minor adverse effects during the construction phase have been identified relating to the spread of INNS, human health, resource use, GHG emissions, two Scheduled Ancient Monuments and visual amenity. Minor beneficial effects were identified relating to delivering 1MI/d helping to |
| Ruyton WRZ transfer solution | Benefici | | | | | | | | | | | | | | | | | | | | | | | | | maintain public health and well-being. The option will also provide resilience to the climate change during emergency peak periods. |

Figure 6.3 – Supply-side Visual Evaluation Matrix - Strategic Grid (northern and western parts of the zone)

| | | | | | | | | | SE/ | <u>\ To</u> | opic | s a | nd | Obj | ect | ive | s | | | | | | | | | |
|--|------------|-----|---------------|---------------|-----|-----|------------------------------|-----|-------------------|--------------|------|-----|-------|-----|-----|-----|-----------------------------|-----|-----|---------------|-----|------------------------------------|-----------|-----|-----|---|
| Option | | | Biodiversity, | flora & fauna | | | Population & human health | | Material assets & | resource use | | | Water | | | | Soil, geology & land use | | | Air & climate | | Archaeology & cultural heritage | Landscape | HRA | WFD | Commentary |
| | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 1.1 | 8.1 | | | |
| GRD11 Site U WTW to | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Two major adverse effects have been identified with regards to significant resource use and GHG emissions. Moderate adverse effects relate to the construction and include effects on Ancient Woodland, SSSIs and LNRs. Two moderate beneficial effects have been identified relating to delivering |
| North Staffs WRZ transfer solution | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | 15MI/d helping to maintain public health and well-being as well as promoting a sustainable economy. |
| GRD12 Site Q WTW to | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Three major adverse effects have been identified with regards to Biodiversity, flora and fauna (the HRA concluded that there is potential for LSEs on Cannock Chase SAC and West Midlands Mosses SAC and there is the potential for Ancient Woodland and LNR habitat loss); human health; and significant resource use and GHG emissions. Moderate adverse effects relate to the construction and include impacts on human health from poise, dust and vibration due to HGV movements. Construction |
| North Staffs WRZ transfer solution | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | AONB. Three minor beneficial effects have been identified relating to delivering 7 MI/d helping to maintain public health and well-being as well as promoting a sustainable economy. |
| MIT01 Site O WTW to Site | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | One major adverse effect was identified relating to potentially significant adverse affect on the qualifying features of the Wye Valley & Forest of Dean Bat Sites SAC, including habitat loss in two areas of Ancient Woodland areas due to the construction of pipeline. A further Stage 2 HRA is therefore required to investigate this further. Moderate adverse effects relating to effects of construction on ecosystem services and natural central including habitat loss in human services and natural adverse effects of construction on ecosystem services and natural central including habitat loss fragmentations human health concurse use |
| K WTW raw water transfer main | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | and an increase in GHG emissions were also identified. Three moderate beneficial effects were identified relating to delivering 15MI/d helping to maintain public health and well-being as well as promoting a sustainable economy and providing resilience to the effects of climate change. |
| GRD15 Whaddon | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Two minor adverse effects were identified relating to increased resource use and GHG emissions. Minor beneficial effects were identified relating to delivering 5MI/d helping to maintain public health and well-being as well as promoting a custoing he |
| (Strategic Grid WRZ) to Forest & Stroud WRZ transfer solution | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | economy. The option will utilise existing assets with no construction or upgrade works required. |

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|--|------------|-----|---------------|---------------|-----|-----|--------------|--------------|-------------------|--------------|------|------|-------|-----|-----|-----|-----------------------------|-----|-----|---------------|-----|------------------------------------|-----------|-----|-----|--|
| Option | | | Biodiversity. | flora & fauna | | | Population & | numan nealth | Matorial accote & | resource use | | | Water | | | | Soil, geology & land use | | | Air & climate | | Archaeology & cultural heritage | Landscape | HRA | WFD | Commentary |
| | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 1.1 | 8.1 | | | |
| BH S06 Maximise | Adv erse | | | | | | | | | | | | | | | | | | | | | | | | | Minor adverse effects from construction have been identified relating to relating to human health, increased resource use and GHG emissions. Minor beneficial effects have been identified relating to delivering 0.9MI/d table in the statement of the believer of the statement o |
| deployment from Diddlebury WTW and Munslow BH | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | heiping to maintain public health and well-being as well as promoting a sustainable economy. |
| BHS17 Shelton WRZ to Mardy WRZ transfer solution adapting | Adv erse | | | | | | | | | | | | | | | | | | | | | | | | | One moderate adverse effect has been identified relating the setting of Brogyntyn Registered Park and Garden which may be subject to noise disturbance and dust emissions. Minor beneficial effects have been identified relating to delivering 3 Ml/d helping to maintain public health and well-being as well as promoting a |
| existing assets (Solution 1) | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | sustainable economy. |
| BHS18 Shelton WRZ to Mardy WRZ transfer | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | One moderate adverse effect has been identified relating the setting of Brogyntyn Registered Park and Garden which may be subject to noise disturbance and dust emissions. Minor beneficial effects have been identified relating to delivering 3 MI/d |
| solution using new assets | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | helping to maintain public health and well-being as well as promoting a sustainable economy. |
| BHS12 | Adv erse | | | | | | | | | | | | | | | | | | | | | | | | | Major adverse effects have relate to the potential for significant effects on the Cannock Chase SAC both during construction and operation (therefore a Stage 2 Appropriate Assessment would be required). Construction impacts would also adversely effect Baswich Meadows SSSI. Major adverse effects also identified as the proposed pipeline route intersects Shugborough Registered Park and Garden. One moderate adverse effect relating to adverse effects on the landscape setting of the Cannock Chase |
| New GW source in the Hopton GWMU | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | AONB, as a section of the proposed pipeline would be within in the AONB. Three minor beneficial effects have been identified relating to delivering 3.5MI/d helping to maintain public health and well-being as well as promoting a sustainable economy and providing resilience against climate change. |
| LIT01 Site F WTW | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Moderate adverse effects have been identified relating to the proposed pipeline intersecting Bullwell Hall Park Meadows LNR resulting in the habitat loss on the site, Little Eaton WTW being located within flood risk zone 3, resource use and an increase in GHG emissions. |
| expansion | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | Two moderate beneficial effects have been identified relating to maintaining public health and well-being as well as promoting a sustainable economy. |

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| Option | | | Biodiversity. | flora & fauna | | | Population & human health | | Material assets & | resource use | | | Water | | | | Soil, geology & land use | | | Air & climate | | Archaeology & cultural heritage | Landscape | HRA | WFD | Commentary |
| | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 8.1 | | | |
| WTW08 New WTW on the River Severn near | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | One major adverse effect has been identified relating to adverse effects towards the visual amenity of Shrawley Wood AONB and SSSI. Moderate adverse effects relating to the proposed abstraction being located in flood risk zone 3, GHG emissions during construction, temporary nuisance effects and affect access to archaeology and cultural heritage sites and the new WTW permanently altering the landscape character of the surrounding |
| Ombersley, Shropshire | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | countryside. Two moderate beneficial effects have been identified relating to delivering 15MI/d helping to maintain public health and well-being as well as promoting a sustainable economy. |
| WTW16 New WTW on the River Severn near | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | One major adverse effect has been identified relating to habitat loss from the proposed pipeline route transferring water to Redhill DSR and Cluddley DSR which will intersect Ancient Woodland, Lydebrook Dingle SSSI and Telford Town Park LNR. Moderate adverse effects have been identified relating to human health, resource use, GHG emissions, SAMs and the solution of Lydebrook Dingle Dingle ONB. |
| Buildwas, Shropshire | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | Three moderate beneficial effects have been identified relating to delivering 15MI/d helping to maintain public health and well-being, as well as promoting a sustainable economy and improving resilience to the effects of climate change. |
| UNK01 New WTW on the River Weaver near | Adv erse | | | | | | | | | | | | | | | | | | | | | | | | | Moderate adverse effects were identified relating to the new WTW being within Flood Risk Zone 2 and the storage reservoir and intake being within Flood Risk Zone 3. These elements of the option would significantly increase flood risk by reducing the natural drainage adjacent to the river Two mederate herefield effects have been identified relating to delivering 20 |
| Nantwich | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | MI/d helping to maintain public health and well-being as well as promoting a sustainable economy. |
| UNK03 Support Site L | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Two major adverse effects have been identified relating to significant resource use and GHG emissions. Moderate adverse effects identified relate to habitat loss, noise disturbance and dust emissions on Ancient Woodland as well as the landscape setting of the Madams Wood AONB. |
| WTW from the River Weaver | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | Two moderate beneficial effects were identified relating to delivering 20MI/d helping to maintain public health and well-being as well as promoting a sustainable economy. |

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|---|------------|-----|---------------|---------------|-----|-----|--------------|-----|-------------------|--------------|------|------|-------|-----|-----|-----|-----------------------------|-----|-----|---------------|-----|------------------------------------|-----------|-----|-----|--|
| Option | | | Biodiversity. | flora & fauna | | | Population & | | Material assets & | resource use | | | Water | | | | Soil, geology & land use | | | Air & climate | | Archaeology & cultural heritage | Landscape | HRA | WFD | Commentary |
| | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 1.1 | 8.1 | | | |
| BHS13 Croxton BH output increase and | Adv erse | | | | | | | | | | | | | | | | | | | | | | | | | One major adverse effect has been identified in terms of biodiversity. The potential for effects on Midland Meres and Mosses – Phase 2 (Ramsar Site) were considered in HRA screening and the assessment concluded that works associated with the option may have LSEs on the site due to the risk of run-off and accidental pollution water quality degradation and pollution. A Stage 2 Appropriate Assessment is required to assess the construction impacts further. In addition, the pipeline will intersect an area of Appine Wandfaced (Applement Constraint) |
| transfer to Hob Hill DSR | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | Two minor beneficial effects were identified relating to delivering 2.5MI/d helping to maintain public health and well-being as well as promoting a sustainable economy. |
| MEL37 Raw water augmentation of Staunton Harold Reservoir with Site | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Two major adverse effects have been identified. Adverse effects relating to biodiversity, flora and fauna during construction relate to the proposed pipeline intersecting Lount Meadows SSSI (200 m) and Dimminsdale SSSI (500 m). In operation effluent inputs may lead to impacts on water quality, especially phosphate with associated knock on effects to aquatic ecology. The major adverse effect regarding archaeology and cultural heritage relates to the proposed pipeline intersecting 1 km of Staunton Harold Hall Registered Park and Garden. Two moderate adverse effects that relate to the loss of natural capital and ecosystem services and secondly to water quality. As identified by the WFD assessment the effluent inputs to Carr- |
| Q WTW enhancements | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | New Brook may lead to a deterioration in water quality and there is also a risk of deterioration between chemical status classes due to the diversion of effluent into the small seized brook. Further investigation is required. Two minor beneficial effects were identified related to delivering <5 Ml/d helping to maintain public health and well-being as well as promoting a sustainable economy. |
| UNK06 Maximise outputs | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | The specific pipeline route and/or locations of pumping stations and associated distribution infrastructure is unknown. There are numerous designated sites including ancient woodland, SSSIs and LNRs as well as archaeological assets (SAMs and Listed Buildings) in this corridor. In the case that it is not feasible to avoid these sites then construction of the pipeline would be associated with major adverse effects due to habitat loss. Moderate adverse effects include Hammton Loade WTW being located in |
| WTW | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | Flood Risk Zones 2 and 3 and adverse construction effects on human health relating to emissions to air. Two moderate beneficial effects were identified relating to delivering 30 Ml/d helping to maintain public health and well-being as well as promoting a sustainable economy. |

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|--|------------|-----|--------------|---------------|-----|-----|------------------------------|-----|-------------------|--------------|------|------|-------|-----|------|-----|-----------------------------|-----|-----|---------------|-----|------------------------------------|-----------|-----|-----|--|--|--|--|
| Option | | | Biodiversity | flora & fauna | | | Population & human health | | Material assets & | resource use | | | Water | | | | Soil, geology & land use | | | Air & climate | | Archaeology & cultural heritage | Landscape | HRA | WFD | Commentary | | | |
| | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 1.1 | 8.1 | | | | | | |
| BHS15 Birmingham BHs conversion to | Adv erse | | | | | | | | | | | | | | | | | | | | | | | | | One major adverse effect relates to the proposed pipeline routes being located in close proximity to Weoley Castle (Scheduled Ancient Monument) a large number (103) of Grade II Listed Buildings and intersects two Registered Parks and Gardens (Key Hill Cemetery and Warstone Lane Cemetery). Construction would result in the loss of foliage that contributes to the setting of the parks and temporary nuisance effects on the setting of the other assets. Moderate adverse effects relate to resource use, impacts on the flows in a two dependent river water bodies: River Rea from Bourn Brook to River Tame and Hockley Brook Catchment (trib of Rea) and air | | | |
| potable supply | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | and dust emissions during construction. The WFD Assessment also determined that there is a potential for WFD status deterioration and further assessment is required. Minor beneficial effects were identified relating to delivering 9 MI/d helping to maintain public health and well-being as well as promoting a sustainable economy. | | | |
| SHE01 | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | The proposed pipeline intersects a Scheduled Ancient Monument. The construction would have major adverse effects on the monument through the disturbance of archaeological remains. Moderate adverse effects relate to construction impacts on human health as well as Ercall and Larence's Hill LNB, Hongost Bool SSS and five access of Accient Woodlond within | | | |
| Site M WTW Expansion | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | 1km (Alkmondpark Coppice, Ercall Wood, Limeklin Wood, Wenlocks Wood and Short Wood). Moderate beneficial effects were identified relating to delivering 18MI/d helping to maintain public health and well-being as well as promoting a sustainable economy. | | | |
| GRD16 Clungunford / | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Major adverse effects relate to the HRA assessment identifying that Clungunford BH2 site abstraction works are functionally linked with the River Clun SAC habitat, which may be impacted/degraded as a result of the abstraction Stage 2 HRA is required. The proposed pipeline also intersects the River Teme SSSI which would result in habitat loss. The WFD assessment also identified that the abstraction is in close proximity to the watercourse and may lead to a reduction in flows due to the likely connectivity with the aquifer. This in turn may adversely impact on the | | | |
| enhancements | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | ecological receptors. There is a potential risk of WFD status deterioration resulting in the need for further assessment. Minor beneficial effects were identified relating to delivering 0.9MI/d helping to maintain public health and well-being, promote a sustainable economy and build resilience against the threats of climate change. | | | |

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|---|------------|-----|---------------|---------------|-----|-----|------------------------------|-----|-------------------|--------------|------|------|-------|-----|-----|------|-----------------------------|-----|-----|---------------|-----|------------------------------------|-----------|-----|-----|---|
| Option | | | Biodiversity. | flora & fauna | | | Population & human health | | Material assets & | resource use | | | Water | | | | Soil, geology & land use | | | Air & climate | | Archaeology & cultural heritage | Landscape | HRA | WFD | Commentary |
| | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 8.1 | | | |
| GRD17 | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Major adverse effects adverse effects relate to the HRA assessment identifying that Clungunford BH2 site abstraction works are functionally linked with the River Clun SAC habitat, which may be impacted/degraded as a result of the abstraction. The proposed pipeline also intersects the River Teme SSSI which would result in habitat loss. Major adverse effects also relate to the proposed pipeline intersecting 500 m of a Roman Scheduled Ancient Monument. Construction would have effects on the setting of the site and have the potential to disturb archaeological remains associated with the monument. Moderate adverse effects effects to water |
| Strategic Grid to Bishops Castle WRZ transfer solution | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | and landscape and visual amenity. The BH3 pumping facility is located within Shropshire Hills AONB. The WFD assessment also identified that the abstraction is in close proximity to the watercourse and may lead to a reduction in flows due to the likely connectivity with the aquifer. This in turn may adversely impact on the ecological receptors. There is a potential risk of WFD status deterioration resulting in the need for further assessment. Minor beneficial effects were identified relating to delivering 4.7MI/d helping to maintain public health and well-being, promote a sustainable economy and build resilience against the threats of climate change. |
| BHS07 Ladyflatte BHs asset and water | Adv erse | | | | | | | | | | | | | | | | | | | | | | | | | Moderate adverse effects relate to potential impacts to flows in the Ecclesborne catchment (trib of R Derwent) as a result of recommissioning the abstraction at Ladyflette. The abstraction is in close proximity to the watercourse and may lead to a reduction in flows due to the likely connectivity with the aquifer. It may also adversely effect ecological connectivity with the aquifer. It may also adversely effect ecological |
| treatment enhancements | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | Receptors which may be sensitive to changes in now regime. Minor beneficial effects were identified relating to delivering 2.7 MI/d helping to maintain public health and well-being and promote a sustainable economy. |
| GRD20 New WTW on River Dove near Uttoxeter supported by | Adv erse | | | | | | | | | | | | | | | | | | | | | | | | | Major adverse effects relate to the proposed pipeline intersecting 100 m of three areas of Ancient Woodland; construction would result in habitat loss. Construction would also generate indirect nuisance effects such as noise disturbance and dust emissions. Moderate adverse effects relate to reduction in ecosystem services and natural capital and increased GHG emissions as a result of the additional numping and treatment (20 MI/d) |
| Carsington reservoir and deploying to Stoke (Size A) | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | Moderate beneficial effects were identified relating to delivering 20MI/d helping to maintain public health and well-being and promote a sustainable economy. |

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|---|------------|-----|---------------|---------------|-----|-----|--------------|--------------|-------------------|--------------|------|------|-------|-----|------|-----|-----------------------------|-----|-----|---------------|-----|------------------------------------|-----------|-----|-----|--|
| Option | | | Biodiversity. | flora & fauna | | | Population & | numan neattn | Material assets & | resource use | | | Water | | | | Soil, geology & land use | | | Air & climate | | Archaeology & cultural heritage | Landscape | HRA | WFD | Commentary |
| | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 1.1 | 8.1 | | | |
| GRD21 New WTW on River Dove near Uttoxeter supported by | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Major adverse effects relate to the proposed pipeline intersecting 100 m of three areas of Ancient Woodland; construction would result in habitat loss. Construction would also generate indirect nuisance effects such as noise disturbance and dust emissions. Moderate adverse effects relate to reduction in ecosystem services and natural capital and increased GHG emissions as a result of the additional pumping and treatment (30 MI/d). |
| Carsington reservoir and deploying to Stoke (Size B) | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | Moderate beneficial effects were identified relating to delivering 30MI/d helping to maintain public health and well-being and promote a sustainable economy. |
| BHS03 Preston Brockhurst BH asset and water | Adv erse | | | | | | | | | | | | | | | | | | | | | | | | | Three moderate adverse effects regarding biodiversity, fauna and flora and water that relate to groundwater abstraction effects on baseflows in the River Roden. This in turn may have adverse effects on its ecology, especially during periods of low flow. As identified by the WFD assessment, further assessment is necessary. Four minor adverse effects |
| treatment enhancements | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | have been identified relating to population and human health; material assets and resource use and GHG emissions. Minor beneficial effects were identified relating to delivering 1.5Ml/d helping to maintain public health and well-being and promote a sustainable economy. |
| BHS16 | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Moderate adverse effects relate to the WFD Assessment which determined that the risk of WFD status deterioration is uncertain. Minor beneficial effects were identified relating to delivering 0.7MI/d helping |
| Much Wenlock BH enhancements | Benefici / | | | | | | | | | | | | | | | | | | | | | | | | | to maintain public health and well-being and promote a sustainable economy. |
| BH S08 | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Six minor adverse effects have been identified relating to population and human health; material assets and resource use; air and climate; and landscape and visual amenity. |
| the Coven GWMU | Benefici | | | | | | | | | | | | | | | | | | | | | | | | | Minor beneficial effects were identified relating to delivering 3.8MI/d helping to maintain public health and well-being and promote a sustainable economy. |
| MIL01 | Adv erse | | | | | | | | | | | | | | | | | | | | | | | | | One major adverse effect that relates to the HRA identifying that there are potential temporary impacts on qualifying habitat features of Cannock Chase SAC (a Stage 2 AA is required). Moderate adverse effects relate to flows in the Sow from R Penk to R Trent linked to the new abstraction at Milford. The abstraction is in close proximity to the watercourse and may lead to a reduction in flows due to the likely connectivity with the aquifer. |
| Mílford BH output enhancements | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | This may adversely effect the ecological receptors. Other moderate effects include temporary effects on visual amenity of Cannock Chase AONB. Minor beneficial effects were identified relating to delivering 2MI/d helping to maintain public health and well-being and promote a sustainable economy. |

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|--------------------------------------|------------|-----|---------------|---------------|-----|-----|------------------------------|-----|-------------------|--------------|------|------|-------|-----|------|-----|-----------------------------|-----|-----|---------------|-----|------------------------------------|-----------|-----|-----|---|
| Option | | | Biodiversity, | flora & fauna | | | Population & human health | | Material assets & | resource use | | | Water | | | | Soil, geology & land use | | | Air & climate | | Archaeology & cultural heritage | Landscape | HRA | WFD | Commentary |
| | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 1.1 | 8.1 | | | |
| BAM04 Site R WTW to | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | One major adverse effect has been identified relates to the northern section of the DVA that will be worked on which is located adjacent to Padley Woods ancient woodland and is also located within Yarncliff Wood SSSI. Moderate adverse effects relate to the loss of ecosystem services, resource use, GHG emissions and temporary adverse effects on visual |
| Baslow pipeline capacity increase | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | amenity on the Park District National Park and the Eastern Peak District AONB. Moderate beneficial effects relate to delivering 20MI/d helping to maintain public health and well-being, ensuring resilient water supplies and building resilience to climate change. |
| BAM03 Site R WTW to | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | No adverse effects are anticipated. Four minor beneficial effects were identified associated with human health and well-being (delivering 7.5MI/d), resource use (upgrading existing |
| pipeline capacity increase | Benefici | | | | | | | | | | | | | | | | | | | | | | | | | sections of the DVA) and an improved resilience to the threats of climate change (by increasing transfer capability between different water resource zones). |
| BAM05 Site R WTW to | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Major adverse effects relating to biodiversity, flora and fauna as works could have a significant effect on South Pennine Moors SAC, Peak District Moors (South Pennine Moors Phase 1) SPA and Peak District Dales SAC. The proposed pipeline construction area intersects the Eastern Peak District Moors SSSI at multiple locations within the Peak District, including the Yarncliff Wood SSSI at Padley; large fens habitats, located within the Eastern Peak District Moors and South Pennine Moors; and four areas of ancient woodland including: Bow Wood, Jumble Coppice, Hall Dale Wood and Padley Woods. Other major adverse effects include disruption to a range of recreational resources, including public rights of way associated with the Peak District National Park, the Longshaw Country Park and the Cromform Canal LNR. Additionally, a high magnitude of resources would be required for construction and a major increase in power would be required for pumping |
| solution | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | energy in operation, with increase of GHG emissions. The proposed pipeline runs through the Derwent Valley Mills world heritage site and five scheduled monuments would be intersected by the construction area. Pipeline construction would have temporary major adverse effects on the setting of the above heritage assets. The proposed pipeline runs adjacent to the Chatsworth House registered park and garden, at Baslow and would disrupt access. Five moderate beneficial effects related to benefits to health and wellbeing by contributing a DO of 50MI/d), ensuring resilient water supplies, improving the water efficiency of the DVA and building resilience to climate change. |

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|--|------------|-----|---------------|---------------|-----|-----|------------------------------|-----|-------------------|--------------|-----|-----|-------|-----|------|----------------|-----------------------------|-----|-----|---------------|-----|------------------------------------|-----------|-----|-----|---|
| Option | | | Biodiversity. | flora & fauna | | | Population & human health | | Material assets & | resource use | | | Water | | | Coll accious 8 | soll, geology & land use | | | Air & climate | | Archaeology & cultural heritage | Landscape | HRA | WFD | Commentary |
| | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 8.1 |] | | |
| GRD22 Cross- Wolverhampton | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Moderate adverse effects relate to archaeology and cultural heritage, due to its proximity (<0.2km) to West Park (Registered Park and Garden). However, it would be constructed adjacent to existing roads for its entirety, therefore, the potential for adverse effects to these designated heritage assets are considered limited. Minor adverse effects relating to biodiversity, flora and fauna; population and human health; material assets and resource use; air and climate; and landscape and visual amonity. |
| strategic transfer solution | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | Three moderate beneficial effects were identified associated with human health and well-being (due to the deployable output of 10MI/d) and improved resilience to the threats of climate change (by increasing transfer capability between different water resource zones). |
| SHE04 Shared South Staffordshire Asset to Nurton Transfer | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | The southern end of the proposed pipeline route intersects the Highgate Common SSSI and Highgate LNR, areas of ancient woodland and would result in habitat loss and would have major planning constraints. Construction would result in direct major adverse effects on the sites located in close proximity, such as habitat loss/fragmentation, nuisance and mortality of qualifying features of the SSSI/LNR. Four moderate adverse effects relating to habitat loss/fragmentation in the SSSI/LNR; resource use for construction; landscape and visual amenity as a small area of the Patshull Hall registered park and garden is intersected by the proposed pipeline at Westbeech Road. Construction activities |
| (High Flow) | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | would disrupt access to this designated site and present medium scale temporary effects on its visual amenity. Two moderate beneficial effects relating to population and human health by contributing a DO of 18MI/d and two minor beneficial effects related to ensuring resilient water supplies and building resilience to climate change. |
| SHE06 Shared South Staffordshire Asset to Shelton | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | The proposed pipeline route intersects the Highgate Common SSSI, Highgate LNR, some areas of ancient woodland and other priority habitats; Iowland heathland (approx. 175m), Iowland dry acid grassland (approx. 60m, deciduous woodland (approx. 650m) and traditional orchard (approx. 50m) and would result in habitat loss and would have major planning constraints. Construction would result in direct major adverse effects on the sites located in close proximity, such as habitat loss/fragmentation, nuisance and mortality of qualifying features of the SSSI/LNR and other priority habitats. Two moderate adverse effects relating to habitat |
| WRZ transfer solution (Low flow) | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | small area of the Patshull Hall registered park and garden is intersected by the proposed pipeline at Westbeech Road. Construction activities would disrupt access to this designated site and present medium scale temporary effects on its visual amenity. Four minor beneficial effects relating to population and human health by contributing a DO of 10MI/d; ensuring resilient water supplies and building resilience to climate change. |

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|--|------------|-----|---------------|---------------|-----|-----|--------------|-----|-------------------|--------------|------|------|-------|-----|------|-----|-----------------------------|-----|-----|---------------|-----|------------------------------------|-----------|-----|-----|---|
| Option | | | Biodiversity. | flora & fauna | | | Population & | | Material assets & | resource use | | | Water | | | | Soil, geology & land use | | | Air & climate | | Archaeology & cultural heritage | Landscape | HRA | WFD | Commentary |
| | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 1.1 | 8.1 | | | |
| MEL41 Melbourne WTW enhancements with | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Moderate adverse effects have been identified relating to significant resource use and GHG emissions. Potential for minor adverse effects regarding construction in proximity to two SSSIs, two areas of Ancient Woodland. and two Registered Parks and Gardens. Moderate beneficial effects were identified relating to delivering 15MI/d beloing a cuttainable. |
| abstractions from the River Derwent | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | economy and contributing to resilience against the threats of climate change. |
| MEL39 BH raw water transfer to Site Q WTW with Site O | Adv erse | | | | | | | | | | | | | | | | | | | | | | | | | Two moderate adverse effects have been identified regarding biodiversity, flora and fauna and water in relation to the potential for the groundwater abstraction to have adverse effects on other waterbodies including a low risk of adverse impacts on flows in the Milton Brook Catchment which may adversely impact on water quality and ecological receptors. Minor adverse effects have been identified regarding; population and human health; material assets and resource use; soil; geology and land use; air and |
| WTW enhancements | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | climate; archaeology and cultural heritage; and landscape and visual amenity. Two minor beneficial effects were identified relating to delivering 5MI/d helping to maintain public health and well-being as well as promoting a sustainable economy. |
| MEL23 River Trent to Site | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Moderate adverse effects were identified relating to increased resource use and GHGs. Potential for minor adverse effects regarding construction in proximity to two SSSIs, two areas of Ancient Woodland. and two Registered Parks and Gardens. |
| with Site Q WTW enhancements | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | Two moderate beneficial effects were identified relating to delivering 15MI/d helping to maintain public health and well-being as well as promoting a sustainable economy. |
| MEL29 River Trent support | Adv erse | | | | | | | | | | | | | | | | | | | | | | | | | Two moderate adverse effects relating to resource use and GHG emissions. Minor adverse effects relating to biodiversity, flora and fauna; population and human health; flood risk; air and climate; archaeology; and landscape and visual amenity. The Habitat Regulations Assessment (HRA) Screening concluded that there would be no likely eignificant effects (LSE) |
| Site Q WTW enhancements | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | on any European designated sites. The Water Framework Directive (WFD) Assessment concluded that the potential risk of deterioration of WFD status in any water bodies would be negligible. Two moderate beneficial effects relating to population and human health and one minor beneficial effect relating to water. |

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|---|------------|-----|---------------|---------------|-----|-----|------------------------------|-----|-------------------|--------------|------|------|-------|-----|------|-----|-----------------------------|-----|-----|---------------|-----|------------------------------------|-----------|-----|-----|---|
| Option | | | Biodiversity, | flora & fauna | | | Population & human health | | Material assets & | resource use | | | Water | | | | Soil, geology & land use | | | Air & climate | | Archaeology & cultural heritage | Landscape | HRA | WFD | Commentary |
| | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 8.1 | | | |
| WIL05 Site E WTW expansion and transfer main supported by raw | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Major adverse effects relate to the proposed pipeline intersecting 50 m of Lockington Marshes SSSI and 175 m of Sutton Bonnington Spinney and Meadows LNR. Construction would have direct adverse effects on the site such as habitat loss and fragmentation; and indirect nuisance effects such as noise disturbance and dust emissions. Moderate adverse effects relate to reduction in ecosystem functions, disturbance to residential areas from construction works and increased GHG emissions as a result of the additional pumping and treatment. Further assessment is required marking the offect of the crew works compared tion of the Direct Fort. |
| water augmentation of the River Trent | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | source of the raw water augmentation of the rover ment, the source of the raw water augmentation needs to be confirmed, however based on the sources under consideration and available mitigation the risk of adverse effects is considered low. Moderate beneficial effects were identified relating to helping to maintain public health and well-being and promote a sustainable economy. |
| WTW01 New WTW on the River Trent near Little Haywood | Adv erse | | | | | | | | | | | | | | | | | | | | | | | | | Adverse effects relating to the construction phase include moderate effects identified with respect to heritage features (Shugborough Registered Park and Garden and three Listed Buildings). In operation the new intake and pumping station structure will be permanently located on the river bank along with the multi-stage WTW which will impact permanently on visual amenity and the surrounding landscape. Adverse effects relating to the augmentation of the River Trent include the moderate adverse effects associated with the pumping of raw water for augmentation (resource use |
| supported by raw water augmentation of the River Trent | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | and an increase in GHG emissions). Several minor adverse effects have been identified relating to increases in flows and changes in water quality in the catchment which may have adverse impacts on river ecology. Moderate beneficial effects were identified relating to delivering 13MI/d helping to maintain public health and well-being and promote a sustainable economy. |
| MEL47 Site Q WTW enhancements supported by raw | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Two moderate adverse effects were identified relating to increased resource use and GHGs. Minor adverse effects include potential for construction related effects to SSSIs, areas of Ancient Woodland and heritage assets. In operation minor adverse potential adverse effects have been identified regarding the augmentation of the river Trent where increases in flows and changes in water quality in the catchment may have adverse impacts on river ecology. Further assessment is required on the quality of the generation and its ensures for course for course parts in a different set of the set of |
| water augmentation of the River Trent | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | Moderate beneficial effects have been identified relating to helping to maintain public health and well-being as well as promoting a sustainable economy. |

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|--------------------------------------|------------|---|---------------|---------------|-----|-----|---------------------------|-----|-------------------|--------------|------|------|-------|-----|-----|-----|-----------------------------|-----|-----|---------------|-----|------------------------------------|-----------|-----|-----|---|
| Option | | | Biodiversity. | flora & fauna | | | Population & human health | | Material assets & | resource use | | | Water | | | | Soil, geology & land use | | | Air & climate | | Archaeology & cultural heritage | Landscape | HRA | WFD | Commentary |
| | | 5 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 8.1 | | | |
| WIL02 Site E WTW | Adv erse | | | | | | | | | | | | | | | | | | | | | | | | | Major adverse effects relate to the proposed pipeline intersecting 50 m of Lockington Marshes SSSI and 175 m of Sutton Bonnington Spinney and Meadows LNR. Construction would have direct adverse effects on the site such as habitat loss and fragmentation; and indirect nuisance effects such as noise disturbance and dust emissions. Moderate adverse effects relate |
| expansion and transfer main | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | to reduction in ecosystem functions, disturbance to residential areas from construction works and increased GHG emissions as a result of the additional pumping and treatment. Moderate beneficial effects were identified relating to helping to maintain public health and well-being and promote a sustainable economy. |
| SHE05 | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | The proposed pipeline intersects a Scheduled Ancient Monument. The construction would have major adverse effects on the monument through the disturbance of archaeological remains. Moderate adverse effects relate to construction impacts on human health as well as Ercall and Larence's Hill LNR, Hencott Pool SSSI and five areas of Ancient Woodland within |
| Site M WTW Expansion | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | 1km (Alkmondpark Coppice, Ercall Wood, Limeklin Wood, Wenlocks Wood and Short Wood). Moderate beneficial effects were identified relating to delivering 10MI/d helping to maintain public health and well-being as well as promoting a sustainable economy. |
| SHE03 | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | One major adverse effect regarding biodiversity, flora and fauna rleating to indirect and direct adverse effects to SSSIs and Ancient Woodland (e.g. Wrekin and the Ercall SSSI). Moderate adverse effects regarding natural capital, construction impacts on human health, resource use, GHG emissions, landscape and visual amenity (due to construction in the |
| import to Shelton WRZ (WRZ wide) | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | Shropshire Hills AONB) and cultural heritage. Moderate beneficial effects were identified relating to delivering 18MI/d helping to maintain public health and well-being as well as promoting a sustainable economy. |
| SHE02 Potable water | Adv erse | | | | | | | | | | | | | | | | | | | | | | | | | No adverse effects are anticipated. Moderate beneficial effects were identified relating to delivering 13MI/d helping to maintain public health and well-being and promote a sustainable |
| import to Shelton WRZ (localised) | Benefici | | | | | | | | | | | | | | | | | | | | | | | | | economy. |

| | | | | | | | | | SE/ | A To | opiq | cs a | nd | Ob | ect | ive | s | | | | | | | | | |
|---|------------|-----|---------------|---------------|-----|-----|------------------------------|-----|-------------------|--------------|------|------|-------|-----|-----|-----|-----------------------------|-----|-----|---------------|-----|------------------------------------|-----------|-----|-----|--|
| Option | | | Biodiversity. | flora & fauna | | | Population & human health | | Material assets & | resource use | | | Water | | | | Soil, geology & land use | | | Air & climate | | Archaeology & cultural heritage | Landscape | HRA | WFD | Commentary |
| | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 8.1 | | | |
| WTW29 New WTW on the River Trent near Stafford, Staffordebico | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | The HRA concluded that works associated with the new WTW are considered likely to have a significant effect on the Cannock Chase SAC. As such, Stage 2 HRA is required to further assess this significant effect. Construction related effects may also impact SSSIs and other interest features. The setting of Shugborough Registered Park and Garden and Cannock Chase AONB will also be majorly affected with the construction of the pipeline due to permanent loss of foliage. Two moderate adverse effects relating to resource use and GHG emissions during construction. |
| Stanorusinie | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | I wo moderate beneficial effects have been identified relating to delivering 22.5MI/d helping to maintain public health and well-being as well as promoting a sustainable economy. |
| DAM12 New WTW on the River Severn near Ombersley with | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Major adverse effects towards the visual amenity of Shrawley Wood AONB and SSSI. Moderate adverse effects relating to the proposed abstraction being located in flood risk zone 3, GHG emissions during construction, temporary nuisance effects and affect access to archaeology and cultural heritage sites and the new WTW permanently altering the landscape character of the surrounding countryside. |
| raw water imports into the River Severn | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | Two moderate beneficial effects have been identified relating to delivering 30MI/d helping to maintain public health and well-being as well as promoting a sustainable economy. |
| VYR02 River Severn raw | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Major adverse effects relate resource use, energy use and GHG emissions associated with umping and chemicals for treatment of the additional supply. Major beneficial effects were identified relating to delivering 60MI/d helping to maintain public health and well-being and promote a sustainable. |
| Site U WTW | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | economy. |
| VYR01 River Severn raw water import to Site II and Site P | Adv erse | | | | | | | | | | | | | | | | | | | | | | | | | Major adverse effects relate resource use, energy use and GHG emissions associated with umping and chemicals for treatment of the additional supply. Moderate adverse effects relate to the proposed pipeline passing in close proximity to Croome Court Registered Park and Garden and also intersecting the Battle of Worcester Registered Battlefield. Construction would have minor adverse effects on the setting of the park. Other moderate effects relate to human health from the construction of the WTW and pipeline and other works required for the option. |
| WTWs | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | Major beneficial effects were identified relating to delivering 60MI/d helping to maintain public health and well-being and promote a sustainable economy. |

| | | | | | | | | | S | EA ' | For | ics | an | d 0 | bje | ctiv | es | | | | | | | | | | |
|-------------------------------|-------------------|-----|---------------------|---------|-----|-----|--------------|--------------|-----|-----------------------------------|-----|-----|-------|-----|-----|------|-----------------|-------------|------------|-----|---------------|-----|------------------------------------|-----------|-----|-----|--|
| Option | | | Biodiversity, flora | & fauna | | | Population & | numan nealun | | Material assets & resource use | | | Mator | | | | Soil, geology & | land use | | | Air & climate | | Archaeology & cultural heritage | Landscape | HRA | WFD | Commentary |
| | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 12 | 4.4 | 4.5 | 51 | 5.2 | 3. C | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 8.1 | | | |
| DAM01 Stanford Reservoir | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | | Minor adverse effects from construction have been identified relating to biodiversity, flora and fauna, population and human health, resource use, water, air and climate, archaeology and cultural heritage and landscape and visual. Minor beneficial effects include providing water storage and delivering 2.5 MI/d to help |
| capacity increase (Size A) | Beneficia | | | | | | | | | | | | | | | | | | | | | | | | | | maintain public health and well-being, a sustainable economy and improve resilience to climate change. |
| DAM02 Lower Shustoke | i Adverse | | | | | | | | | | | | | | | | | | | | | | | | | | Minor adverse effects have been identified relating to biodiversity, flora and fauna, population and human health, resource use, water, air and climate, archaeology and cultural heritage and landscape and visual. |
| capacity increase (Size A) | Benefici | | | | | | | | | | | | | | | | | | | | | | | | | | being, a sustainable economy and improve resilience to climate change. |
| DAM03 Whitacre Reservoir | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | | Moderate adverse effects on the River Blythe SSSI from construction impacts such as noise disturbance, dust emissions and contamination from site runoff. Minor beneficial effects from delivering 2.5 MI/d to help maintain public health and well- being a suctainable account and improve regiliance to climate change. |
| capacity increase (Size A) | Beneficia | | | | | | | | | | | | | | | | | | | | | | | | | | being, a sustainable economy and improve resilience to climate change. |
| DOR02 Site I WTW | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | | Three minor adverse effects have been identified relating to nuisance effects on Learn Valley LNR, recreational activities, resource use and GHG emissions. Two minor beneficial effects have been identified relating to delivering 2MI/d to help maintain while head wall being as well encurring a resilient curply for curpture to the second |
| enhancements | Benefici | | | | | | | | | | | | | | | | | | | | | | | | | | and economic activity. |
| DOR05 | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | | Minor adverse effects have been identified relating to nuisance effects on Draycote Meadows SSSI, disruption to recreational activities, the use of construction materials, an increase GHG emissions and disturbance to Draycote Meadows AONB. |
| enhancements | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | | maintain public health and well-being as well ensuring a resilient supply for customers and economic activity. |

Figure 6.4 – Supply-side Visual Evaluation Matrix - Strategic Grid (eastern and southern parts of the zone)

| | | | | | | | | | SE | ΑT | opi | CS a | and | Ob | jec | tive | s | | | | | | | | | |
|--|------------|-----|---------------------|---------|-----|-----|------------------------------|-----|-------------------|--------------|-----|------|-------|-----|-----|---------|-----------------------------|-----|-----|---------------|-----|------------------------------------|-----------|-----|-----|--|
| Option | | | Biodiversity. flora | & fauna | | | Population & human health | | Material assets & | resource use | | | Water | | | · · · · | Soil, geology & land use | | | Air & climate | | Archaeology & cultural heritage | Landscape | HRA | WFD | Commentary |
| | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 8.1 | | | |
| BHS01 Watery Lane BHs asset and water | Adv erse | | | | | | | | | | | | | | | | | | | | | | | | | Moderate adverse effects relate to the flows in the River Sowe linked to the recommissioning of the abstraction at Watery Lane. Reduction in flows may adversely impact ecological receptors. The WFD Assessment determined that there is a risk of WFD status deterioration in the River Sowe resulting in the need for further assessment. Wings beneficial effects uwas identified relations to advise a set of the basing to maintain the set of the set o |
| treatment enhancements | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | public health and well-being as well as promoting a sustainable economy. |
| BHS02 Waverly Road BHs asset and water | Adv erse | | | | | | | | | | | | | | | | | | | | | | | | | Moderate adverse effects relate to the flows in the River Sherbourne - source to conf R Sowe linked to the recommissioning of the abstraction at Waverley. The reduction in flows may adversely impact on the ecological receptors. The WFD Assessment determined that there is a risk of WFD status deterioration resulting in the need for further assessment. |
| treatment enhancements | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | Minor beneficial effects were identified relating to delivering 2MI/d helping to maintain public health and well-being as well as promoting a sustainable economy. |
| CRO06 River Soar to | Advers | | | | | | | | | | | | | | | | | | | | | | | | | Two moderate adverse effects have been identified relating to the increase in resource use and GHG emissions. Moderate beneficial effects were identified relating to delivering 17MI/d helping to maintain |
| support Site B WTW | Benefic | | | | | | | | | | | | | | | | | | | | | | | | | public health and well-being as well as promoting a sustainable economy. |
| RAW02 Raw water import | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Moderate adverse effects relate to nuisance effects on Swift Valley LNR, Newbold Quarry Park LNR, Ashlaw Cutting LNR and Linnell Road LNR. The proposed pipeline also borders 600 m of Draycote Meadows SSSI and would be subject to moderate adverse indirect construction effects due to the close proximity. Other moderate adverse effects include resource use during operation due to the potential additional treatment processes which may be required due to the program equal to the carbon water. |
| from CRT to Site C WTW | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | Moderate beneficial effects were identified relating to delivering 12.75MI/d helping to maintain public health and well-being and promote a sustainable economy. |
| BHS05 Broomleys BHs asset and water | Adv erse | | | | | | | | | | | | | | | | | | | | | | | | | Minor adverse effects relate to population and human health; resource use; air and climate; and landscape and visual amenity. Minor beneficial effects were identified relating to delivering 1.1MI/d helping to maintain |
| treatment enhancements | Benefici | | | | | | | | | | | | | | | | | | | | | | | | | public realth and well-being, promote a sustainable economy and provide resilience against the threats of climate change. |

| | | | | | | | | | | SE | A T | opi | CS (| anc | l Ob | ojec | tive | s | | | | | | | | | |
|---|------------|-----|---------------------|---------|-----|----|--------------|--------------|-----|-------------------|--------------|-----|------|-------|------|------|------|--------------------------|-----|-----|---------------|-----|------------------------------------|-----------|-----|-----|--|
| Option | | | Biodiversity. flora | & fauna | | | Population & | human health | | Material assets & | resource use | | | Water | | | | Soil, geology & land use | | | Air & climate | | Archaeology & cultural heritage | Landscape | HRA | WFD | Commentary |
| | | 1.1 | 1.2 | 1.3 | 1.4 | 51 | 3 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 1.1 | 8.1 | | | |
| WTW05 East Midlands raw water storage | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | | Major adverse effects relate to two SSSIs which are on the boundary of the quarry. Construction would be likely result in significant habitat loss. Major adverse effects also relate to the SSSI designation at the site with respect to its geological importance. Converting the site into a reservoir would eliminate the potential further study of the geological features of interest. Moderate adverse effects relate to reduction in ecosystem functions and disturbance to residential areas from construction works. |
| including new WTW | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | | Moderate beneficial effects were identified relating to delivering 45 MI/d helping to maintain public health and well-being and promote a sustainable economy. |
| WTW06 East Midlands raw water storage | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | | Major adverse effects relate to the proposed pipeline intersecting >1 km of Grace Dieu and High Sharpley SSSI; 150 m of Pasture and Asplin Woods SSSI; and 900 m of Ancient Woodland. Construction would result in direct adverse effects on these sites such as habitat loss/fragmentation and mortality of qualifying features. Moderate adverse effects relate to reduction in ecosystem functions, disturbance to residential areas from construction works and increased GHG emissions as a result of the additional pumping |
| including new WTW | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | | and treatment. Moderate beneficial effects were identified relating to delivering 45 MI/d helping to maintain public health and well-being and promote a sustainable economy. |
| DOR08 | Advers | | | | | | | | | | | | | | | | | | | | | | | | | | Five minor adverse effects relating to biodiversity, flora and fauna; population and human health; resource use; and GHG emissions. Minor beneficial effects were identified relating to delivering 3.6 MI/d helping to maintain |
| enhancements | Benefici | | | | | | | | | | | | | | | | | | | | | | | | | | public health and well-being and promote a sustainable economy. |
| WTW30 Site P WTW | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | | Moderate adverse effects relate to the proposed pipeline passing in close proximity to Croome Court Registered Park and Garden and also intersecting the Battle of Worcester Registered Battlefield. Construction would have minor adverse effects on the setting of the park. Other moderate effects relate to human health from the construction of the WTW and pipeline and increased GHG emissions as a result of the additional pumping and treatment (30 MI(d)). |
| expansion | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | | Moderate beneficial effects were identified relating to delivering 15MI/d helping to maintain public health and well-being and promote a sustainable economy. |

| | | | | | | | | | SE | A | орі | CS | and | l Ob | ojec | tive | es | | | | | | | | | |
|---|------------|-----|---------------------|---------|-----|-----|--------------|-----|-------------------|--------------|-----|-----|-------|------|------|------|-----------------|-----|-----|---------------|-----|------------------------------------|-----------|-----|-----|--|
| Option | | | Biodiversity, flora | & fauna | | | Population & | | Material assets & | resource use | | | Water | | | | Soil, geology & | | | Air & climate | | Archaeology & cultural heritage | Landscape | HRA | WFD | Commentary |
| | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 8.1 | | | |
| RAW08 Site C WTW output | Adv erse | | | | | | | | | | | | | | | | | | | | | | | | | Three major adverse effects have been identified relating the proposed pipeline intersecting the River Blythe SSSI, Coleshill and Bannery Pools SSSI and an area of Ancient Woodland which would result in habitat loss across 350 m of the sites. Construction of the pipeline would also have major adverse effects on Packington Hall, Spa Gardens (Royal Leamington Spa), Warwick Castle and two LNR in Leamington Spa, including Welches Meadow and Leam Valley. Moderate adverse effects relate to |
| increase using additional and supported abstractions from the River Avon | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | ecosystem services, resource use, water, and air and climate. This includes adverse effects that relate to the potential for localised increase in flows which may have an adverse impact on river ecology. Further assessment is required regarding WFD compliance. Two moderate beneficial effects have been identified relating to delivering 36MI/d helping to maintain public health and well-being as well as promoting a sustainable economy. |
| RAW09 Site C and Site U WTW output increase using additional and curpacted | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Major adverse effects relate to the proposed 21km pipeline to Finham STW intersecting the Coleshill and Bannerly Pools SSSI and the 36 km pipeline to Willes Meadow Reservoir intersecting the Learn Valley and Welches Meadow LNRs, which would result in habitat loss. It would also intersect Packington Hall, Spa Gardens (Royal Learnington Spa) and will have direct impacts on Warwick Castle resulting in an adverse effect on the setting of the area. Other major adverse effects relate to material assets and resource use. Moderate adverse effects relate to effects on the ecosystem services and natural capital, GHG emissions, water (a substantial localised increase in flows in the River Sowe which may have a negative impact on river ecology) and effects on the setting of the |
| supported abstractions from the River Avon | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | AONBs in the surrounding area. The WFD assessment also determined that there is a potential risk of deterioration between status class. Further assessment is therefore required. Moderate beneficial effects were identified relating to delivering 20 MI/d helping to maintain public health and well-being as well as promoting a sustainable economy. |
| BHS11 Haseley Spring source asset and | al Adverse | | | | | | | | | | | | | | | | | | | | | | | | | One moderate adverse effect relating to habit loss and fragmentation where the pipeline intersects Green Grove. Minor adverse effects been identified with regards to invasive species; population and human health; water; resource use; and GHG emissions. Three minor beneficial effects have been identified relating to delivering 2MI/d helping to maintain public health and well-being as well as promoting a sustainable economy, and |
| WTW enhancement | Benefici | | | | | | | | | | | | | | | | | | | | | | | | | resilience to climate change. |

| | | | | | | _ | | | SE | <u> </u> | opi | cs a | and | Ob | jec | tive | S | | | | | | _ | | | |
|---|--------------------|----|------------------------|------------|----|----|------------------|-----|-----------------------|------------------|-----|------|---------|----|-----|------|-----------------------------|-----|----|-------------------|----|---------------------------------|---------------|-----|-----|---|
| Option | | 1. | .2 Biodiversity, flora | .3 & fauna | .4 | 21 | 2.2 Population & | 0.3 | 3.1 Material assets & | 2.2 resource use | 11 | .2 | 3 Water | .4 | .5 | 5.1 | .2 Soil, geology & land use | 5.3 | 51 | 3.2 Air & climate | .3 | Archaeology & cultural heritage | 3.1 Landscape | HRA | WFD | Commentary |
| CRO05 Thornton Reservoir to support Site B WTW | Beneficial Adverse | | | | | | | | | | | | | 7 | | | | | | | | | | | | Two major adverse effects regarding Biodiversity, flora and fauna and Archaeology and Cultural Heritage (potential impacts to Bradgate Registered Park and Garden). Construction of the 10km pipeline from Thornston Reservoir to Cropston WTW would have adverse construction effects on some areas of Ancient Woodland (Lady Hay Wood, Sheet Hedges Wood) and SSSIs (Bradgate Park and Cropston Reservoir, Groby Pool Woods, Sheet Hedges Wood) as the pipeline directly intersects these sites. Six moderate adverse effects mainly relating to the potential for the abstraction from Thornton Reservoir to result in WFD deterioration risks for Rothley Brook in terms of modifications to its flow regime, water quality and associated disturbances to ecological receptors. Moderate adverse effects. Pipeline diversion would be required to avoid adverse effects to areas of ancient woodland, SSSIs, listed buildings and the registered park and garden. Moderate beneficial effects were identified relating to delivering 8 MI/d helping to maintain public health and well-being. Minor beneficial effects were associated with promoting a sustainable economy. The option will provide additional support to Cropston WTW for resilience during drought. |
| MIT01 Site O WTW to Site K WTW raw water transfer main | Beneficial Adverse | | | | | | | | | | | | | | | | | | | | | | | | | One major adverse effect was identified relating to potentially significant adverse affect on the qualifying features of the Wye Valley & Forest of Dean Bat Sites SAC, including habitat loss in two areas of Ancient Woodland areas due to the construction of pipeline. A further Stage 2 HRA is therefore required to investigate this further. Moderate adverse effects relating to effects of construction on ecosystem services and natural capital, including habitat loss/fragmentation, human health, resource use and an increase in GHG emissions were also identified. Three moderate beneficial effects were identified relating to delivering 15MI/d helping to maintain public health and well-being as well as promoting a sustainable economy and providing resilience to the effects of climate change. |
| DOR07 Site Q WTW enhancements | Beneficial Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Minor adverse effects regarding construction in proximity to Calke Park SSSI, Dimminsdale SSSI and two areas of Ancient Woodland. Minor adverse effects due to the use of construction materials, an increase in GHG emissions from additional pumping and disturbance on Melbourne Hall, Cake Abbey and Staunton Harold Hall Registered Parks and Gardens. In operation, the component would facilitate solutions but itself would not have an associated increase in deployable output, therefore negligible beneficial effects have been identified. |

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|--|------------|-----|---------------------|---------|-----|-----|--------------|-----|-------------------|--------------|-----|------|-------|-----|-----|------|-----------------------------|-----|-----|---------------|-----|------------------------------------|-----------|-----|-----|--|
| Option | | | Biodiversitv. flora | & fauna | | | Population & | | Material accete & | resource use | | | Water | | | | Soil, geology & land use | | | Air & climate | | Archaeology & cultural heritage | Landscape | HRA | WFD | Commentary |
| | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 1.1 | 8.1 | | | |
| DAM11 West area new raw water storage with Site U WTW | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Major adverse effects relate to adverse construction related effects to SSSI's including habitat loss, contamination from runoff and mortality of qualifying features. Major adverse effects relate to recreation through the disruption of public footpaths and access to open space. The reservoir will take up to 10 km2 of land resulting in the permanent loss of open space. The reservoir would also have a major adverse effect on land-use and flood risk by covering 10 km2 of land that provides natural flood attenuation. Moderate adverse effects relate to disturbance to residential areas, open space and places of interest. Moderate effects also pipelines passing in close proximity to Brandwood End Cemetery and |
| enhancement and deployment infrastructure upgrades | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | Packington Hall Registered Parks and Gardens. Major beneficial effects were identified relating to delivering 180MI/d helping to maintain public health and well-being and resilience against climate change. |
| RAW12 River Severn to Draycote mutual support solution - Size BC (Upper) | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | Major adverse effects have been identified relating to a potential for LSEs towards the Fens Pools SAC, due to the risk of spreading INNS and the pipeline intersecting Waseley Hills Country Park, Leam Valley LNR and Ancient Woodland. Construction would result in permanent habitat loss and direct adverse effects on the qualifying features of the sites. It would also intersect Warwick Castle, Mallory Court and Packington Hall Registered Parks and Gardens resulting in the loss of foliage and landscape features that contribute to the setting of the parks. Additionally, lowering of the reservoir water level and excavation and refilling of the existing core would have major adverse effects on these recreational activities. Major adverse effects also identified relating to significant resource use and GHG emissions. Moderate adverse effects relate to spreading/introducing INNS. Moderate adverse effects also include a loss of ecosystem services and natural capital provided by the habitats and disruption to local businesses (sailing club) and fishing club) |
| | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | due to the lowering of the reservoir water level . Moderate adverse effects relate to impacts of construction on human health. The WFD assessment concludes that it is unlikely that ecological status will deteriorate further, however, further assessment is necessary. Major beneficial effects were identified relating to delivering 78.5MI/d helping to maintain public health and well-being as well as promoting a sustainable economy. |

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|--|--------------------|----|----------------------|-----------|---|--------------|------------------------------|---|--|-----|-------|----|---------|-----|-----|-----|-------------------|----|---|-----------------|---|---------------|-------------------|-------------|-----|-----|---|
| Option | | 1 | 2 Biodiversity flora | 3 & fauna | 4 | Population & | human health human health | | Material assets & resource use | N - | -] - | | 3 Water | 4 | 5 | - | 2 Soil, geology & | 3 | - | 2 Air & climate | | Archaeology & | cultural heritage | 1 Landscape | HRA | WFD | Commentary |
| RAW15 River Severn to Draycote mutual support solution - Size EB (Mid) | Beneficial Adverse | 1. | - | | | | | | ń r | · · | i v | ŕ | 4 | 4, | 4. | 5. | <u>s</u> | j. | e | | ė | | | 8 | | | Major adverse effects have been identified relating to the pipeline intersecting Waseley Hills Country Park, Leam Valley LNR and Ancient Woodland. Construction would result in permanent habitat loss and direct adverse effects on the qualifying features of the sites. It would also intersect Warwick Castle, Mallory Court and Packington Hall Registered Parks and Gardens resulting in the loss of foliage and landscape features that contribute to the setting of the parks. Construction could result in major adverse effects on recreational activities. Major adverse effects relating to significant resource use and GHG emissions both during construction and operation. Moderate adverse effects relate to spreading/introducing terrestrial INNS (raw water transfer from the River Severn). The HRA concluded that there is potential for LSE on Fen Pools SAC due to this INNS risk. Moderate adverse effects due to loss of ecosystem services and natural capital provided by the habitats. Moderate adverse effects relating to impacts of construction on human health and disruption to local businesses and moderate adverse effects regarding the visual setting of the surrounding landscape. The WFD assessment concludes that it is unlikely that ecological status will deteriorate further due to the magnitude of the expansion, however, further assessment is necessary. Major beneficial effects were identified relating to delivering 59MI/d helping to maintain public health and well-being as well as promoting a sustainable economy. |
| RAW13 River Severn to Draycote mutual support solution with supported River Avon abstractions - Size CB (Mid) | Beneficial Adverse | | | | | | | | | | | | | | | | | | | | | | | | | | Major adverse effects have been identified relating to the pipeline intersecting Waseley Hills Country Park, Leam Valley LNR and Ancient Woodland. Construction would result in permanent habitat loss and direct adverse effects on the qualifying features of the sites. It would also intersect Warwick Castle, Mallory Court and Packington Hall Registered Parks and Gardens resulting in the loss of foliage and landscape features that contribute to the setting of the parks. Lowering of the reservoir level and excavation and refilling of the existing core would have major adverse effects on reservoir recreational activities. Major adverse effects also identified relating to significant resource use and GHG emissions. Moderate adverse effects relate to spreading/introducing terrestrial INNS due to groundworks over a very large scale and the raw water transfer from the River Severn poses a potential risk of spreading aquatic invasive non-native species. The HRA concluded that there is potential for LSE on Fen Pools SAC due to this risk. Moderate adverse effects also include a loss of ecosystem services and natural capital provided by the habitats and disruption to local businesses (sailing club and fishing club) due to the lowering of the reservoir water level. The WFD Assessment determined the potential for deterioration of waterbodies and that further assessment is required. Major beneficial effects were identified relating to delivering 79MI/d helping to maintain public health and well-being as well as promoting a sustainable economy. Moderate beneficial effects identified regarding resilience against the threats of climate change. |

| | | | | | | | | | SE | <u>A T</u> | opi | cs a | and | Ob | jec | <u>tive</u> | s | | | | | | | | | |
|--|------------|-----|---------------------|---------|-----|-----|------------------------------|-----|-------------------|--------------|-----|------|-------|-----|-----|-------------|-----------------------------|-----|-----|---------------|-----|------------------------------------|-----------|-----|-----|---|
| Option | | | Biodiversity. flora | & fauna | | | Population & human health | | Material assets & | resource use | | | Water | | | | Soil, geology & land use | | | Air & climate | | Archaeology & cultural heritage | Landscape | HRA | WFD | Commentary |
| | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 8.1 | | | |
| RAW16 River Severn to Draycote mutual support solution - Size FA (Lower) | Adv erse | | | | | | | | | | | | | | | | | | | | | | | | | Major adverse effects have been identified relating to the pipeline intersecting Waseley Hills Country Park, Leam Valley LNR and Ancient Woodland. Construction would result in permanent habitat loss and direct adverse effects on the qualifying features of the sites. It would also intersect Warwick Castle, Mallory Court and Packington Hall Registered Parks and Gardens resulting in the loss of foliage and landscape features that contribute to the setting of the parks. Significant resource use and GHG emissions. Moderate adverse effects relate to spreading/introducing terrestrial INNS due to groundworks over a very large scale. The raw water transfer from the River Severn poses a potential risk of spreading aquatic invasive non-native species. HRA concluded that there is potential for LSE on Fen Pools SAC due to this risk. Moderate adverse effects also include a loss of ecosystem services and natural capital provided by the habitats and disruption to the recreational activities (fishing and sailing clubs) associated with the reservoir. The WFD |
| Size i A (LUWEI) | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | assessment concludes that it is unlikely that ecological status will deteriorate further due to the magnitude of the expansion, however, further assessment is necessary. Moderate beneficial effects were identified relating to delivering 44.5MI/d helping to maintain public health and well-being as well as promoting a sustainable economy, contributing to the sustainable use of water and providing resilience against the threats of climate change. |
| RAW14 River Severn to Draycote mutual support solution with supported River Avon abstractions - Size | Adv erse | | | | | | | | | | | | | | | | | | | | | | | | | Major adverse effects have been identified relating to the pipeline intersecting Waseley Hills Country Park, Leam Valley LNR and Ancient Woodland. Construction would result in permanent habitat loss and direct adverse effects on the qualifying features of the sites. It would also intersect Warwick Castle, Mallory Court and Packington Hall Registered Parks and Gardens resulting in the loss of foliage and landscape features that contribute to the setting of the parks. Moderate adverse effects regarding INNS including those that relate to the raw water transfer from the River Severn. The HRA concluded that there is potential for LSE on Fen Pools SAC due to this risk. Major adverse effects regarding the significant resource use and GHG emissions. Moderate adverse effects also include a loss of ecosystem services and natural capital provided by the habitats and disruption to the recreational activities (fishing and sailing clubs) associated with the reservoir. The WFD Assessment determined potential for deterioration for one waterbody and uncertainty regarding another therefore further assessment is required. |
| DA (Lower) | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | Major beneficial effects were identified relating to delivering 64.5Ml/d helping to maintain public health and well-being as well as promoting a sustainable economy. Moderate beneficial effects identified regarding resilience against the threats of climate change. |

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|---|------------|-----|------------------|---------|---|-----|-------------|------------------------------|-----|-------------------|--------------|-----|------|-------|-----|-----|------|-----------------------------|-----|-----|---------------|-----|------------------------------------|-----------|-----|-----|---|
| Option | | | Diadharatha flam | & fauna | | | - - - | Population & human health | - | Material assets & | resource use | | | Water | | | | Soil, geology & land use | | | Air & climate | | Archaeology & cultural heritage | Landscape | HRA | WFD | Commentary |
| | | 1.1 | 1.2 | 13 | 2 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 1.1 | 8.1 | | | |
| RAW11 River Severn to Draycote mutual support solution with supported River Avon | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | | Major adverse effects have been identified relating to the pipeline intersecting Waseley Hills Country Park, Learn Valley LNR and Ancient Woodland. Construction would result in permanent habitat loss and direct adverse effects on the qualifying features of these sites. It would also intersect Warwick Castle, Mallory Court and Packington Hall Registered Parks and Gardens resulting in the loss of foliage and landscape features that contribute to the setting of the parks. Moderate adverse effects regarding INNS including those that relate to the raw water transfer from the River Severn. The HRA concluded that there is potential for LSE on Fen Pools SAC due to this risk. Major adverse effects regarding the significant resource use and GHG emissions. Moderate adverse effects also include a loss of eccsystem services and natural capital provided by the habitats; disruption to |
| abstractions - Size AA (Upper) | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | | local PROW; and restricted access to open space and recreational areas. The WFD Assessment determined that there is a risk of WFD status deterioration. Major beneficial effects were identified relating to delivering 84.5MI/d helping to maintain public health and well-being as well as promoting a sustainable economy. Moderate beneficial effects identified regarding resilience against the threats of climate change. |
| DAM07 | Adverse | | | | | | | | | | | | | | | | | | | | | | | | | | Major adverse effects have been identified relating to the pipeline intersecting Waseley Hills Country Park, Leam Valley LNR and Ancient Woodland. Construction would result in permanent habitat loss and direct adverse effects on the qualifying features of these sites. It would also intersect Warwick Castle, Mallory Court and Packington Hall Registered Parks and Gardens resulting in the loss of foliage and landscape features that contribute to the setting of the parks. Moderate adverse effects regarding INNS including those that |
| Draycote Reservoir capacity increase (Size A) with transfer main from Site C WTW to Coventry | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | | relate to the raw water transfer from the River Severn. The HRA concluded that there is potential for LSE on Fen Pools SAC due to this risk. Major adverse effects regarding the significant resource use and GHG emissions. Moderate adverse effects also include a loss of ecosystem services and natural capital provided by the habitats; disruption to local PROW; and restricted access to open space and recreational areas. The WFD Assessment determined that there is a risk of WFD status deterioration. Major beneficial effects were identified relating to delivering 9 MI/d helping to maintain public health and well-being as well as promoting a sustainable economy. Moderate beneficial effects identified regarding resilience against the threats of climate change. |
| CR004 Blackbrook Reservoir to | Adv erse | | | | | | | | | | | | | | | | | | | | | | | | | | Major adverse construction effects towards a number of SSSI located within 100m of the proposed pipeline. These include Blackwood Reservoir SSSI; One barrow Plantation SSSI; Beaconhill Haggingstone and Outwoods SSSI; Swithland Wood and the Brand SSSI and the Outwoods SSSIs. Construction in proximity to these areas would lead to fragmentation of these habitats. Moderate adverse effects on ecosystem services and natural capital associated with habitat loss/fragmentation, in addition to recreational resources through the disruption of public footpaths and access to open space during construction. This includes access to the Beacon Hill Country Park, Bradgate Country Park and Swithland Wood, which are located in proximity to the proposed pipeline. |
| Support Site D WTW | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | | Additionally, the proposed pipeline runs through the Longcliffe Golf Course and intersects the Wellbeck DSFC Sport Pitches. Moderate adverse effects are also anticipated on geology or overall land-use management during operation. Moderate beneficial effects were identified relating to delivering 12 Ml/d helping to maintain public health and well-being, promoting a sustainable economy and contributing to resilience against the threats of climate change. |

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|--|--------------------|-----|---------------------|---------|-----|-----|--------------|--------------|-----|-------------------|--------------|-----|------|-------|-----|-----|------|-----------------------------|-----|-----|---------------|-----|------------------------------------|-----------|-----|-----|--|---|
| Option | | | Biodiversity. flora | & fauna | | | Population & | human health | | Material assets & | resource use | | | Water | | | | Soil, geology & land use | | | Air & climate | | Archaeology & cultural heritage | Landscape | Ман | НКА | | Commentary |
| | | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 8.1 | | | | |
| CRO07 Blackbrook Reservoir and Thornton Reservoir to support Site B WTW | Beneficial Adverse | | | | | | | | | | | | | | | | | | | | | | | | | | Three Cultura the res Woodl of flow Moder (disrup space) Moder public change suppor | major adverse effects regarding Biodiversity, flora and fauna and Archaeology and al Heritage and Landscape and Visual Amenity. Construction of the pipelines from servoirs to the WTW could adversely affect a number of SSSIs and areas of Ancient and. Seven moderate adverse effects include those that relate to the modification regime, water quality and associated disturbances to ecological receptors. ate adverse effects also include population and human health in terms of recreation tion to disruption to public footpaths, recreational facilities and access to open b. ate beneficial effects were identified relating to delivering 17MI/d helping to maintain health and well-being and contributing to resilience against the threats of climate e. Minor beneficial effects have been identified as the option will provide additional t to Cropston WTW for resilience during drought. |
| WTW07 East Midlands existing raw water storage including | Adv erse | | | | | | | | | | | | | | | | | | | | | | | | | | Major a interse Woods 1km of increas Two m mainta | adverse effect may result with the construction of the pipeline which will directly sct Launde Big Wood SSSI and run in close proximity to Stoke and Bowd Lane s SSSI, Eye Brook Reservoir SSSI and Eye Brook Valley Woods SSSI (all within the scheme). Two moderate effects relating to ecosystem services, human health, sed resource use, GHG emissions and air quality. oderate beneficial effects were identified relating to delivering 18MI/d helping to in public health and well-being as well as promoting a sustainable economy. |
| new WTW and infrastructure | Beneficial | | | | | | | | | | | | | | | | | | | | | | | | | | | . , , , , , , , , , , , , , , , , , , , |

7 Programme Appraisal

7.1 Programme Appraisal and SEA Considerations

Advanced investment modelling techniques were used to derive an optimised investment programme to meet Severn Trent's future supply/demand challenges. Severn Trent's Water Infrastructure and Supply/Demand investment Model (WiSDM) was used to optimise its water resource requirements with other water investment requirements, such as supply resilience, asset maintenance and drinking water quality improvements. The costs considered by the model were capital costs (capex), operating costs (opex), carbon costs and certain environmental and social effects which were monetised according to methods set out in the Environment Agency's Benefits Assessment Guidance. The latter drew on the findings of the SEA of each option as the starting point of assessing the effects and translating these into monetary values.

WiSDM was used to test the long term, holistic investment decisions required to both maintain the performance of the water distribution network and improve the balance between future supply and demand. The WiSDM model took account of the costs and benefits of different levels of mains renewal, leakage reduction, demand management and metering alongside options to increase supply capability. The model facilitated the prediction of the future performance of water distribution assets, the investment needed to achieve different levels of performance, and the scale of investment required to ensure that there is a sufficient water supply to meet future demand.

The WiSDM model generated many 'least cost programmes' that could be used to solve different potential supply/demand scenarios. Complex scenario and uncertainty modelling was also used to test the sensitivity of certain investment decisions to supply and demand assumptions. The outputs of the approach were a number of potential long-term investment programmes which represent different ways of securing long term supply and demand objectives. The model was also used to test the costs and benefits of adopting different top-down policy decisions, such as in relation to leakage reduction, customer water metering and the pace at which Severn Trent adapts to Water Framework Directive requirements. Severn Trent also examined how water trading options could impact its long-term investment needs, and what level of investment would be required to achieve the strategic objectives of Water UK's Water Resources Long Term Planning Framework (2016). Appendix E of Severn Trent's Final WRMP explains the investment modelling and decision-making approach described above in more detail.

The modelling process produced three optimised programmes. The detailed assessments of each option as summarised in the visual evaluation comparison matrices (**Figures 6.1 to 6.4**) were used to examine the mix of options in each alternative programme, both alone and in combination with each other. Using this information, Severn Trent was able to review and compare the alternative programmes in terms of their environmental performance, but taking account of those environmental effects already included in the optimisation process through monetisation (for example, carbon emissions and some traffic-related effects on air quality), so as not to "double count" the effects. In this way, a commentary on the environmental performance of each alternative programme could be provided in a consistent manner.

These alternative programmes were then refined taking account of the environmental and social effects identified from the SEA findings, alongside consideration of a range of other factors, including government policy, regulatory requirements, customer preferences and risk considerations (e.g. water supply resilience). The SEA considerations led to several options being removed from the alternative programmes due to the relatively greater environmental effects of those options when compared to other combinations of options that could equally be developed into options to address the forecast supply deficit in the water resource zone. For example, a number of treated water transfers from the Strategic Grid WRZ to the Nottinghamshire WRZ were added to the WRZ programme to replace a new River Trent abstraction option in Nottinghamshire which the SEA identified had greater operational environmental effects (including WFD compliance risks) than the pipeline transfer options which make use of existing water resources within existing abstraction licence conditions. Several options where the HRA indicated the requirement for Appropriate Assessment were replaced with alternative options to reduce the risk of possible adverse effects on European sites.

For all WRZs, the overall beneficial effects of demand management options identified through the SEA added weight to the policy challenges from regulators to include a much greater level of leakage reduction than identified by the WiSDM optimisation. The SEA was used to identify the poorest performing water supply options from an environmental perspective that were then removed from WRZ programme in favour of greater leakage reduction over the 25 year planning period. Further consideration was given to whether additional environmental mitigation measures could be implemented to reduce identified adverse effects for those options included in the alternative programmes.

The revised programmes were re-run through the optimisation process to ensure that the supply deficits could still be addressed, but removing those options that had been determined by the SEA, HRA and WFD assessments to have the poorest environmental performance. These refinements of the alternative programmes culminated in the production of the Final WRMP19 Programme as set out in **Section 7.2.**

7.2 SEA of the Final WRMP19 Programme

Table 7.1 sets out the Final WRMP19 programme of options for balancing supply and demand over the next 25 years across the Severn Trent supply area.

The Final WRMP19 Programme includes a range of options, including the purchase a third-party disused asset and developing it into a raw water storage facility to help meet long term supply/demand needs. This is an innovative option to develop strategic raw water storage in a way that minimises environmental impact by being filled by abstraction from the River Soar during periods of high flows.

The following sections present the SEA findings of the Final WRMP19 Programme.

| Options Reference | Options Name | Supply- Demand Benefit (MI/d) |
|----------------------|--|-------------------------------------|
| | Demand Management | |
| WE003B | Enhanced Household Water Efficiency Audit | 0.3 |
| WE004B | Enhanced Social Housing Water Efficiency Audit | 0.2 |
| WE005 | Leakage Reduction (50% reduction) | 211.7 |
| WE006 | Increase in Metering | 29.9 |
| | | |
| | Water Supply Options | |
| OGS01 | Site J WTW expansion | 15 |
| NOT04 | Heathy Lea to North Nottinghamshire transfer solution | 25 |
| GRD18 | Peckforton Group BHs rehabilitation and treatment enhancement | 36 |
| BAM03 | Site R WTW to Grindleford pipeline capacity increase | 7.5 |
| CRO06 | River Soar to support Site B WTW | 17 |
| DOR08 | Site B WTW enhancements | 3.6 |
| DOR02 | Site I WTW enhancements | 2 |
| WIL05 | Site E WTW expansion and transfer main supported by raw water augmentation ⁸ of the River Trent | 35 |
| WTW05 | East Midlands raw water storage including new WTW | 45 |
| CRO05 | Thornton Reservoir to support Site B WTW | 8 |

Table 7.1 Final WRMP19 Programme

⁸ Following consultation on the Environmental Report for the Draft WRMP between February and April 2018 and responses concerning this solution, alternative approaches regarding raw water flow augmentation have been investigated. This solution has been re-designed for the Final WRMP and no longer involves the use of effluent from the Barnhurst sewage treatment works. The source of the raw water for the flow augmentation is currently being finalised.

| Options Reference | Options Name | Supply- Demand Benefit (MI/d) |
|----------------------|--|-------------------------------------|
| DAM07 | Draycote Reservoir capacity increase (Size A) with transfer main from Site C WTW to Coventry | 9 |
| MEL29 | River Trent support to Site Q WTW with WTW enhancements | 26 |
| BHS06 | Maximise deployment from Diddlebury WTW and Munslow BH | 0.9 |
| DOR05 | Site C WTW enhancements | 8 |
| LIT01 | Site F WTW expansion | 10 |
| DAM01 | Stanford Reservoir capacity increase (Size A) | 2.5 |
| NOT01 | Ambergate to Mid Nottinghamshire transfer solution | 30 |
| DAM03 | Whitacre Reservoir capacity increase (Sub-option A) | 2.5 |
| BHS07 | Ladyflatte BHs recommissioning | 2.7 |
| DAM02 | Lower Shustoke capacity increase (Size A) | 2.5 |
| NOT05 | Site E to South Nottinghamshire transfer solution | 30 |
| UNK07 | Improve Site L WTW outputs during low raw water periods | 7 |

The findings of the SEA of the Final WRMP19 Programme across Severn Trent's WRZs are summarised below. Assessment took account of the residual effects after the application of standard best practice construction and operational measures in accordance with national SEA guidance, together with any option-specific mitigation measures included in the outline design of the option.

Visual evaluation matrices have been prepared to summarise the detailed SEA of all the options included in the Final WRMP19 programme, presenting the significance of the identified adverse and beneficial effects (see **Figures 7.1 to 7.4** below). The colour coding in these matrices reflects the following significance of effect:

Red = Major adverse; Amber = Moderate adverse; Yellow = Minor adverse

Grey = Negligible adverse

Light Green = Minor beneficial; Green = Moderate beneficial; Dark Green = Major beneficial

| | | | | | | | | | | SEA To | pics a | nd Ob | jective | s | | | | | | | | |
|-----------------------------------|-----|---------------|---------------|-----|-----|------------------------------|-----|-----------------|----------------|--------|--------|-------|---------|-----|-----|-----------------------------|-----|-----|---------------|-----|------------------------------------|-----------|
| Solutions | | Biodiversity, | flora & fauna | | | Population & human health | | Material assets | & resource use | | | Water | | | | Soil, geology & land use | | | Air & climate | | Archaeology & cultural heritage | Landscape |
| | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 8.1 |
| WE003B - Enhanced Household Water | | | | | | | | | | | | | | | | | | | | | | |
| Efficiency Audit | | | | | | | | | | | | | | | | | | | | | | |
| WE004B - Enhanced Social Housing | | | | | | | | | | | | | | | | | | | | | | |
| Water Efficiency Audit | | | | | | | | | | | | | | | | | | | | | | |
| WE00E Lookage Deduction | | | | | | | | | | | | | | | | | | | | | | |
| WE005 - Leakage Reduction | | | | | | | | | | | | | | | | | | | | | | |
| WE006 Increased Matering | | | | | | | | | | | | | | | | | | | | | | |
| WEUUO - Increased Metering | | | | | | | | | | | | | | | | | | | | | | |

Figure 7.1 Final WRMP19 Programme Visual Evaluation Matrix – Demand Management Options

Key:

| Negligible adverse | Negligible beneficial |
|--------------------|-----------------------|
| Minor adverse | Minor beneficial |
| Moderate adverse | Moderate beneficial |
| Major adverse | Major beneficial |

As shown in **Figure 7.1** (above), the water demand management options (water efficiency audit, increased metering and leakage reduction options) included in the Final WRMP19 programme will be implemented across the Severn Trent supply area and will, in aggregate, bring major beneficial effects in respect of reducing demand for water and contributing to sustainable water management objectives. Other beneficial effects are generally assessed as being of negligible to minor significance. Given the scale of the demand management options to be delivered, some temporary moderate adverse effects are anticipated with respect to temporary street works to repair leaks and install external meters, as well as associated vehicle movements and traffic congestion; remaining adverse effects are assessed as being of negligible to minor significance.

Nottinghamshire

As shown in the visual evaluation matrix, three water transfer options (NOT01, NOT04 and NOT05) are included in the Final WRMP19 to bring treated water supplies into the zone from the Strategic Grid WRZ. Options NOT01 and NOT04 involve significant construction activities which are associated with adverse effects on biodiversity, flora and fauna; population and human health; archaeology and cultural heritage; and landscape and visual amenity. Both NOT01 and NOT04) are identified as having major adverse effects on biodiversity, flora and fauna as they involve pipelines that intersect areas of Ancient Woodland, Sites of Special Scientific Interest (SSSI) and Local Nature Reserves (LNRs). These options would also have minor to major adverse effects on archaeology and cultural heritage as well as landscape and visual amenity as they either intersect or are in close proximity to sensitive receptors.

In the case of NOT01, the option currently includes construction of a length of pipeline within the Teversal Pastures SSSI and LNR. Option NOT04 currently includes a pipeline route that intersects a number of areas of Ancient Woodland, two SSSIs (Peak District Moors SSSI and Ginny Spring SSSI) and a small part of the Peak District National Park.

Major adverse effects for landscape and visual amenity are identified for option NOT04 mainly due to the fact that the associated pipeline intersects the Peak District National Park. Option NOT04 also includes some construction in proximity to the South Pennine Moors SAC and the Peak District Moors SPA and within the Natural England Impact Risk Zone for these designations. The HRA identified that Likely Significant Effects (LSE) could arise from the release of suspended sediments and pollution incidents. HRA Stage 2 Appropriate Assessment was therefore completed which concluded that sufficient mitigation measures could be effectively implemented to avoid adverse effects to the integrity of these two European sites.

Although option NOT05 involves some significant works, this option is identified as having moderate adverse effects on biodiversity, flora and fauna, resource use and carbon emissions.

The proposed mitigation measures for these transfer schemes will need to be further developed as part of the next stage of the development of these options to minimise the identified major and moderate adverse effects, such as optimisation of pipeline routes to avoid areas of Ancient Woodland, SSSIs and Local Nature Reserves. Severn Trent will liaise closely with Natural England as the schemes are brought forward for detailed design to discuss and agree the specific development of the necessary mitigation measures to protect these designated environments and landscapes.

All the options in this WRZ have negligible residual adverse effects on the SEA water environmental objectives, subject to careful pipeline design and best practice construction methods to avoid any adverse effects. The abstraction of water in the Strategic Grid WRZ to provide the treated water transfers will take place from a variety of existing water sources and within existing abstraction licence conditions.

In terms of beneficial effects, the options would have moderate beneficial effects on population and human health by providing a significant volume of water for the Nottinghamshire WRZ, increasing the resilience of the water supply system for customers.

| | | | | | | | | | | SEA | Topics a | nd Obje | ctives | | | | | | | | | |
|--|-----|---------------|---------------|-----|-----|------------------------------|-----|----------|--------------------------|-----|----------|---------|--------|-----|-----|-----------------------------|-----|-----|---------------|-----|---------------------------------------|-----------|
| Solutions | | Biodiversity, | flora & fauna | | | Population & human health | | Material | assets & resource use | | | Water | | | | Soil, geology & land use | | | Air & climate | | Archaeology & cultural heritage | Landscape |
| | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 8.1 2 |
| NOT04 - Heathy Lea to North Nottinghamshire | | | | | | | | | | | | | | | | | | | | | | |
| transfer solution (25 Ml/d) | | | | | | | | | | | | | | | | | | | | | | |
| NOT01 - Heathy Lea to North Nottinghamshire | | | | | | | | | | | | | | | | | | | | | | |
| transfer solution (30 Ml/d) | | | | | | | | | | | | | | | | | | | | | | |
| GRD18 - Peckforton Group BHs rehabilitation | | | | | | | | | | | | | | | | | | | | | | |
| and treatment enhancement (36 MI/d) | | | | | | | | | | | | | | | | | | | | | | |
| UNK07 - Improve Site L WTW outputs during | | | | | | | | | | | | | | | | | | | | | | |
| low raw water periods (7 Ml/d) | | | | | | | | | | | | | | | | | | | | | | |
| NOT05 - Site E to South Nottinghamshire | | | | | | | | | | | | | | | | | | | | | | |
| transfer solution (30 MI/d) | | | | | | | | | | | | | | | | | | | | | | |

Figure 7.2 Final WRMP19 Programme Visual Evaluation Matrix – Nottinghamshire and North Staffordshire Water Resources Zones

Key:

| Negligible adverse | Negligible beneficial |
|--------------------|-----------------------|
| Minor adverse | Minor beneficial |
| Moderate adverse | Moderate beneficial |
| Major adverse | Major beneficial |
North Staffordshire

Two water treatment works (WTW) upgrade options (GRD18 and UNK07) are proposed for this WRZ to increase water treatment capacity to the zone. These options are relatively benign in terms of their potential for adverse effects across the SEA objectives. The options would result in minor to moderate adverse effects relating to resource use and moderate adverse effects relating to carbon emissions due to the infrastructure upgrades required to implement the options (borehole rehabilitation and treatment upgrades). GRD18 has the potential for minor adverse effects that relate to temporary pipeline construction in proximity to some sensitive features. The options would deliver minor (UNK07) to moderate (GRD18) beneficial effects relating to population and human health through the provision of a more resilient and reliable supply of water to customers in the zone.

Strategic Grid

The findings of the SEA for the Strategic Grid zone are presented in spatial groupings (northern, western, eastern and southern parts of the zone) in **Figures 7.3 and 7.4** to facilitate the understanding of potential cumulative, in combination effects of the options that might be constructed and/or operated in proximity to each other.

There are five options in the northern part of the Strategic Grid includes (MEL29, LIT01, BHS07, BAM03 and OGS01) that involve increasing water treatment and/or water transfer capacity, recommissioning boreholes and enabling support from an existing reservoir to augment water supplies in the Strategic Grid zone. These options give rise to adverse effects ranging from minor to moderate significance.

Options MEL29 and OGS01 have moderate adverse effects relating to resource use and carbon emissions.

Option OGS01 involves the release of water from Carsington Water reservoir to the River Dove but the effects of the release was assessed as being unlikely to prompt deterioration to ecology (currently at WFD 'poor' status) in the receiving River Dove water body. The stretch of the River Dove that would be subject to the augmentation is over-abstracted and likely to benefit from the flow release. An invasive non-native species risk assessment will need to be carried out as part of the detailed design of this option.

Options LIT01 and OGS01 have been identified as having potential moderate adverse effects on biodiversity, flora and fauna due to construction activities taking place in close proximity to some areas of Ancient Woodland, one SSSI (Ogston Reservoir SSSI) in the case of OSG01 and two SSSIs (Bullwell Wood and Sellers Wood) and a LNR (Bulwell Hall Park Meadow) in the case of LIT01. Construction mitigation measures will need to be developed as part of the detailed design of these options to ensure no damage to these features during construction.

It should be noted that option BAM04 was selected for the draft WRMP19, however it was excluded from the Final WRMP19 preferred programme and replaced with the smaller scale option BAM03. Option BAM03 has negligible adverse effects on all SEA objectives and a minor beneficial effect on sustainability and adaption to climate change. BAM03 is located within the Peak District National Park. However, construction activities are limited to cleaning and relining of existing pipes therefore adverse effects on the landscape and other designated features of the National Park are considered negligible.

With the exception of option BHS07, the WFD assessment concludes that individually these options are WFD compliant. The recommissioning of a borehole for option (BHS07) may lead to the risk of potential moderate adverse effects on river flow and river water quality in a river due to its hydrological connection to the aquifer from which water will be abstracted. This presents a risk of WFD status deterioration of the affected surface water body. Further assessment of the hydrogeological connectivity between the groundwater source and dependant ecosystems is required in order to confirm the magnitude of any potential impact during operation which is likely to arise during most years once the option has been commissioned. If hydrological connectivity is determined and there is a risk of reducing flows in the river mitigation can be put in place. Mitigation might include monitoring groundwater levels and river flow rates and reducing or stopping abstraction during times of low flow in the river. The scope of these investigations are likely to include:

- A detailed review of underlying geological strata, in order to establish the connectivity of the aquifer to the Ecclesbourne catchment
- Modelling of the drawdown level likely to be experienced under the 2.7 Ml/d abstraction scenario and associated impacts on flows within the Ecclesbourne Catchment.
- Determination of likely impacts on ecological receptors (review of available ecological data or expert opinion, in the absence of data) in light of the new evidence provided by the hydrogeological and hydrological investigations.

These investigations will indicate whether WFD deterioration for either or both of the waterbodies will occur under the 2.7MI/d abstraction scenario and whether any mitigation measures may be implemented to enable the option to be delivered. In the event that WFD deterioration risks cannot be mitigated, an alternative sustainable option will be provided in order to ensure that the final WRMP remains WFD compliant whilst still meeting the needs of customers.

All of these options provide moderate beneficial effects on human health and population associated with a reliable supply of water, with the exception of the option (BHS07) which would only deliver minor beneficial effects to supply reliability.

There are four options in the Strategic Grid (DAM02, DAM03, BHS06, and WIL05) that include reservoir expansion, increasing water transfer capacity, increasing water treatment capacity and a water conjunctive use scheme. Adverse effects identified for these options range from minor to major magnitude.

Option WIL05 has the potential for major adverse effects on biodiversity, flora and fauna due to the risk of habitat loss/fragmentation in one SSSI (Lockington Marshes) and one Local Nature Reserve (Sutton Bonnington Spinney & Meadows) as a result of the construction phase. Mitigation measures will need to be developed during the detailed design of this option to reduce the magnitude of these construction effects, particularly in relation to designated sites, such as through optimisation of pipeline routes to avoid areas of Ancient Woodland, SSSIs and Local Nature Reserves, n operation, there is the potential for increases in flows and changes in water guality in the River Trent upstream of the abstraction intake due to the flow augmentation option, although this is a provisional, precautionary assessment pending finalisation of the precise source of the flow augmentation. Changes in flows are considered to be negligible to minor depending on the location of flow augmentation in the catchment. It is noted that as the augmentation would only operate during periods of prolonged dry weather when there are low flows in the River Trent. There is the potential for beneficial effects to watercourses that would be affected by the augmentation in dry weather or drought conditions. The risk of introducing or spreading invasive non-native species (INNS) as a result of the flow augmentation depends on the exact source of raw water, but as part of the detailed design of this option a full INNS risk assessment will be carried out and any required mitigation measures developed in consultation with the Environment Agency.

Option DAM03, which is comprised of a minor capacity increase of the Whitacre Reservoir, has the potential for construction related adverse effects such as contamination from site runoff and pollution during construction, due to the reservoir being partially drawn down to allow works on the reservoir wave wall and weir crest. Mitigation measures will be implemented to minimise these risks, such as standard good practices to avoid pollution of the reservoir and downstream watercourses (including the River Blythe SSSI) and control of earthworks drainage. In addition, environmental permits will be obtained from the Environment Agency where appropriate which will impose measures to avoid adverse effects on the SSSI.

The adverse effects for options DAM02 and BHS06 are limited to no greater than minor effects.

These options provide minor beneficial effects while option WIL05 would deliver moderate beneficial effects on human health and well-being due to the greater volume of reliable water supplies provided.

| | SEA Topics and Objectives | | | | | | | | | | | | | | | | | | | | | |
|--|--------------------------------|-----|---------|------------------------------|-----|---------------------------------------|-----|-------|-----|-----|-----|----------------------------|-----|---------------|-----|-----|---------------------------------------|-----------|-----|-----|-----|-----|
| Solutions | Biodiversity. flora & fauna | | | Population & human health | | M aterial assets & resource use | | Water | | | | Soil, geology 8 and use | | Air & climate | | | Archaeology & cultural heritage | Landscape | | | | |
| | Ę | 1:2 | 6. L | 4. | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 8.1 |
| MEL29 - River Trent to Site Q WTW | | | | | | | | | | | | | | | | | | | | | | |
| MI/d) | | | | | | | | | | | | | | | | | | | | | | |
| LIT01 - Site F WTW expansion (10 | | | | | | | | | | | | | | | | | | | | | | |
| Ml/d) | | | | | | | | | | | | | | | | | | | | | | |
| BHS07 - Ladyflatte BHs recommissioning (2.7 Ml/d) | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| DAM02 - Lower Shustoke capacity increase (Size A) (2.5 Ml/d) | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| DAM03 - Whitacre Reservoir capacity | | | | | | | | | | | | | | | | | | | | | | |
| increase (Size A) (2.5 Ml/d) | | | | | | | | | | | | | | | | | | | | | | |
| BHS06 - Maximise deployment from | | | | | | | | | | | | | | | | | | | | | | |
| (0.9 MI/d) | | | | | | | | | | | | | | | | | | | | | | |
| WIL05 - Site E WTW expansion and transfer main supported by raw water | | | | | | | | | | | | | | | | | | | | | | |
| augmentation of the River Trent (35 MI/d) | | | | | | | | | | | | | | | | | | | | | | |
| BAM03 - Site R WTW to Grindleford | | | | | | | | | | | | | | | | | | | | | | |
| pipeline capacity increase (7.5 Ml/d) | | | | | | | | | | | | | | | | | | | | | | |
| OGS01 - Site J WTW expansion (15 | | | | | | | | | | | | | | | | | | | | | | |
| Ml/d) | | | | | | | | | | | | | | | | | | | | | | |

Figure 7.3 Final WRMP19 Programme Visual Evaluation Matrix Strategic Grid (northern and western parts of the zone)

Key:

| Negligible adverse | Negligible beneficial |
|--------------------|-----------------------|
| Minor adverse | Minor beneficial |
| Moderate adverse | Moderate beneficial |
| Major adverse | Major beneficial |

Three options in the eastern part of the Strategic Grid (DOR08, CRO06 and CRO05) relate to Site B Water Treatment Works (WTW), including upgrading the WTW and transferring more water to it for the treatment. A fourth option (WTW05) involves using a large disused third-party asset for raw water storage.

These options have the potential for minor to major adverse effects across the SEA objectives. The construction activities required to deliver options CRO05 and WTW05 have the potential for major adverse effects on biodiversity, flora and fauna. This is due to the potential loss/fragmentation of Ancient Woodland, and the risk of adverse effects on two SSSIs (Groby Pool Woods and Sheet Hedges Wood) in the case of CRO05. The construction phase of option (CRO05) would also have moderate adverse effects on the setting of a Registered Park and Garden. Additional mitigation measures or design modifications will need to be developed through the detailed design stage to avoid adverse effects on these designated features, such as optimisation of pipeline routes to avoid areas of Ancient Woodland, SSSIs and Local Nature Reserves.

Operationally, option CRO05 will require a new abstraction from the wider Rothley Brook Catchment. Rothley Brook experiences issues with elevated phosphate concentrations due to diffuse phosphate inputs and hence, alterations in flows may potentially lead to a further deterioration in WFD status (currently at moderate status). Appropriate mitigation measures will need to be developed as part of the detailed design of this option, for example, the provision of a compensation flow for Rothley Brook and the implementation of specific abstraction licence conditions. Further investigations will be undertaken to understand the impact of the abstraction on the flow regime within Rothley Brook and whether these will have adverse effects on its biology. The following surveys are proposed:

- Cross-sectional flow surveys along Rothley Brook to understand the likely changes in depth and velocity and whether these are likely to impact on ecological receptors.
- Ecological surveys to understand the macroinvertebrate and fish species assemblages and understand whether the species present may be sensitive to the likely depth and velocity changes inferred from the cross-sectional flow surveys.

Based on the results of these investigations, Severn Trent will either propose mitigation measures to ensure no deterioration or replace the option with an alternative which is known to be WFD compliant. Where adverse impacts are identified Severn Trent will endeavour to devise mitigation measures in consultation with Natural England, local Wildlife Trusts and other relevant stakeholders.

Option WTW05 is presented in the final programme to represent a group of similar options associated with the conversion of large, disused third-party guarries for the strategic storage of water abstracted from rivers during periods of high river flow. Several guarries have been investigated and the SEA has identified the need to carefully develop such options to avoid adverse effects on geological (and some biological) SSSIs that are associated with some disused quarries (as reflected in the precautionary major adverse rating for the related SEA objectives (Objectives 1.1 and 5.1 in Figure 7.4 below). These adverse effects correspond to the potential for significant habitat loss during construction. However, depending on the location of the proposed reservoir and river intake infrastructure, it would be possible to avoid habitat loss on the Croft Pasture SSSI. Further investigations will therefore be required to develop this innovative option in a sustainable manner so as to minimise adverse environmental effects, whilst maximising the potential beneficial effects associated with using large disused guarries for substantial and sustainable water supply benefit. Additional potential beneficial effects relate to recreational and biodiversity enhancement opportunities, including habitat creation (achieving net gain in biodiversity). This future use of disused quarries accords with the County Council core policies for the sustainable reclamation of former mineral workings. Where adverse impacts are identified, Severn Trent will endeavour to devise mitigation measures in consultation with Natural England, local Wildlife Trusts and other relevant stakeholders. Mitigation measures may include funding a study on the geological features of interest prior to the development of the option and providing habitat to link the new storage facility with the existing biological SSSIs adjacent to the asset.

Options DOR08 and CRO06 are generally characterised by negligible to minor adverse effects, with the exception of material assets and resource use and greenhouse gas emissions associated with construction and operational pumping and treatment of water. In terms of beneficial effects, CRO06 provides moderate beneficial effects for population and human health and minor beneficial effects relating to recreation and landscape.

Four options (DAM01, DAM07, DOR02 and DOR05) are located in the southern part of the Strategic Grid. Two options (DAM07 and DOR05) relate to increasing the deployable output of Site C WTW through upgrading the treatment capacity and increasing the Draycote reservoir capacity. The remaining two options (DAM01 and DOR02) relate to Stanford reservoir expansion and recovery of deployable output at the Site I WTW. The potential adverse effects identified for these options are mostly limited to minor effects, with the exception of moderate adverse effects relating to material assets and resource use and carbon emissions for options DAM07 and DOR05.

Option DOR02 is associated with only minor adverse effects.

Three options (DAM01, DAM07 and DOR05) may give rise to greater adverse effects relating to population and human health; water quality; landscape and visual amenity; and archaeology and cultural heritage. The adverse effects in respect of recreation and landscape objectives associated with the reservoir options (DAM01 and DAM07) are of minor magnitude only due to the small scale of the proposed expansion (6-10% increase in storage capacity).

Option DOR02 is associated with only minor adverse effects. Three options (DAM01, DAM07 and DOR05) may give rise to greater adverse effects relating to population and human health; water quality; landscape and visual amenity; and archaeology and cultural heritage. The adverse effects in respect of recreation and landscape objectives associated with the reservoir options (DAM01 and DAM07) are of minor magnitude only due to the small scale of the proposed expansion (6-10% increase in storage capacity).

Operationally, option DAM07 will require a minor raising of the existing reservoir level, The WFD assessment concluded that although it is unlikely that macrophyte and phytobenthos status will deteriorate, macrophytes could be impacted by the increase in water levels. Further assessment would be required to confirm this, which would include a study of the existing macrophyte population, assessment of the sensitivity of the macrophytes to changes in water levels and consultation with the Environment Agency regarding the mitigation measures associated with the heavily modified water body.

Option DAM01 (increase the capacity of Stanford Reservoir) has the potential for a risk of contamination from site runoff and pollution during construction, due to the reservoir being partially drawn down to allow works to the existing reservoir embankments. Where potential adverse effects are identified, mitigation measures including standard good practices to avoid pollution of the reservoir and watercourses and control of earthworks drainage will be implemented

The reservoir expansion options provide a greater range of beneficial effects relative to some of the other options as the additional water storage they provide will bolster resilience drought events which will become more prevalent due to climate change. In addition, as with option WTW05, they offer opportunities for habitat creation and careful landscape design to support biodiversity gain and provide additional recreational amenity.

| | SEA Topics and Objectives | | | | | | | | | | | | | | | | | | | | | |
|---|--------------------------------|-----|-----|---------------------------------|-----|---|-----|-------|-----|-----|-----------------------------|-----|-----|---------------|-----|-----|---------------------------------------|-----------|-----|-----|-----|-----|
| Solutions | Biodiversity, flora & fauna | | | Population & human health | | Material assets & resource use | | Water | | | Soil, geology & land use | | | Air & climate | | | Archaeology & cultural heritage | Landscape | | | | |
| | 1.1 | 1 2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 7.1 | 8.1 |
| DOR08 - Site B WTW enhancements (3.6 MI/d) | | | | | | | | | | | | | | | | | | | | | | |
| CRO06 - River Soar to support Site B | | | | | | | | | | | | | | | | | | | | | | |
| CRO05 - Thornton Reservoir to support B WTW (8 Ml/d) | | | | | | | | | | | | | | | | | | | | | | |
| WTW05 - East Midlands raw water storage including new WTW (45 Ml/d) | | | | | | | | | | | | | | | | | | | | | | |
| DAM01 - Stanford Reservoir capacity increase (Size A) (2.5 Ml/d) | | | | | | | | | | | | | | | | | | | | | | |
| DAM07 - Draycote Reservoir capacity increase (Size A) with transfer main | | | | | | | | | | | | | | | | | | | | | | |
| from Site C WTW to Coventry (9 Ml/d) DOR02 - Site I WTW enhancements (2 Ml/d) | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| DOR05 - Site C WTW enhancements (8 MI/d) | | | | | | | | | | | | | | | | | | | | | | |

Figure 7.4 Final WRMP19 Programme Visual Evaluation Matrix Strategic Grid (eastern and southern parts of the zone)

Key:

| Negligible adverse | Negligible beneficial |
|--------------------|-----------------------|
| Minor adverse | Minor beneficial |
| Moderate adverse | Moderate beneficial |
| Major adverse | Major beneficial |

Mitigation measures

As discussed above, further mitigation measures will be necessary to address the risks of major adverse effects identified for biodiversity, flora and fauna; archaeology and cultural heritage; and landscape and visual amenity. The majority of these adverse effects are associated with the construction of new pipelines which have currently only been designed at an outline level. As detailed design of these pipeline proceeds, optimisation of the pipeline routes will take place to, wherever feasible, avoid designated sites and features to reduce the magnitude of environmental effects. Similarly, construction activities associated with other options will need to be carefully planned, with detailed mitigation measures to address the environmental risks identified by the SEA. Design and mitigation measures will be carefully considered as part of the further investigations of the third-party asset option as highlighted earlier.

7.3 Specific Stakeholder Environmental Considerations

In preparing the Final WRMP19, Severn Trent took into consideration the findings of the SEA and also specific stakeholder concerns that were made as part of the consultation on the draft SEA Environmental Report. The key considerations are summarised below.

Landscape-scale effects

The SEA objective concerning landscape and visual amenity focusses on potential adverse effects on landscape designations. It is acknowledged that Ancient Woodland is important due to its contribution towards landscape quality. Therefore, the presence of Ancient Woodland influences the sensitivity of the designated landscapes, but the potential adverse effects on Ancient Woodland have been considered within the Biodiversity objective topic.

Options BAM03 and NOT01: Impact on the Peak District National Park

The SEA identified potential landscape and visual amenity effects of these options due to construction works and access to existing assets within the Peak District National Park. Further mitigation measures will be developed to minimise adverse effects as part of the further development of these options, noting that Option BAM03 has a reduced scale of construction activity compared to Option BAM04 included in the draft WRMP19. The notional route of the pipeline within option NOT01 passes through part of the Peak District National Park, the Teversal Pastures Area of Outstanding Natural Beauty (AONB) with potential for moderate adverse effects. These effects would be temporary and can mitigated through best practice construction techniques, for example, pipeline routing optimisation, appropriate selection of construction method and the screening and control of site runoff. Prior to the implementation of these options we will engage with appropriate stakeholders to gain greater understanding of the specific sites that may be affected. Where appropriate we will also consult with other water companies to identify any potential cumulative effects on designated landscapes and develop Protected Landscape Officers.

Effects on Local Nature Reserves

Local designated sites such as Local Nature Reserves (LNRs) are not explicitly included within the scope of SEA methodology as the SEA is a strategic level assessment. However, a total of five LNRs were identified which have been taken into consideration in assessing the severity of the adverse residual effects towards the SEA objective of biodiversity, flora and fauna to four options in our preferred programme (NOT01, NOT05, WIL05, LIT01). These LNRs are:

- Teversal/Peasley Network LNR
- Bulwell Hall Park Meadows LNR
- Sutton Bonnington Spinney & Meadows LNR
- Bulwell Hall Park Meadows LNR)

These LNRs sites will also be considered further at the project-level environmental assessment during the implementation phase of these options, including thorough consultation with the relevant regulatory and local authorities and interested stakeholders.

Sites of Special Scientific Interest (SSSIs)

Assessment of the implementation phase of several options in our preferred WRMP (NOT01, NOT04,

LIT01, WIL05, DAM03, CRO05) has identified potential adverse effects on a total of 11 SSSIs. Given these findings, further project-level environmental assessments will be required inform the detailed

design and selection of mitigation measures, for example optimisation of the pipeline routes to ameliorate adverse effects. At this stage of a strategic assessment, it is not feasible or representative to calculate the total area of SSSI that may be affected as this will require site-specific investigations, and potentially field surveys, in dialogue with Natural England and site managers. As the option development phase progresses through to the detailed design stage, discussions will be held with Natural England, site managers and other interested stakeholders to agree appropriate mitigation measures following the more detailed environmental assessment.

Biodiversity

Promoting biodiversity, particularly in the aquatic ecosystem, is one of the cornerstones of Severn Trent's business objectives and as the plan is implemented, the company will seek to identify opportunities for achieving net biodiversity gain (see **Section 7.6**). These opportunities will likely revolve around the creation of new habitat associated with reservoir and asset storage options, but other opportunities will also be sought to support net biodiversity gain where appropriate. Option WTW05 in particular will be reviewed to account for opportunities of bankside habitat creation.

The importance of preserving the biodiversity in existing reservoirs is recognised in the SEA assessments of reservoir options in the Final WRMP19, and some risks of potential adverse impacts on ecology, as well as loss of some habitat, have been identified. In particular, further investigations will be required at Carsington Water reservoir to fully assess the risks to flora with increased use of the stored water. Where adverse effects are identified, Severn Trent will work to develop appropriate mitigation measures in consultation with Natural England, local Wildlife Trusts and other relevant stakeholders.

7.4 Summary of HRA and WFD Assessment Findings

HRA Findings

With one exception, the HRA screening assessment concluded that the supply-side options included in the preferred programme would have no likely significant effects on any European site. The screening assessment could not rule out likely significant effects from implementation of the NOT04 option (New Strategic Transfer Capacity from Strategic Grid to Sunnyside (option 305)), and consequently an Appropriate Assessment was carried out of this option. The Appropriate Assessment concluded that implementation of option NOT04 would not have any adverse effects on the integrity of any European site.

None of the Final WRMP19 options were shown to have in-combination effects on any European site with any other options included in final plan, or with any other plans or projects. The HRA concluded that the Final WRMP will have no adverse effects on any European site, either alone or in combination with any other plans or projects.

Full details are provided in the HRA Report accompanying the Final WRMP19.

WFD Assessment Findings

The vast majority of the options included in Severn Trent's final WRMP19 preferred programme have demonstrated compliance with WFD objectives and statutory requirements. There are two proposed options where further investigations are required to confirm WFD compliance: the Ladyflatte groundwater abstraction option and the Thornton Reservoir abstraction option. These investigations will be carried out, and the findings discussed with the Environment Agency, before any applications for abstraction licences or environmental permits are sought for these options. Should the investigations determine that WFD compliance cannot be secured, even after development of mitigation measures, there are sufficient WFD compliant alternative options available to address the forecast supply deficit.

The provisional assessment of the WIL05 option flow augmentation component indicates no WFD compliance risks are likely from the options under consideration once mitigation measures have been considered (if necessary). The flow augmentation will be subject to environmental permitting which will include any necessary conditions to ensure WFD compliance. This provisional assessment will need to be confirmed once the source of the flow augmentation has been finalised.

Cumulative effects of several options relying on flow releases from Carsington Water reservoir requires further investigation in relation to the effects on marginal vegetation from increased water level drawdown during prolonged dry weather. Should the investigations determine that WFD compliance cannot be secured, even after development of mitigation measures, there are sufficient WFD compliant alternative options available to address the forecast supply deficit.

Potential risks of cumulative adverse effects between other water companies draft or revised draft WRMP19s (as available at February 2019) were investigated and no such impacts were identified. No cumulative effects with any other plans or projects were identified.

Full details are provided in the WFD Assessment Report accompanying the Final WRMP19.

7.5 Role of SEA in Informing Development of the WRMP19

The SEA findings, along with the findings of the HRA and WFD assessments, have been used to help inform the development of the WRMP19 from the very outset. As already described in Section 5.1, initially, the 'Unconstrained' list of options were screened using statutory, regulatory and legal constraints (including environmental and planning risks, taking the principles of SEA into consideration at this very early stage of the planning process).

A high-level SEA (and HRA and WFD) review was subsequently applied to the resulting Constrained list of potential options. These assessments helped to inform the development of a Feasible List of options by screening out options where SEA (HRA or WFD) assessment identified significant environmental effects that mitigation was unlikely to be able to reduce to an acceptable level. The screening identified that several of the unconstrained options, including some reservoir raising options, water transfer options and some groundwater abstraction options would have a wide range of major adverse environmental effects as identified by the environmental and planning risks determined from the high level SEA, HRA and WFD considerations. These options were therefore screened out. Further information on the specific options screened out is provided in Appendix D of the Final WRMP19. The Feasible List of options was then subject to detailed assessment using the SEA methodology described in Section 4 of this report.

The findings of the SEA of the Feasible List options were initially used (alongside the HRA and WFD assessments) to evaluate the environmental and social performance of a range of alternative programmes, as described in Section 7.1. The likely scale of adverse and beneficial environmental and social effects for each option was considered, both on its own and cumulatively with the other options included in each programme. The SEA review of these initial programmes indicated that some programmes performed less well against the SEA objectives than other programmes depending on the mix of options included in the programme. A number of the programmes would cumulatively lead to some major adverse effects for multiple SEA objectives due to the combination of options included in the programme. Where this was the case, the SEA was used to remove certain options from these programmes which were shown to perform relatively poorly against the SEA objectives compared to other alternative options available from the Feasible List. The following options were therefore manually excluded post WiSDM from the next iteration of the programme appraisal process:

- reservoir options 31D, 122B, 123B and 190
- transfer options 120 A-D, 44, 45, 71, 79, 81, 88, 108, 110, 111, 112, 128, 138, 144A, 152 and 187B)
- river augmentation option 25

The potential effects in combination with any other relevant projects, plans or programmes (for example, any planned major infrastructure schemes that may be constructed and/or operated at the same time and affecting the same environment and/or communities) were also assessed. The SEA appraisal of each alternative programme also included consideration of the potential for any regulatory compliance risks associated with the Habitats Regulations and the WFD, as well as other statutory obligations (including effects on SSSIs, National Parks, AONBs and heritage features).

These assessments, together with the consultation responses to the Draft WRMP19, helped to determine the preferred programme for the Final WRMP19. The decision to include a greater proportion of demand management options in the Final WRMP19 preferred programme was influenced by the mostly negligible adverse or minor beneficial effects expected with this type of option.

7.6 Delivering on National Environmental Policy Objectives

Net environmental gain has been included as a policy principle in the Government's 25 year plan to improve the environment (published in January 2018). References to achieving net gains across the three overarching objectives for sustainable development (economic, social and environmental), along with achieving net gain in biodiversity, are also set out in the updated National Planning Policy

Framework (NPPF) published in July 2018. The National Infrastructure Commission (NIC) report on water infrastructure (published in April 2018) also emphasises the economic and social benefits of improving water supply resilience.

The SEA has incorporated these key policy principles within the various topic area objectives against which each option and the Final WRMP19 as a whole has been assessed, ensuring that these national planning objectives have been considered in developing the Final WRMP19.

Severn Trent is committed to delivering against the principles of net gain in biodiversity in delivering the options included in Final WRMP19, working in dialogue with regulators, planners and stakeholders as the options are progressed to the detailed design stage and any required environmental mitigation measures are developed.

At the WRMP19 level as a whole, Severn Trent will continue to embed the principles of achieving net gain across the three overarching objectives for sustainable development (economic, social and environmental) as the plan is delivered.

The SEA has had regard to Severn Trent's statutory duties under the Water Industry Act 1991, Wildlife and Countryside Act 1981 and Countryside and Rights of Way Act 2000 to further the conservation and enhancement of SSSIs, along with the Water Industry Strategic Environmental Requirements (WISER) for delivery of these obligations.

8 Cumulative Effects of the Final WRMP19 Programme

8.1.1 Demand Management Options

Cumulative beneficial effects have been identified for all demand management options in the Final WRMP19. In-combination implementation of these options will increase the overall demand savings, thereby contributing to sustainable abstraction. The cumulative benefits will help reduce stress on the water environment and the water settings of heritage and landscape features, as well as reducing energy use for water pumping and treatment.

8.1.2 Water Supply Options

Potential cumulative effects between the water supply options in the Final WRMP19 Programme were identified using GIS data to assess overlapping locations of options, using the programme delivery timescales to identify any concurrent construction activities (**Figure 8.1**), and taking account of the SEA option assessment information on those options affecting the same water bodies. The matrix in **Figure 8.2** illustrates the potential for construction and/or operational cumulative effects between water supply options. The following sub-sections present the findings of the cumulative effects assessments for water supply options in the Final WRMP19 Programme.

| Solutions | Components | Start Date | Delivery Date | 2020-2030 | 2031-2040 |
|-----------|------------|------------|---------------|-----------|-----------|
| MEL29 | 61B &99G | 2020 | 2025 | | |
| GRD18 | 200 | 2021 | 2026 | | |
| CRO06 | 54 | 2021 | 2031 | | |
| WTW05 | 31C | 2021 | 2031 | | |
| NOT04 | 305 | 2022 | 2027 | | |
| WIL05 | 7A&14B | 2022 | 2027 | | |
| DAM07 | 122A&310 | 2022 | 2027 | | |
| OGS01 | 95B | 2023 | 2028 | | |
| BAM03 | 312 | 2023 | 2028 | | |
| DOR08 | 99D | 2023 | 2028 | | |
| CRO05 | 135 | 2023 | 2028 | | |
| BHS06 | 191 | 2025 | 2030 | | |
| DOR05 | 99E | 2025 | 2030 | | |
| LIT01 | 32 | 2025 | 2030 | | |
| DOR02 | 99B | 2026 | 2031 | | |
| DAM01 | 84A | 2026 | 2031 | | |
| NOT01 | 304 | 2026 | 2031 | | |
| DAM03 | 84C | 2026 | 2031 | | |
| BHS07 | 198 | 2026 | 2031 | | |
| DAM02 | 84B | 2026 | 2031 | | |
| NOT05 | 306 | 2026 | 2031 | | |
| UNK07 | 195 | 2030 | 2035 | | |

| Figure | 8 1 | Phasing | of the | Ontions | in the | Final | WRMP19 | Programme |
|--------|-----|----------|--------|---------|--------|-------|--------|--------------|
| Iguic | 0.1 | i naoniy | | options | in the | i mai | | / i rogramme |

| Legend | | | | | | | | | |
|--------|------------------------|--|--|--|--|--|--|--|--|
| | No | | | | | | | | |
| | construction/operation | | | | | | | | |
| | Implementation | | | | | | | | |
| | Operation | | | | | | | | |





8.1.3 Draycote Water Options

The Site C WTW Enhancements (DOR05) solution and the Draycote Reservoir capacity increase (Size A) with transfer main from Site C WTW to Coventry (DAM07) solution have been identified as having the potential for cumulative effects on Draycote SSSI. Upgrades to the WTW only involve minor works confined to the actual site boundary. The reservoir expansion requires the raising of the existing overflow weir and the bridge in addition to modifications to assets around the dam. The cumulative construction effects (noise disturbance and dust emissions) would not significantly increase the minor adverse effects posed by the options individually. Best practice construction techniques and the implementation of specific additional mitigation measures in dialogue with Natural England (such as noise abatement barriers and dust suppression measures) would minimise adverse effects on the SSSI during construction.

8.1.4 Shustoke and Whitacre Reservoir Expansion Options

The Lower Shustoke capacity increase (DAM02) and Whitacre Reservoir capacity increase (DAM03) options have been identified as having potential cumulative adverse effects on nearby environmental receptors. Construction activities required for option (DAM03) were identified as having the potential for moderate adverse effects on the River Blythe SSSI due to the risk of nuisance effects such as noise disturbance and dust emissions, for which additional specific mitigation measures will need to be developed as part of the detailed design of the option in dialogue with Natural England. However, construction activities involved for the option (DAM02) would be over one kilometre away and unlikely to have cumulative effects with the option (DAM03) on the SSSI.

8.1.5 Carsington Water

The simultaneous operation of three options (WIL05, LIT01 and OGS01) has the potential for cumulative adverse effects on Carsington Water. All three options will involve releasing more water from Carsington Water during their operation compared to the current situation. The cumulative assessment concluded that there is a risk of adverse effects on the Carsington Water reservoir WFD heavily modified water body due to the cumulative releases from the reservoir in periods of dry weather leading to lower water levels in the reservoir than historically. It should be noted that concurrent release for all three options would be rare and only temporary in nature. The releases will not be made on a continuous basis throughout the year, and will only be required in periods of prolonged dry weather. The total volume of water released will remain within exiting abstraction licence limits for Carsington Water.

Although lower water levels in the reservoir could lead to a risk of impacting on aquatic plants, it is considered that such effects can be mitigated to minimise the magnitude of any adverse effects to a minor magnitude. Further investigations will be carried out as part of the detailed design of the schemes

that may affect water levels in Carsington Water, including modelling to assess the change in reservoir levels, surveys of the aquatic plants relative to the revised water level pattern, and consideration of the mitigation measures to protect adverse effects on aquatic plants. Mitigation measures could include the creation of refuge areas within the reservoir that will continue to hold water when the water levels fall below a pre-determined level and the use of floating islands or rafts. Severn Trent will discuss the findings of the further investigations with the Environment Agency and agree any necessary mitigation measures prior to implementation of the options. Should these investigations indicate that adverse effects cannot be avoided, Severn Trent will review the alternative options available to reduce the scale of river flow support from Carsington Water while still addressing the forecast supply deficit in the Strategic Grid zone.

The HRA concluded that there would be no in-combination likely significant effects on any European site from the concurrent construction and/or operation of these options.

8.1.6 Trent from Dove to Derwent

The simultaneous operation of options WTW05, WIL05 and MEL29 has the potential for cumulative adverse effects on the River Trent from Dove to Derwent. Abstraction for option WTW05 will only take place at high flows in accordance with an abstraction licence hands-off flow condition to ensure no adverse effects on the River Soar or downstream River Trent. Abstraction from the River Trent for option WIL05 will be supported by raw water augmentation. Abstraction from the River Trent for option MEL29 will be subject to a hands off flow condition to protect the downstream River Trent. Given these operational measures, the cumulative assessment concluded that there would be a negligible risk of adverse impact on the flow regime and ecology of the River Trent from Dove to Derwent.

8.1.7 River Derwent from Amber to Bottle Brook

Options WIL05, LIT01 and OGS01 expand the Derwent Valley System conjunctive use scheme. Incombination, these options optimise the use of existing abstraction licences, taking water from the River Derwent at Ambergate when flows are high for storage in Carsington Water reservoir for subsequent release in dry weather conditions to support abstractions from the River Derwent and the River Dove so as to protect the river environment at times of low flow. The cumulative effects of these additional reservoir releases will be the consequent need to abstract more water from the Derwent at Ambergate at times of high flows to replenish the storage in Carsington Water. Option NOT05 (treated water transfer to the Nottinghamshire water resource zone) will also partly be enabled through a small increase in abstraction from the River Derwent at Ambergate. These five options will maximise the use of the existing abstraction licence limit at Ambergate and will be subject to the existing abstraction licence hands-off flow conditions to protect the River Derwent from Amber to Bottle Brook.

It should also be noted that options NOT01, NOT04 and BAM03 involve the transfer of treated water produced within the Strategic Grid Water Resource Zone which covers a large part of the Severn Trent region and is not limited to water produced from the River Derwent, and therefore no material additional cumulative effects will arise on the River Derwent from Amber to Bottle Brook due to the concurrent operation of these three options.

The cumulative assessment of the effects of the concurrent additional abstraction from the River Derwent at Ambergate to replenish storage in Carsington Water concluded that there will be no greater than minor adverse effects on the River Derwent from Amber to Bottle Brook. There may be some minor adverse effects from the changes to the flow regime, but these are not considered to be of a magnitude that would lead to any WFD deterioration of this water body. The increased releases from Carsington Water to the River Derwent at Ambergate as a result of concurrent operation of these options at times of low flow conditions will also not lead to any WFD deterioration of the water body.

8.2 Cumulative Effects of the Final WRMP19 with Relevant Plans, Programmes and Projects

In-combination effects of the WRMP with other relevant plans, programmes and projects have been considered. These include the following:

Severn Trent's Drought Plan

- Neighbouring water companies' 2019 WRMPs and Drought Plans
- Environment Agency Drought Plans
- Canal & River Trust Management Plans
- Relevant Local Development Frameworks
- Relevant National Policy Statements and National/Regional Infrastructure Plans
- Relevant Major projects

8.2.1 Severn Trent's Drought Plan

Severn Trent is currently in the process of updating its Drought Plan. The current Drought Plan was published in 2013, however, Severn Trent published an updated Draft Drought Plan for consultation in May 2018. The Drought Plan identifies demand side and supply side measures which could be employed in the event of a drought. The purpose of the Drought Plan is to bring about adaptations to manage drought and its implications effectively.

The implementation of the current 2013 Drought Plan or the updated Drought Plan (once finalised) alongside the Final WRMP19 may lead to both beneficial and adverse cumulative impacts, the latter particularly in terms of environmental water stress. However, the assessment identified that there would be no concurrent operation of supply-side Drought Plan options with supply options in the Final WRMP19. The Drought Plan supply-side options will only be implemented in severe drought conditions and will effectively replace some normal supply sources which will cease operation in drought due to abstraction licence conditions that prevent abstraction at low flows or low water levels. No cumulative adverse effects between the Severn Trent Drought Plan and the Final WRMP19 are therefore anticipated.

The Drought Plan demand-side measures complement the demand management options included in the Final WRMP19. Whilst their concurrent implementation might exacerbate some of the potential adverse effects of the leakage management measures, specifically in relation to vehicle movements and associated effects on air quality, transport, community and nuisance, such additional effects are considered negligible and, overall, there should be an overall beneficial cumulative effect on water resources (with indirect beneficial effects on environmental receptors such as biodiversity) because of the reduced consumption use of water.

8.2.2 Neighbouring water companies' WRMPs and Drought Plans

WRMPs and Drought Plans from the following water companies were considered for potential cumulative effects:

- Yorkshire Water
- Hafren Dyfrdwy
- United Utilities Water
- South Staffordshire Water
- Dŵr Cymru Welsh Water
- Anglian Water
- Bristol Water
- Wessex Water
- Thames Water

Severn Trent has taken account of the developing draft or revised draft 2019 WRMPs of other water companies (as available) to inform decisions on its Final WRMP. This included the decision to exclude the Vyrnwy Reservoir import from United Utilities from its Final plan on the basis that this supply had already been included in the revised draft WRMP19 of Thames Water. This cumulative assessment has been updated with the draft or final draft 2019 WRMPs (as available at February 2019) for the Final WRMP publication. The review indicated the potential for cumulative effects of the Final WRMP19 with the Anglian Water scheme 'Hall WTW and Reservoir in Central Lincolnshire' in its revised draft WRMP19. This scheme abstracts from the River Trent and water is gravity-fed from the reservoir to the WTW. Option WIL05 is the nearest of the Severn Trent options in the Final WRMP19 that involves

abstraction from the River Trent; however, it is located over 50km upstream of the Anglian Water scheme. More importantly, Option WIL05 will not result in any increase to the overall abstraction from the River Trent as it will be supported by flow augmentation. Consequently, no cumulative effects are anticipated.

The updated assessment identified no other risks of cumulative adverse effects between the WRMPs of the neighbouring water companies and Severn Trent's Final WRMP19.

All of the neighbouring water companies are including demand management programmes in their 2019 WRMPs, similar to those included in Severn Trent's Final WRMP19. Improved water efficiency and leakage reduction across England and Wales will result in beneficial in-combination effects in terms of reducing the need for, or scale of, new water resources thereby helping protect the water environment as well as reducing energy use through reduced water pumping and treatment.

Severn Trent will continue to communicate with neighbouring companies regarding the options in their 2019 WRMPs as these are finalised during 2019 and the subsequent implementation over the next few years prior to the next WRMP submission. In particular, small scale developments (e.g. new pipelines) constructed at a distance from each other by different water companies can still lead to incremental effects resulting in gradual loss of natural areas and woodland, resulting in impacts on designated landscapes. Prior to the implementation of the WRMP options, Severn Trent will consult with other water companies to identify any potential for such incremental cumulative effects on designated landscapes and consider developing Protected Landscape Mitigation Strategies in partnership with the relevant other water company, Natural England and relevant Protected Landscape officers, as appropriate.

No cumulative adverse effects have been identified in relation to the current published Drought Plans of neighbouring water companies. Beneficial effects may arise in respect of the Drought Plan measures for water efficiency and demand management with similar activities in the Final WRMP19.

8.2.3 Environment Agency Drought Plans

Assessment of the potential for in-combination impacts of the preferred plan with drought options listed in the Environment Agency Midlands Drought Plan has been undertaken. The information used to carry out these assessments is the most up to date information available at February 2019, but the assessments should be reviewed at the time of option implementation to ensure that no changes to the Environment Agency's Drought Plan have been made in the intervening period, and that this assessment therefore remains valid.

Drought actions and triggers are given in the Environment Agency's Drought Plan. Actions described include communications (internal and external), monitoring and potential drought order applications to protect the environment. Of these actions, those which are applicable for in-combination assessment with Severn Trent's Final WRMP19 are external water efficiency communications with the public and potential environmental drought orders.

External communications will have positive in-combination effects with Severn Trent's demand management options in the Final WRMP19, as drought communication messages may reinforce the need for water efficiency audits and for new metered customers to use water wisely, thereby resulting in increased demand savings and greater recognition by the public to conserve their use of water.

No cumulative adverse effects have been identified in relation to the current Environment Agency Drought Plan. The Environment Agency's drought order for the River Severn Regulation scheme is compatible with the options set out in Severn Trent's Final WRMP19 options and no cumulative adverse effects are anticipated.

8.2.4 Land Use and Spatial Plans

Potential cumulative effects with Local Plans and similar spatial plans have been assessed based on the plans available at February 2019. Local Plans and other spatial plans are relatively high-level policy documents and, whilst they identify potential areas for future development and zones for particular activities, the certainty of developments, the precise spatial location and their timing make it difficult to identify any specific potential cumulative effects with the Final WRMP19. However, following review of the available Local and spatial plans that may be affected by the options within the Final WRMP19, the potential for cumulative effects was identified in relation to three options: NOT05, NOT04 and CRO06 as summarised below.

The proposed pipeline route for option NOT05 intersects the following sites identified in the latest spatial plans for the districts of Erewash and Gedling:

- The Regeneration Area at Stanton by Dale
- The Breaston, Risley and Stanton by Dale conservation areas
- Bestwood Village and Calverton strategic housing sites, with up to 560 and 1055 housing units proposed, respectively. The NOT05 proposed pipeline runs through Bestwood County Park (adjacent to Bestwood Village) and within 1km of Calverton.

The proposed pipeline for NOT04 intersects the following strategic sites in the districts of Bolsover and Chesterfield:

- Planned housing allocations at the southern boundary of Clowne
- Employment land allocations at the Industrial Park in Worksop
- Local conservation areas to the north of Barlborough
- Residential development allocated sites (urban areas in Chesterfield)
- Sites allocated for economic growth (urban areas including Old Whittington).

There are two strategic sites located within 1km of CRO06 in the district of Charnwood. These include one large housing allocation site located in Rothley to the south of the option and a proposed New Employment Allocation in Rothley, located just to the north of the option.

As the WRMP19 options are brought forward for promotion, an assessment will need to be carried out of possible construction and/or operational cumulative effects with known local developments, including strategic sites and sites of local importance, as indicated above, in dialogue with the relevant local planning authorities.

The relevant County Council Minerals Development Frameworks have also been considered in respect of the third-party asset storage option (WTW05) and this demonstrates compatibility with the Council's core policy on asset reclamation, subject to appropriate mitigation and enhancement package being developed and agreed with the Council and other statutory bodies.

8.2.5 National Policy Statements and National/Regional Infrastructure Plans

No in-combination effects have been identified with National Policy Statements (including the consultation draft National Policy Statement for Water Resources Infrastructure issued in January 2018), or with national or regional infrastructure plans (including energy and transport sector plans).

8.2.6 Major projects

The potential for in-combination effects with known significant projects and developments identified in the Severn Trent supply area include: High Speed Two (HS2) Phases 1 and 2; M42 Junction 6 Improvement Scheme, M54 to M6 Link Road; Avonmouth Deep Sea Container Terminal; Hinkley Point C Nuclear Power Plant and the Wednesbury to Brierley Hill Metro Extension.

The assessment indicated that only one option - option NOT05 – has the potential for cumulative effects with the identified projects. Small sections (0.8km) of the NOT05 pipeline intersect the HS2 Phase 2b Safeguarded Route at two locations immediately to the west of Nottingham, parallel to the M1, and large sections (6.2km) are in close proximity to the HS2 Phase 2b Safeguarded Route of the East Midlands Branch within the Broxtowe and Nottingham Borough districts. There remains uncertainty as to the precise timing of HS2 Phase 2b in relation to the timing of the construction of the NOT05 pipeline, but currently the HS2 construction is scheduled between 2024 and 2030, so there is the potential for construction overlap with NOT05. Close consultation will therefore take place between Severn Trent and HS2 Limited to agree appropriate measures to manage any concurrent construction and ensure environmental protection. Subject to careful design, best practice construction methods by both parties and, if necessary, the development of environmental mitigation measures, there is unlikely to be greater than minor cumulative temporary adverse effects on the environment but there may be some localised moderate to major cumulative temporary adverse effects on recreation and local communities due to construction traffic and site construction activities, despite best practice construction methods. No cumulative operational effects are anticipated.

No cumulative, in-combination effects with the other identified projects are considered likely as the zones of influence largely do not overlap with the Final WRMP19 schemes and/or there are differing construction periods, or otherwise the impacts have been identified as small-scale and geographically distributed. No cumulative operational effects are anticipated with these other identified projects.

9 Mitigation and Monitoring

9.1 Overview

Key stages of the SEA process include:

- Task B5: Mitigating adverse effects
- Task B6: Proposing measures to monitor the environmental effects of implementing a plan or programme,
- Stage E: Monitoring the significant effects of the plan or programme on the environment.

The sub-sections below describe how these tasks have been addressed in the SEA – or will be addressed, as applicable. The sub-sections also describe how Severn Trent intends to ensure that monitoring of potential effects of implementing the Final WRMP is carried out and that the appropriate mitigation measures are implemented for any adverse effects identified.

9.2 Mitigation of Adverse Effects

Mitigation may be defined as a measure to limit the effect of an identified significant effect or, where possible, to avoid the adverse effect arising altogether. Consideration of mitigation measures has been an integral part of the SEA process for the Final WRMP19, informing the development of the plan at each key stage. In particular, the SEA appraisals set out in Sections 6 and 7 were based on the assessment of residual effects, i.e. those adverse effects likely to remain after the implementation of identified mitigation measures. Certain assumptions have been made regarding mitigation in carrying out the assessments, notably:

- Where suitable mitigation measures have been identified, these have been taken into account, such that the resultant residual impact has been determined in this SEA; and
- In line with recommendations made in the UKWIR SEA Guidance, the SEA appraisals have assumed the implementation of reasonable mitigation measures such as operation of water sources in line with regulatory requirements and the use of good construction practice, including measures such as:
 - o Invasive species on site are to be identified and removed in advance of construction;
 - HGV routing, cap on movements, appropriate working hours;
 - Screening around the perimeter of works at the start of construction (creation of landscaping/planting for large scale construction);
 - Footpath diversions established regarding construction work including pipelines;
 - Resources for construction of the scheme would be sourced locally where possible;
 - o Minimising removal of spoil from construction sites;
 - Runoff from the construction sites would be attenuated and the quality managed according to best construction practices;
 - Appropriate pipeline laying techniques regarding river crossings;
 - Flood risk management during construction (temporary flood defence and siting of spoil and contaminants away from areas at risk of flooding);
 - Siting of temporary and permanent works to minimise impacts on setting of heritage and landscape features;
 - Archaeological watching briefs during excavation;
 - Noise abatement barriers where required; and
 - Dust control measures: dampening dust emissions from groundworks and vehicle washing.

The mitigation measures described above would, in some cases, be implemented through Environmental Impact Assessment, planning processes and environmental permitting processes. In this way, effective mitigation plans can be developed to minimise many of the residual adverse effects currently identified in the SEA appraisals.

9.3 Monitoring Requirements

The natural, built and human receptors potentially impacted by development and operation of the options included in the Final WRMP19, and possible indicators of effects, have been set out in **Table 9.1**. The proposed indicators in the table would form the core component of a monitoring programme, to assess whether the identified effects in the SEA are occurring as anticipated, or whether it is giving rise to greater or lesser effects (adverse or beneficial). In turn, the monitoring may identify changes to the mitigation measures necessary to minimise adverse effects and/or modifications to scheme design or operation to further augment beneficial effects.

The monitoring programme will be refined through the detailed planning and environmental approvals stage. The monitoring programme includes:

- Scheme-specific monitoring requirements and targets that focus on scheme-specific risks, habitats, species and sites; and
- Strategic, regional and local monitoring requirements and targets to ensure that monitoring is conducted at a suitable spatial scale that reflects the scale and risks of each scheme and the overall plan.

The monitoring plan will be owned and implemented by Severn Trent and will be developed to reflect phasing of the plan. The monitoring plan will be further developed beyond this SEA Environmental Report during the implementation of the WRMP19 in consultation with the Environment Agency, Natural England and Historic England (as the SEA statutory consultation bodies) in order to make best use of available data, to share existing monitoring locations and locate new monitoring sites where possible in locations that not only meet scheme-specific requirements but provide additional value to the existing Environment Agency, Natural England and Historic England and Historic England and Historic England monitoring programmes.

| Impacted Receptor | Monitoring Indicator | Information Source | Responsibility |
|--|---|--|-------------------------------------|
| | Proportion of surface waters and groundwater waterbodies at 'Good' WFD status | Environment Agency online Catchment Data Explorer for RBMP2 for the year 2015 and any updates | Environment Agency |
| | Protected species and habitats surveys | Site specific during detailed design stage to confirm presence/likely absence of protected species | Severn Trent |
| Water resources, water quality, biodiversity | Biological monitoring (macrophytes, macroinvertebrates, fish) | Environment Agency database, monitoring completed by Severn Trent | Environment Agency, Severn Trent |
| | Condition of European Sites and SSSIs according to Natural England condition | Natural England favourable condition assessment tables | Natural England |
| | Progress against the Severn Trent's | Biological monitoring and surveys | Severn Trent |

Table 99.1 Proposed SEA monitoring parameters – strategic WRMP monitoring

| Impacted Receptor | Monitoring Indicator | Information Source | Responsibility |
|---|---|--|--|
| | biodiversity action plan Surface water and | Monitoring and comparison with historic records | Severn Trent, Environment Agency |
| | groundwater levels | | |
| Climate Factors | Net greenhouse gas emissions per MI (million litres) of treated water (kg CO2 equivalent emissions per MI) | Reported annually by Severn Trent | Severn Trent |
| Transport | Transport fleet fuel consumption, emissions and mileage | Routinely monitored by Severn Trent | Severn Trent |
| Nuisance/ Community Amenity Effects | Scheme level community disruption due to construction works / during operation (where applicable) | Monitored through an Environmental Management Plan | Severn Trent |
| | Complaints logged during construction | Compile data held by Severn Trent (and contractors) and Local Authority Environmental Health Officer | Severn Trent, Local Authority |
| | Customer satisfaction surveys | Responses gauged through and reported in Severn Trent's annual performance processes | Severn Trent |
| | Surveys of recreational and other amenities likely to be affected | Survey responses pre- and post- construction | Severn Trent |
| Air Quality | Scheme-specific monitoring during construction works / during operation (where applicable) | Environmental Management Plan | Severn Trent |
| | Changes in background air quality | Defra Automatic Urban and Rural Network, Local Authority monitoring | Defra, Local Authority data sources |
| Resource Use | Proportion of demolition materials sent to land fill or recycled | Part of Construction Environmental Management Plan | Severn Trent (contractors) |

Ricardo Energy & Environment

| Impacted Receptor | Monitoring Indicator | Information Source | Responsibility |
|------------------------------|---|--|---|
| | Proportion of construction build materials derived from recycled materials | Part of design criteria for new builds | Severn Trent |
| Landscape and visual amenity | Loss of land within AONB, National Park or protected views | Landscape and Visual Impact Assessments | Complete assessments in consultation with Natural England, Local Authority and Historic England |
| | Changes to townscape and views | Townscape assessment | As above |
| Cultural Heritage | Loss or change in condition of buried archaeology | Archaeological Written Scheme of Investigation | Complete assessment in consultation with Historic England and Local Authority |
| | | Environmental Management Plan | Severn Trent |
| | Change in condition of existing heritage assets | Monitoring of heritage assets such as Listed Buildings and Scheduled Monuments, Registered Battlefields, Registered Parks and Gardens, in particular the 'Heritage at risk' register. | Historic England |

As options are brought forward for development, further specific monitoring requirements are likely to be set out in detailed designs and plans accompanying scheme development (including, where applicable, formal applications for any required environmental permits, abstraction licences or planning permission, as well as any project level HRA and WFD assessments. These will be discussed with relevant regulatory and statutory bodies and stakeholders to agree the appropriate scale and duration of such scheme-specific monitoring activities proportionate to the assessed environmental risks.

10 Conclusions

Through application of the SEA process (and associated HRA and WFD assessments) from the very outset, Severn Trent has actively considered environmental and social effects throughout the development of the Final WRMP19 and consulted regularly with regulators, stakeholders and customers to seek their views on the emerging findings from the effects assessment. The SEA process complies with the regulatory requirements and national best practice guidance. The assessments have been based on a broad range of objective environmental and social criteria, developed through public consultation, to ensure all options were considered on a consistent basis, in line with the meeting the requirements of the SEA Directive and national SEA Regulations.

By integrating environmental and social assessment into the development of the Final WRMP19, a long-term sustainable water resource plan has been produced that maintains water supply reliability for Severn Trent's customers without unacceptable adverse effects on the environment or local communities.

As well as protecting the environment, the Final WRMP19 provides opportunities for environmental enhancement through various measures, in particular:

- Reducing water abstraction from a number of existing water sources where there is a risk of adverse effects on the water environment.
- Includes a new scheme to purchase a third party asset and develop it into raw water storage to help meet long term supply / demand needs. This is an innovative option to develop strategic raw water storage and there are opportunities, through careful planning and dialogue with stakeholders, to develop recreational amenities and enhance biodiversity through asset reclamation activities in line with County Council policies.
- Actively pursuing further water efficiency measures to substantially reduce leakage from the water supply system and customer properties, reducing the amount of water required to be abstracted from the environment.
- Significantly extending water metering to more customers and helping customers reduce their demand for water to achieve a material reduction in water consumption.

SEA Statement

Following publication of the Final WRMP19, Severn Trent will publish a SEA 'Post Adoption' Statement setting out how the SEA, and any views expressed by the consultation bodies or the public, influenced the development of the Final WRMP 2019.

11 Quality Assurance

ODPM Guidance on SEA contains a Quality Assurance checklist to help ensure that the requirements of the SEA Directive are met. The checklist is reproduced in Appendix C, demonstrating how this Environmental Report meets the requirements.

Appendices

- Appendix A Statutory consultee responses to the SEA Scoping Report
- Appendix B Review of policies, plans and programmes
- Appendix C Quality assurance checklist
- Appendix D Environmental baseline review



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