

ANNEX A SEA TABLES

<b>Element Name</b>	Vyrnwy Reservoir release (25Mld)
<b>Description</b>	Release of 25Ml/d water licensed to UU from Lake Vyrnwy directly into the River Vyrnwy. The release would be in addition to the compensation flow (45Ml/d) and any Severn Regulation Release.

SEA topic	SEA objective	Construction Effects		Operational Effects		Effect Description (including embedded mitigation i.e., costed mitigation that is committed to as part of the scheme)	Further Mitigation	Residual Construction Effects		Residual Operational Effects	
		+ve	-ve	+ve	-ve			+ve	-ve	+ve	-ve
Biodiversity, flora and fauna	1.1 To protect designated sites and their qualifying features	0	0	0	-	<p><b>Construction effects:</b> This assessment assumes no construction works are required to provide mitigation and/or to enable the discharge of water from Vyrnwy reservoir to the River Vyrnwy. With no new development associated with this option neutral construction effects have been identified.</p> <p><b>Operational effects:</b> Potential effects on the Berwyn and South Clwyd Mountains SAC and Berwyn SPA, and the Severn Estuary SAC SPA and Ramsar sites were considered in HRA screening. The assessment identified no Likely Significant Effects (LSE) regarding the Berwyn and South Clwyd Mountains SAC, Berwyn SPA sites during operation. The HRA identified an LSE due to a risk to supporting habitat for the Severn Estuary SPA and Ramsar sites and their qualifying species (particularly the lamprey and Atlantic salmon that depend on the River Vyrnwy for spawning and nursery habitats and impacts towards the migratory passage of adult and juvenile lamprey). Analysis of habitat and velocity/depth changes during Gate 2 investigations indicated an inflection point of 175Ml/d as the upper limit of the tolerances in velocity for the salmonid community. At these flows, habitats become less suitable and continuous releases at this rate would also impact on fine sediment accumulation in riffles, further impacting on habitat quality. However, the appropriate assessment concluded that under the 25Ml/d option flows within the River Vyrnwy downstream of the reservoir are expected to remain below the 175Ml/d threshold and significant effects on supporting habitats for the Severn Estuary SPA and Ramsar sites are therefore not expected.</p> <p>Field surveys and assessment of impacts on the Coed Copi'r Graig SSSI suggested that water levels are not expected to result in impacts on the notifiable features of the SSSI. The releases of 25Ml/d will not impact on the supporting habitat upon which features such as higher plants (including <i>Gemmaium sylvaticum</i>, <i>Rubus saxatilis</i> and <i>Trollius europaeus</i>) depend. The small (0.25-0.75°C) changes in water temperature associated with the STT operation and reservoir releases is not assessed as resulting in any significant changes in dissolved oxygen saturation.</p> <p>The assessment assumes that mitigation measures will be in place to reduce the potential environmental risks, including operational rules to ensure gradual reservoir release start-up and shutdown to avoid sudden changes in flow velocities and limitations in the use of the scheme during Severn Regulation releases. In operation, minor adverse effects are anticipated.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p> <p><b>Operation mitigation:</b> Additional monitoring and assessment of the potential effects of the discharge on the anadromous species that are qualifying features of the Severn Estuary SAC and Ramsar site</p>	0	0	0	0
	1.2 To avoid a net reduction, and where possible enhance, in non-monetised natural capital assets	0	0	+	0	<p><b>Construction Effects:</b> Construction will lead to loss or degradation of enclosed farmland natural capital stock, with potential associated disbenefits to biodiversity, carbon regulation and water purification services. Potential short-term impacts to recreation and wellbeing if construction causes loss of access to recreation sites within the zone of influence. The Draft Natural Capital Assessment has found neutral effects during construction.</p> <p><b>Operational effects:</b> Minor benefit to biodiversity natural capital is possible as priority habitats along the riverbank may be better supported during low flow conditions due to increased river flow during drought conditions. Potential minor benefits to water purification and carbon regulation services related to improved habitat.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p> <p><b>Operation mitigation:</b> Delivery of required BNG to offset construction losses (woodland planting) will result in benefits to natural capital stocks and ecosystem service provision, including biodiversity, carbon regulation, natural hazard regulation and water purification. Potential benefits to recreation are dependent on design of BNG mitigation.</p>	0	0	+	0
	1.3 To protect and enhance biodiversity, priority habitats and species	0	0	0	-	<p><b>Construction effects:</b> This assessment assumes no construction works are required to provide mitigation and/or to enable the discharge of water from Vyrnwy reservoir to the River Vyrnwy. With no new development associated with this option neutral construction effects have been identified.</p> <p><b>Operational effects:</b> Several priority species are associated with the River Vyrnwy. Of particular importance is the high abundances of Atlantic salmon (<i>Salmo salar</i>) that depend on the River Vyrnwy for spawning habitat. Similarly, low abundances of river lamprey (<i>Lampetra fluviatilis</i>) and sea lamprey (<i>Petromyzon marinus</i>) are also present in the reaches most likely to be affected by operation of the scheme. Brown trout (<i>Salmo trutta</i>) and bullhead (<i>Cottus gobio</i>) has also been observed in high abundances in the reaches immediately downstream of the Vyrnwy reservoir. In addition, the notifiable features of the SSSI are also known to be susceptible to high flows in the summer months. NRW has advised that species susceptible to water level changes are also present within the River Vyrnwy. These include Five-spot lady bird (<i>Coccinella quinquepunctata</i>) recorded on Exposed Riverine Sediment (ERS) in the Meifod valley as well as the Yellow Crucifer Weevil (<i>Aulacobaris lepidii</i>). Lowland fens and reedbeds</p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	0	0	-

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		+ve	-ve	+ve	-ve			+ve	-ve	+ve	-ve
						and purple moor grass and rush pastures were also identified as present within 500m of the River Vyrnwy, however, further assessment identified no hydrological link with the watercourse. Flow changes under the 25MI/d release would be minor in the context of the range of normal flows in the River Vyrnwy and are assessed as resulting in only limited and localised change in habitat. There Gate 2 assessment has not identified any pathway to general water quality changes in the River Vyrnwy as a result of STT operation Impacts are expected to be negligible to minor. The assessment assumes that mitigation measures will be in place to reduce the potential environmental risks, including operational rules to ensure gradual reservoir release start-up and shutdown. This will avoid sudden changes in flow velocities and limitations in the use of the scheme during Severn Regulation releases.					
	1.4 To avoid and, where required, manage invasive and non-native species (INNS)	0	0	0	0	<b>Construction effects:</b> This assessment assumes no construction works are required to provide mitigation and/or to enable the discharge of water from Vyrnwy reservoir to the River Vyrnwy. With no new development associated with this option neutral construction effects have been identified. <b>Operational effects:</b> The operation of this scheme would provide a pathway for distribution of INNS; however, this pathway is already present and will not be considered new. The increased volume of the releases could result in a slight increase in the distribution of INNS, but the impact would be considered negligible, given the scale of the existing regulation releases from Vyrnwy reservoir to the River Vyrnwy and the INNS risks in the catchment. In operation there would be an additional 25MI/d transfer to the River Thames at times when transfer is required below the Hands of Flow (HoF) conditions on the River Severn. No additional/new pathways will be created for the distribution of INNS. Overall, neutral effects are anticipated in operation.	<b>Construction mitigation:</b> No further mitigation proposed.	0	0	0	0
	1.5 To meet WFD objectives relating to biodiversity	0	0	0	0	<b>Construction effects:</b> This assessment assumes no construction works are required to provide mitigation and/or to enable the discharge of water from Vyrnwy reservoir to the River Vyrnwy. With no new development associated with this option neutral construction effects have been identified. <b>Operational effects:</b> Additional water for discharge downstream will be sourced from existing water resources. There will be no material change to reservoir levels as the total volume abstracted from Vyrnwy Reservoir will remain unchanged. The risk to WFD deterioration in the overall ecological status is considered negligible for the reservoir. The associated WFD waterbodies GB109054049720 (Vyrnwy - Lake Vyrnwy to conf Afon Cownwy) and GB109054049852 (Afon Vyrnwy - conf Afon Conwy to conf Afon Banwy) are considered to be of Good Ecological Status. In operation there would be an additional 25MI/d transfer to the River Thames at times when transfer is required below HoF conditions on the River Severn. Overall, neutral effects are anticipated in operation.	<b>Construction mitigation:</b> No further mitigation proposed.	0	0	0	0
Soil	2.1 To protect and enhance the functionality, quantity and quality of soils, including the protection of high-grade agricultural land	0	0	0	0	<b>Construction effects:</b> There is no construction associated with this scheme. As no construction is required, there will be no impacts on the ecosystem service functions of land, soils or geology, or towards geologically important sites. <b>Operational effects:</b> There are no catchment management practices associated with the scheme and there are no opportunities to directly promote catchment land management. The operation of the scheme will not affect land use, soils or geology. Neutral effects are anticipated.	<b>Construction mitigation:</b> No further mitigation proposed.	0	0	0	0
Water	3.1 To minimise or manage flood risk, taking climate change into account	0	0	0	0	<b>Construction effects:</b> Given that no construction is required, no effects on flood risk are anticipated. <b>Operational effects:</b> In operation there would be additional releases of 25MI/d from Vyrnwy Reservoir for intermittent periods typically in the months July to October, peaking in August at 47% of days in August. Outside this period, there would be less regular flow changes in June and November, with changes very rare in May, December and January and not anticipated in February, March or April. These flow changes would continue along the River Severn to the re-abstraction location with no overall change in flows to the Severn Estuary.	<b>Construction mitigation:</b> No further mitigation proposed.	0	0	0	0
	3.2 To enhance or maintain groundwater quality and resources	0	0	0	0	<b>Construction effects:</b> With no construction associated with this scheme, construction impacts are considered neutral. <b>Operational effects:</b> In operation there would be additional releases of 25MI/d from Vyrnwy Reservoir typically in the months July to October, peaking in August at 47% of days in August. Outside this period, there would be less regular flow changes in June and November, with changes very rare in May, December and January and not anticipated in February, March or April. The operational effects will not impact on groundwater. Neutral effects are anticipated.	<b>Construction mitigation:</b> No further mitigation proposed.	0	0	0	0
	3.3 To enhance or maintain surface	0	0	0	!	<b>Construction effects:</b>	<b>Construction mitigation:</b>	0	0	+	-

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		+ve	-ve	+ve	-ve			+ve	-ve	+ve	-ve
	water quality, flows and quantity					<p>With no construction associated with this scheme, construction impacts are considered neutral.</p> <p><b>Operational effects:</b> In operation there would be additional releases of 25MI/d from Vyrnwy Reservoir typically in the months July to October, peaking in August at 47% of days in August. Outside this period, there would be less regular flow changes in June and November, with changes very rare in May, December and January and not anticipated in February, March or April. These flow changes would continue along the River Severn to the re-abstraction location with no overall change in flows to the Severn Estuary.</p> <p>The 25MI/d direct reservoir releases potentially coincide with Severn Regulation during the period June-October, with managed releases (compensation flow, Severn Regulation Release and STT solution release) up to 145 MI/d. In the 74 km of the River Vyrnwy from Vyrnwy Reservoir to the confluence with the River Severn, the STT solution would episodically augment flow to a total of 25 MI/d. These flow changes would be minor in the context of the range of normal flows in the River Vyrnwy.</p> <p>The small (0.25-0.75°C) changes in water temperature associated with the STT operation and reservoir releases is not assessed as resulting in any significant changes in dissolved oxygen saturation.</p>	No further mitigation proposed.				
	3.4 To meet WFD objectives	0	0	0	0	<p><b>Construction effects:</b> There is no construction associated with this scheme. Option construction impacts are neutral for WFD compliance.</p> <p><b>Operational effects:</b> The tests of constraint of the option against WFD regulations objectives identify no potential non-compliance with ecology or chemical status targets in the Vyrnwy - Lake Vyrnwy to conf Afon Cownwy (GB109054049880) and Afon Vyrnwy - conf Afon Cownwy to conf Afon Banwy (GB109054049720) river water bodies from option operation.</p> <p>As well as the tests of WFD constraint, other WFD objectives relate to whether the option assists the meeting of WFD objectives for the water body, for associated WFD protected areas or reduces the treatment needed to produce drinking water and look to work in partnership with others. The option is considered neutral for these during construction and operation. This is assessed as a neutral effect.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	0	0	0
	3.5 To improve water efficiency through provision of access to a resilient and sustainable supply of water.	0	0	++	0	<p><b>Construction effects:</b> With no construction associated with this scheme, construction impacts are considered neutral.</p> <p><b>Operational effects:</b> The scheme would not have direct effects on water efficiency but would enable the 25 MI/d to be made available for Thames Water. A moderate beneficial effect is considered to result from this option.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	0	+++	0
Air	4.1 To minimise air emissions during construction and operation	0	0	0	0	<p><b>Construction effects:</b> There would be no new development associated with this option.</p> <p><b>Operational effects:</b> In operation, the scheme is not anticipated to result in any additional impact on local emissions to air.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	0	0	0
Climatic Factors	5.1 To introduce climate mitigation where required and improve the climate resilience of assets and natural systems	0	0	++	0	<p><b>Construction effects:</b> There is no construction associated with this scheme.</p> <p><b>Operational effects:</b> The operation of this scheme would transfer water (stored during times of high rainfall availability) for the benefit of flows in the River Severn and the River Thames, with subsequent major water supply availability benefit to the South East during times of low river flows in the River Thames and low reservoir storage in London. This will reduce the vulnerability to increased drought risks associated with climate change and thereby improving resilience to the likely effects of future climate change. A moderate beneficial effect is considered to result from this option.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	0	+++	0
	5.2 To minimise embodied and operational emissions	0	0	0	0	<p><b>Construction effects:</b> With no construction associated with this scheme, construction impacts are considered neutral.</p> <p><b>Operational effects:</b> In operation, the scheme involves releases of water by gravity and there is no pumping or chemical treatment of the raw water required prior to discharge to the River Vyrnwy. Overall, during operation this option is considered to have a neutral effect on this objective</p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	0	0	0
Landscape	6.1 To conserve, protect and enhance landscape and townscape	0	0	0	0	<p><b>Construction effects:</b> With no construction associated with this scheme, construction impacts are considered neutral.</p> <p><b>Operational effects:</b></p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p> <p><b>Operation mitigation:</b></p>	0	0	0	0

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		+ve	-ve	+ve	-ve			+ve	-ve	+ve	-ve
	character and visual amenity					As the release of higher flows may occur during lower flows there is the potential for some beneficial effects to the river landscape and visual amenity, however, relative to the baseline this is considered to be only of negligible benefit. Water levels in Lake Vyrnwy reservoir will not change relative to baseline conditions, with no likely effects on landscape or visual amenity as a consequence. Overall, no impacts on landscape or visual amenity are expected in operation.	No further mitigation proposed.				
Historic Environment	7.1 To conserve/protect and enhance historic assets/cultural heritage and their setting, including archaeological important sites	0	0	0	0	<p><b>Construction effects:</b> There is no construction associated with this scheme.</p> <p><b>Operational effects:</b> Water levels in Lake Vyrnwy reservoir will remain unchanged compared to existing baseline conditions and operation will not lead to any adverse effects on this Victorian heritage infrastructure asset (dam and draw off tower are Grade 1 listed buildings - no changes will be required to these structures), and the associated Grade 2 Listed structures and buildings associated with the reservoir and surroundings. Overall, no impacts on cultural heritage sites and their setting are expected in operation.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	0	0	0
Population and Human Health	8.1 To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing	0	0	++	0	<p><b>Construction effects:</b> The scheme is located in an area with low levels of deprivation for socio-economic criteria, including income, employment, healthcare, and crime, according to the IMD index of multiple deprivation. Although, there is no construction associated with this scheme.</p> <p><b>Operational effects:</b> In operation, this scheme will increase regional resilience which may support economic and population growth. It will help to ensure provision of access to a secure resilient supply of drinking water including during times where additional water resources may not be available. Therefore, generating a moderate positive effect.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	0	+++	0
	8.2 To maintain and enhance tourism and recreation	0	0	0	0	<p><b>Construction effects:</b> There is no construction associated with this scheme.</p> <p><b>Operational effects:</b> In operation water would be released from Lake Vyrnwy reservoir within the existing abstraction licence conditions, therefore there will be no impact on recreation, tourism, or navigation.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	0	0	0
	8.3 To secure resilient water supplies for the health and wellbeing of customers	0	0	++	0	<p><b>Construction effects:</b> With no construction associated with this scheme, construction impacts are considered neutral.</p> <p><b>Operational effects:</b> The option would contribute by providing a resilient water supply. It will provide essential water supply infrastructure to help support a sustainable socio-economy and therefore is considered to have a moderate positive effect.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	0	+++	0
	8.4 To increase access and connect customers to the natural environment, provide education or information resources for the public	0	0	0	0	<p><b>Construction effects:</b> The scheme is located in an area with low levels of deprivation for socio-economic criteria, including education, skills, and training, according to the IMD index of multiple deprivation. However, there is no construction associated with this scheme.</p> <p><b>Operational Effects:</b> Neutral operational effects are anticipated.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	0	0	0
Material Assets	9.1 To minimise resource use and waste production	0	0	+	0	<p><b>Construction Effects:</b> With no construction associated with this scheme, construction impacts are considered neutral.</p> <p><b>Operational Effects:</b> Abstractions from the reservoir for river flow support would be controlled through abstraction licensing regulations and water would be released from Lake Vyrnwy reservoir within the existing abstraction licence conditions, with river regulation releases made under gravity with no requirement for energy resource use for water pumping. There may be some beneficial impacts regarding efficient material usage as the scheme makes use of existing infrastructure, with water resources being re-deployed from supplying North West England to the south of England.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	0	+	0
	9.2 To avoid negative effects on built assets and infrastructure	0	0	0	0	<p><b>Construction Effects:</b> With no construction associated with this scheme, construction impacts are considered neutral.</p> <p><b>Operational Effects:</b> During operation effects towards built assets and infrastructure will be negligible.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	0	0	0

<b>Element Name</b>	River Vyrnwy Mitigation – Vyrnwy Bypass release (155 Ml/d)
<b>Description</b>	<p>The transfer of raw water between the Vyrnwy raw water mains (between Llanforda open reservoir and Oswestry WTW) and the River Severn through an approximately 17 km (1200mm) gravity discharge pipeline of steel/ductile pipeline. The proposed bypass to discharge in the River Severn downstream of confluence and to mitigate environmental damage due to high volumes of discharge enabling STT water transfer. Additional new infrastructure would include:</p> <ul style="list-style-type: none"> <li>• An outfall structure (headwall) (15m<sup>3</sup>) at the discharge point on north bank of River Severn.</li> <li>• Access roads and valve chambers (~ 3000m<sup>2</sup> for access roads + 300m<sup>2</sup> around valve chambers)</li> <li>• Four temporary construction compounds: compound adjacent Oswestry WTW (~100mx60m); compound west of Maesbury (~80mx70m); compound east of Maesbrook (~30mx120m) and compound near to the discharge location on the River Severn (~100mx150m).</li> </ul> <p>For the above construction activities, working widths of 40m are utilised where the pipeline crosses open fields, and 20m working width is applied where the pipeline crosses roads, hedgerows or within 20m of other receptors, including trees and buildings.</p>

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Biodiversity, flora and fauna	1.1 To protect designated sites and their qualifying features	0	-	+	-	<p><b>Construction effects:</b></p> <p>Potential effects on eight European Designated sites were considered in HRA screening: Midland Meres Mosses Phase 1 (approximately 4km from River Severn, downstream of outfall) and Phase 2 Ramsar (approximately 1km from the pipeline route), Montgomery Canal SAC (around 3km from the pipeline route), River Dee and Bala Lake SAC (around 7km from the pipeline route), Tanat and Vyrnwy Bat sites SAC (around 10km from the pipeline route), and the Severn Estuary SAC, SPA and Ramsar sites (115km at closest point, around 170km via hydrological connectivity).</p> <p>The assessment identified Likely Significant Effects (LSE) from construction activities associated with the pipeline route for the Midland Meres Mosses Phase 2 and underpinning SSSI (Morton Pool and Pasture SSSI) as there is a risk of changes to the hydrological regime/groundwater supply to the Ramsar site and exposure to pollution incidents if the pipeline is installed at a depth where groundwater is present and hydrologically connected to Morton Pool and Pasture SSSI. However, based on the location of the site and the hydrological connectivity, and with the inclusion of best practice pollution prevention the Stage 2 appropriate assessment concluded the construction will not impact on the qualifying features.</p> <p>Appropriate mitigation to the construction activities associated with the Bypass pipeline including best practice construction methods to avoid the risk of sediment mobilisation, pollution and timing of in-river works to avoid sensitive periods for important species (e.g., Atlantic salmon migration) are incorporated into the scheme design. Consequently, the HRA concluded no adverse effects on the Severn Estuary SAC or SPA associated with the construction phase due to the distance to the site boundary and functionally linked habitats.</p> <p>The assessment identified no LSE on the other sites considered due to the absence of direct impacts, distance to the sites, an absence of potential impact pathways or hydrological connectivity.</p> <p>Four nationally designated sites are within 2km of the proposed pipeline route: Morton Pool and Pasture SSSI (around 1km), Llanymynech Llyncllys Hills SSSI (~900m), Croft Mills Pasture SSSI (~2km) and Sweeney Fen SSSI (~1km). Although the option is located within 14 SSSI impact risk zones.</p> <p>Due to the proximity to designations, and in consideration of these mitigation measures the effects of these risks are considered minor adverse.</p> <p><b>Operational effects:</b></p> <p>Potential effects on eight European Designated sites were considered in HRA screening: Midland Meres Mosses Phase 1 (~4km from River Severn, downstream of outfall) and 2 Ramsar (approximately 1km from the pipeline route), Montgomery Canal SAC (around 3km from the pipeline route), River Dee and Bala Lake SAC (around 7km from the pipeline route), Tanat and Vyrnwy Bat sites SAC (~10km from the pipeline route), and the Severn Estuary SAC, SPA and Ramsar sites (115km at closest point, 169.87km via hydrological connectivity). The assessment identified no LSE are expected during the operational phase for the Midland Meres Mosses Phase 1 and 2 Ramsar, Montgomery Canal SAC, River Dee and Bala Lake SAC, Tanat and Vyrnwy Bat sites SAC, Severn Estuary SPA and the supporting SSSIs due to the absence hydrological connectivity or other potential impact pathways.</p> <p>The River Severn that will receive the discharge however has hydrological connectivity to the downstream European designated sites the Severn Estuary SAC, SPA and Ramsar (European Marine Site) and the constituent SSSIs. Functionally linked habitat outside of the site boundary that potentially supports the four anadromous fish species (river lamprey; <i>Lampetra fluviatilis</i>, sea lamprey; <i>Petromyzon marinus</i>, Atlantic salmon <i>Salmo salar</i> and twaite shad; <i>Alosa fallax</i>) that form qualifying features of the SAC and Ramsar site could potentially be affected along the River Vyrnwy downstream of the discharge point.</p> <p>The appropriate assessment of the operation of the STT concluded that as changes in flow, velocity and depth will not be discernible and will not result in a change in the quality or quantity of supporting habitat within the River Severn (and tributaries) or within the Severn Estuary, no risk to adverse effects on site integrity have been identified.</p> <p>The assessment assumes that mitigation measures will be in place to reduce the potential environmental risks, including operational rules to ensure gradual reservoir release start-up and shutdown to avoid sudden changes in flow velocities and limitations in the use of the scheme during Severn Regulation releases.</p> <p>Overall, minor negative effects are anticipated in operation of this option. Equally, an opportunity exists for habitat enhancement when reinstating land as well as biodiversity net gain opportunities resulting in minor positive effect</p>	<p><b>Construction mitigation:</b></p> <p>Construction compounds will be sited sensitively and away from designated habitats. However, in the event that site specific ecological assessments identify any impacts to protected species or habitats associated with the construction work, appropriate mitigation measures including where appropriate relocation of such species, will be undertaken in advance of the works being undertaken.</p> <p>Temporary lighting will be strategically located for safe construction requirements and where possible, will be directional to minimise an increase in light levels and light spill.</p> <p><b>Operation mitigation:</b></p> <p>Additional monitoring and assessment of the potential effects of the discharge on the anadromous species that are qualifying features of the Severn Estuary SAC and Ramsar site</p>	0	-	+	0
	1.2 To avoid a net reduction, and where possible	0	-	0	-	<p><b>Construction Effects:</b></p>	<p><b>Construction mitigation:</b></p> <p>No further mitigation proposed.</p>	0	-	+	-

SEA topic	SEA objective	Construction Effects		Operational Effects		Effect Description (including embedded mitigation i.e., costed mitigation that is committed to as part of the scheme)	Further Mitigation	Residual Construction Effects		Residual Operational Effects	
	enhance, in non-monetised natural capital assets					<p>Construction will lead to loss or degradation of enclosed farmland natural capital stock, with potential associated disbenefits to biodiversity, carbon regulation and water purification services. Potential short-term impacts to recreation and wellbeing if construction causes loss of access to recreation sites within the zone of influence.</p> <p>The Draft Natural Capital Assessment found a minor negative effect during construction.</p> <p><b>Operational effects:</b></p> <p>The Draft Natural Capital Assessment found a minor negative effect during operation.</p>	<p><b>Operation mitigation:</b></p> <p>Delivery of required Biodiversity Net Gain (BNG) to offset construction losses (woodland planting) will result in benefits to natural capital stocks and ecosystem service provision, including biodiversity, carbon regulation, natural hazard regulation and water purification.</p> <p>Potential benefits to recreation are dependent on design of BNG mitigation.</p>				
	1.3 To protect and enhance biodiversity, priority habitats and species	0	-	+	0	<p><b>Construction effects:</b></p> <p>The majority of the route is located within the Mere Mosses National Priority Focus Area.</p> <p>The construction phase of the proposed pipeline will not directly protect or enhance priority habitats or species but will allow a reduction in the extent of the river which could be subject to the adverse effects in the Afon Vyrnwy associated with direct release of water from the Vyrnwy reservoir. Direct release from the reservoir has potential to adversely affect a number of priority species including Atlantic salmon, river lamprey, sea lamprey and brown trout.</p> <p><b>Operational effects:</b></p> <p>The operation of the Vyrnwy bypass has the potential to adversely affect Atlantic salmon, river lamprey, sea lamprey and brown trout downstream of the discharge point through changes in water quality (e.g., temperature and dissolved oxygen) and increased flow velocity. The Gate 2 Fisheries Assessment Report for the River Severn from the confluence with the River Vyrnwy to Bewdley concluded that impacts on the fish community as a result of hydrological and hydraulic changes in this reach is not expected and that there is no pathway of general water quality, chemical water quality change or changes in olfaction change in this reach from STT operation. As such, impacts are considered to be negligible.</p> <p>In addition, the impacts from operation on hydrologically connected protected habitats (coastal and floodplain grazing marsh, lowland fens, and purple moor grass and rush pastures) as a result of hydrological and hydraulic changes are not expected to result in significant effects.</p> <p>The operation of the proposed bypass pipeline will allow a reduction in the extent of river which could be subject to the adverse effects in the Afon Vyrnwy associated with direct release of water from the Vyrnwy reservoir. Direct release from the reservoir has potential to adversely affect a number of priority species including Atlantic salmon, river lamprey, sea lamprey and brown trout.</p> <p>Overall, minor positive effects are anticipated in operation.</p>	<p><b>Construction mitigation:</b></p> <p>Construction compounds will be sited sensitively and away from designated habitats. However, in the event that site specific ecological assessments identify any impacts to protected species or habitats associated with the construction work, appropriate mitigation measures including where appropriate relocation of such species, will be undertaken in advance of the works being undertaken.</p> <p>Temporary lighting will be strategically located for safe construction requirements and where possible, will be directional to minimise an increase in light levels and light spill.</p> <p><b>Operation mitigation:</b></p> <p>No further mitigation proposed.</p>	0	0	+	0
	1.4 To avoid and, where required, manage invasive and non-native species (INNS)	0	0	0	0	<p><b>Construction effects:</b></p> <p>Whilst there is a potential risk of spreading INNS during construction. Mitigation measures including best practice construction practices, the identification and removal of invasive species on site in advance of construction and pipeline commissioning with treated water. In consideration of these mitigation measures the impacts of these risks are considered neutral.</p> <p><b>Operational effects:</b></p> <p>Given the scale of the existing regulation releases from Vyrnwy reservoir to the Afon Vyrnwy and the INNS risks in the catchment, the operation of this scheme component is assessed as having a negligible effect on the risk of the spread of INNS in the Afon Vyrnwy/River Severn system. Equally, the scheme is assessed as having a negligible beneficial effect on controlling the spread of INNS in the river system.</p>	<p><b>Construction mitigation:</b></p> <p>No further mitigation proposed.</p> <p><b>Operation mitigation:</b></p> <p>No further mitigation proposed.</p>	0	0	0	0
	1.5 To meet WFD objectives relating to biodiversity	0	-	0	0	<p><b>Construction effects:</b></p> <p>In the absence of mitigation, construction activities associated with the Vyrnwy Bypass scheme adjacent to or in the watercourse, could result in sediment mobilisation, pollution (e.g., hydrocarbons), lighting, and physical disturbance that could adversely affect fish, macroinvertebrate, macrophyte and phytobenthos communities in the waterbody. Option construction impacts, including pipeline and outfall headworks construction are assessed as minor negative effect prior to mitigation.</p> <p><b>Operational effects:</b></p> <p>The associated WFD waterbody (Severn - conf Bele Bk to conf Sundorne Bk) is considered to be in a Moderate WFD status overall with the ecological status considered also as Moderate. Protected and notable fish species have been recorded downstream of the discharge location (including European eel and Atlantic salmon) while other species such as bullhead and lamprey have also been recorded. The operation of the bypass pipeline has the potential to result in a reduction in ecological status for fish and macroinvertebrates due to a potential for change in flow velocity downstream of the discharge. However, the flow changes would be minor in the context of the range of normal and regulated flows in the River Severn and would not result in significant change to wetted habitat or water level at locally important hydraulic features. There is no pathway of general water quality, chemical water quality change or changes in olfaction change in this reach from STT operation. As such, impacts are considered to be negligible.</p>	<p><b>Construction mitigation:</b></p> <p>All vehicles and any chemical/oil storage will be fully bunded to prevent any accidental pollution of groundwater or watercourses.</p> <p>Temporary lighting will be strategically located for safe construction requirements and where possible, will be directional to minimise an increase in light levels and light spill.</p> <p><b>Operation mitigation:</b></p> <p>No further mitigation proposed.</p>	0	0	0	0

SEA topic	SEA objective	Construction Effects		Operational Effects		Effect Description (including embedded mitigation i.e., costed mitigation that is committed to as part of the scheme)	Further Mitigation	Residual Construction Effects		Residual Operational Effects	
		0	-	0	0			0	-	0	0
Soil	2.1 To protect and enhance the functionality, quantity, and quality of soils, including the protection of high-grade agricultural land	0	-	0	0	<p><b>Construction effects:</b> Total land take requirements include approximately 132,000 m<sup>2</sup> for the pipeline wayleave (~17 km long x 8 m wide pipe easement), 3300 m<sup>2</sup> associated with the access roads (3000 m<sup>2</sup>) and valve chambers (300 m<sup>2</sup>) and ~180m<sup>2</sup> associated with four temporary construction compounds. A majority of the proposed pipeline (~70%) lies within Grade 3 Agricultural land. Therefore, minor negative effects are anticipated.</p> <p><b>Operational effects:</b> Neutral effect given that the pipeline would be buried.</p>	<p><b>Construction mitigation:</b> Proposed mitigation to minimise the impacts of construction activities include the storage of materials including any topsoil and subsoils removed during construction is to be undertaken to minimise natural drainage flow paths.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	-	0	0
	3.1 To minimise or manage flood risk, taking climate change into account	0	-	0	0	<p><b>Construction effects:</b> This pipe laying would require a total of 3 river crossings (trenchless techniques to be adopted), where the route crosses the River Morda twice and minor stream/beck diversions for associated unnamed tributaries, to the south of Maesbrook. Consequently, areas of the pipeline fall within EA Flood Zones 2 and 3 at the above crossings, including for around 5km to the east of Llanymynech upon its approach to the River Severn.) Construction compounds would be sited sensitively and away from flood risk zones. Adequate methods of construction will be adopted to minimise the impact, including sheet piling, dewatering and treatment of the groundwater prior to discharge. Flood compensation ponds will be constructed as part of the enabling works. Earthwork's sequencing will include cofferdam formation to avoid flooding of borrow areas during construction. Given the scope of the construction works a minor negative effect on flood risk has been identified.</p> <p><b>Operational effects:</b> The option would not affect flood storage once operational. Effects towards existing flood risk on the River Vymwy are considered neutral. In the River Severn effects towards flows and existing flood risk would be neutral.</p>	<p><b>Construction mitigation:</b> Further mitigation measures will be set out in the applications for Flood Defence Consents where these are required for the river crossing construction works.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	-	0	0
	3.2 To enhance or maintain groundwater quality and resources	0	-	0	0	<p><b>Construction effects:</b> The route is not located within a source protection zone (SPZ), the nearest being SPZ 3, at the opposite bank to the point of discharge on the River Severn. During construction of the pipeline, areas with high permeability and high groundwater levels would require permits to be obtained by the contractor from the relevant authorities for the disposal of the groundwater to a suitable location. There would also be a need for lagoons to intercept and treat the commissioning wastewater. The lagoons would need to be available prior to pressure testing and land would be reinstated after commissioning. All vehicles and any chemical/oil storage will be fully bunded to prevent any accidental pollution of groundwater. Overall, a minor negative effect on groundwater is considered.</p> <p><b>Operational effects:</b> Water quality assessment using available evidence has identified neutral effects.</p>	<p><b>Construction mitigation:</b> Further mitigation measures will be developed in consultation with the regulators as part of the detailed design process.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	0	0	0
	3.3 To enhance or maintain surface water quality, flows and quantity	0	-	0	0	<p><b>Construction effects:</b> A number of rivers would be crossed by the scheme and a risk to water quality therefore exists. Construction of discharge and abstraction points and pipeline river crossings have the potential to effect water quality in the river and downstream. Use of trenchless techniques to cross the main rivers will be adopted. Best practice construction methods will also be adopted. Given the scale of the construction activities required, minor negative effects are anticipated.</p> <p><b>Operational effects:</b> Modelling of the STT operation indicates there would be 155Ml/d support releases to the middle River Severn for up to ~150 days typically in the months July to October, peaking at 47% of days in August. These flow changes would be minor in the context of the range of normal and regulated flows in the River Severn. In the River Severn flow effects would be neutral. Water quality assessment using available evidence has identified neutral effects.</p>	<p><b>Construction mitigation:</b> Further mitigation measures will be set out in the applications for Flood Defence Consents where these are required for the river crossing construction works.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	-	0	0
Water	3.4 To meet WFD objectives	0	-	0	0	<p><b>Construction effects:</b> Option construction impacts, including pipeline and outfall headworks construction are assessed as minor negative effect prior to mitigation.</p> <p><b>Operational effects:</b> The tests of constraint of the option against WFD regulations objectives identify no potential non-compliance with ecology or chemical status targets.</p>	<p><b>Construction mitigation:</b> With further consideration of watercourses to cross without in-channel works, construction impacts would be neutral for WFD compliance.</p> <p><b>Operation mitigation:</b></p>	0	0	0	0

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						As well as the tests of WFD constraint, other WFD objectives relate to whether the option assists the meeting of WFD objectives for the water body, for associated WFD protected areas or reduces the treatment needed to produce drinking water and look to work in partnership with others. The option is considered neutral for these during construction and operation.  This is assessed as a neutral effect.	No further mitigation proposed.				
	3.5 To improve water efficiency through provision of access to a resilient and sustainable supply of water.	0	0	+++	0	<b>Construction effects:</b> Neutral effects anticipated.  <b>Operational effects:</b> During operation there would be a major positive effect due to the option contributing to a resilient water supply. Whilst this option will provide additional water resource (155 Ml/d) and it will provide essential water supply infrastructure to help support a sustainable socio-economy.	<b>Construction mitigation:</b> No further mitigation proposed.  <b>Operation mitigation:</b> No further mitigation proposed.	0	0	+++	0
Air	4.1 To minimise air emissions during construction and operation	0	-	0	0	<b>Construction effects:</b> The duration of construction would be 3 years. HGV movements during construction are estimated to be 58,643, which will result in vehicle emissions to air. The pipeline route does not come within 1km of any designated AQMA. The route of the pipeline is mainly rural in nature, although there are three urban areas (Oswestry, Pant and Llanymynech) within 1km of the route. Assuming best practice construction standards, there is potential for minor adverse effects towards air emissions from construction activities.  <b>Operational effects:</b> During operation there would be limited vehicle movements associated with this scheme. Given the small scale of the activities required, neutral effects are anticipated.	<b>Construction mitigation:</b> Approved traffic routes for construction traffic will be applied in order to minimise impacts on local roads.  <b>Operation mitigation:</b> No further mitigation proposed.	0	-	0	0
Climatic Factors	5.1 To introduce climate mitigation where required and improve the climate resilience of assets and natural systems	0	0	+++	0	<b>Construction effects:</b> Construction effects associated with this option are assessed as neutral.  <b>Operational effects:</b> This option provides additional water resource and will during operation assist the reliable transfer of water for the benefit of flows in the River Severn and resource availability during times of low flow. This will reduce the vulnerability to increased drought risks associated with climate change and thereby improving resilience to the likely effects of future climate change. These effects are considered to be major positive.	<b>Construction mitigation:</b> No further mitigation proposed.  <b>Operation mitigation:</b> No further mitigation proposed.	0	0	+++	0
	5.2 To minimise embodied and operational emissions	0	-	0	?	<b>Construction effects:</b> During construction the option is estimated to generate carbon emissions of 50,697.28 tCO2e per year, associated with 58,643 HGV movements. Overall, during construction this option is considered to have a minor negative environmental effect on this objective  <b>Operational effects:</b> Information including operational carbon emissions of, and associated HGV movements is not something reviewed at feasibility stage and will be further developed in further stages of the project. Levels of operational carbon from the development and operation of the scheme are currently unknown.	<b>Construction mitigation:</b> Investigate use of renewables during construction and operation for energy supply and use of materials with lower embodied carbon. Carbon footprint study could help identify areas for carbon savings or alternative materials.  <b>Operation mitigation:</b> As the pipeline route is gravity, there is the opportunity for hydropower generation. This opportunity is to be explored further	0	-	0	?
Landscape	6.1 To conserve, protect and enhance landscape and townscape character and visual amenity	0	-	0	0	<b>Construction effects:</b> The pipeline route and individual above ground site locations are within rural locations. The proposed route is not located within 3km of National Park, AONB or greenbelt. However, the route runs adjacent to several areas of deciduous woodland. Sensitive receptors including small villages, hamlets, and towns (Oswestry, Pant and Llanymynech) along the route would be expected to have views of the pipeline route.  Given the construction duration (3 years) and assuming best practice construction standards, effects towards visual amenity will be temporary, small scale and reversible. Minor negative effects are anticipated.  <b>Operational effects:</b> Neutral effect given that the pipeline would be buried.	<b>Construction mitigation:</b> Construction compounds will be sited sensitively and away from residential areas. Approved traffic routes for construction traffic will be applied in order to minimise impacts on local roads.  <b>Operation mitigation:</b> No further mitigation proposed.	0	0	0	0
Historic Environment	7.1 To conserve/protect	0	-	0	0	<b>Construction effects:</b> There are numerous Grade I and II listed buildings within 1km of the proposed route, of which 20 are within 500m.	<b>Construction mitigation:</b>	0	-	0	0



SEA topic	SEA objective	Construction Effects		Operational Effects		Effect Description (including embedded mitigation i.e., costed mitigation that is committed to as part of the scheme)	Further Mitigation	Residual Construction Effects		Residual Operational Effects	
	and enhance historic assets/cultural heritage and their setting, including archaeological important sites					<p>The excavation required for construction is considered small-scale and still represents a risk with respect to unknown buried assets. Construction activities therefore have the potential to affect the setting of these heritage assets. Measures would be taken to avoid disturbance to the setting of these designated assets, although there could be some residual temporary adverse effects with respect to access and enjoyment of these assets. The excavation required for construction at each section of the pipeline is considered small-scale and still represents a risk with respect to unknown buried assets.</p> <p>Overall, minor negative effects are anticipated during construction.</p> <p><b>Operational effects:</b> Neutral effect given that the pipeline would be buried.</p>	<p>The alignment of the pipeline should be developed further during design development and further consultation with Historic England should be undertaken during this process.</p> <p>Sensitive location of construction compounds to avoid heritage assets.</p> <p>The development of an archaeological programme of works including archaeological monitoring is proposed.</p> <p><b>Operation mitigation:</b> Screening where settings of heritage assets would be affected.</p>				
Population and Human Health	8.1 To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing	++	--	+++	0	<p><b>Construction effects:</b> The construction of this option would represent capital investment which is expected to generate a number of employment opportunities and supply chain benefits. The degree of this benefit will be dependent on the contractors' recruitment and supply chain practices and will be temporary. Overall, the benefits are expected to be moderate.</p> <p>There are two noise action important areas within 1km of the Vyrnwy Bypass pipeline route, of which one is crossed by the pipeline on the A483 to the south of Morda. The route also runs through one area with low levels of deprivation for socio-economic criteria, including income, employment, healthcare, and crime, according to the IMD index of multiple deprivation.</p> <p>Therefore, there will be adverse effects such as noise, dust and vibrations associated with construction activities and vehicles (this includes construction of permanent infrastructure, including outfall and pipeline), with minor impacts on health and wellbeing at nearby sensitive receptors such as residential properties of nearby hamlets, villages, and towns.</p> <p>Due to the scale and duration of the construction works and sensitive receptors a moderate effect is anticipated.</p> <p><b>Operational effects:</b> In operation, this element will help to ensure provision of access to a secure resilient supply of drinking water including during times where additional water resources may not be available. Major positive effects are anticipated.</p>	<p><b>Construction mitigation:</b> Construction compounds will be sited sensitively and away from residential areas.</p> <p>Approved traffic routes for construction traffic will be applied in order to minimise impacts on local roads.</p> <p>The hours of working associated with the construction of the pipeline route will be limited to minimise amenity and environmental impacts.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	++	-	+++	0
	8.2 To maintain and enhance tourism and recreation	0	-	0	0	<p><b>Construction effects:</b> During construction, there would be the potential for minor temporary disruption to recreation activities, including at playing fields and public parks located in close proximity to the proposed route, east of Llyncllys, in addition towards a well-connected network of Public Rights of Way (PRoWs) which are crossed at multiple locations along the pipeline route: predominantly to the west of Oswestry, east of Pant, west of Maesbrook and upon approach to the discharge location in the River Severn.</p> <p>The construction of the scheme will also involve five major road crossings and three river crossings and eight minor watercourse crossings, with associated temporary disruption to users.</p> <p><b>Operational effects:</b> In operation, there will be limited effects on any recreation activities associated with the River Severn (e.g., walking, angling) or navigation activities.</p>	<p><b>Construction mitigation:</b> Consider reviewing route to avoid recreational areas. Avoid temporary closure of public rights of way and diversions. Public rights of way reinstated following construction completion. Careful siting and use of screening where work locations are in proximity to public rights of way.</p> <p><b>Operation mitigation:</b> There is the opportunity to improve footpaths and connections in and around proposed pipeline route as part of the construction work, giving rise to a permanent minor beneficial effect.</p>	0	-	+	0
	8.3 To secure resilient water supplies for the health and wellbeing of customers	0	0	+++	0	<p><b>Construction effects:</b> Neutral construction effects are anticipated.</p> <p><b>Operational effects:</b> During operation there would be major positive effect due to the option contributing to a resilient water supply. It will provide essential water supply infrastructure to help support a sustainable socio-economy, through an overall reliable supply benefit of up to 155MI/d.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	0	+++	0
	8.4 To increase access and connect customers to the	0	0	0	0	<p><b>Construction effects:</b> The scheme is located in an area with low levels of deprivation for socio-economic criteria, including education, skills, and training, according to the IMD index of multiple deprivation.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p>	0	0	0	0

SEA topic	SEA objective	Construction Effects		Operational Effects		Effect Description (including embedded mitigation i.e., costed mitigation that is committed to as part of the scheme)	Further Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
	natural environment, provide education or information resources for the public					<b>Operational Effects:</b> Neutral operational effects are anticipated.	<b>Operation mitigation:</b> No further mitigation proposed.				
Material Assets	9.1 To minimise resource use and waste production	0	-	0	?	<b>Construction Effects:</b> The Vyrnwy bypass option branches requires a approximately 17 km of steel/ductile pipeline (1200mm) to be laid to transfer water by gravity into the discharge point on River Severn. Construction materials associated with this option will include new valve chambers at four locations along the pipe route with access roads to these locations for the use of UU operations, and one outfall structure (headwall) at the discharge point into River Severn.  The new minor infrastructure requirements of this option cannot be provided through the re-use or recycling of waste materials, with no opportunities for sustainable design or the use of sustainable materials.  Given the scale of this option and temporary nature of the construction works required (duration of 3 years), minor negative effects are anticipated.  Information including quantity of materials used in construction and waste to landfill arising from construction and operation is not something reviewed at feasibility stage and will be further developed in further stages of the project.  <b>Operational Effects:</b> In operation there will be no additional pumping or chemical requirements, and therefore no increase in energy consumption.  Information including waste to landfill arising from operation is not something reviewed at this stage and will be further developed in further stages of the project. Information about resource use and waste generation is currently unknown.	<b>Construction mitigation:</b> Adoption of waste minimisation measures where practicable. Source materials locally and reinstate excavated materials where possible.  <b>Operation mitigation:</b> No further mitigation proposed.	0	-	0	?
	9.2 To avoid negative effects on built assets and infrastructure	0	-	0	0	<b>Construction Effects:</b> The construction of the pipeline route will involve five major road crossings. However, given that the proposed route is located predominantly in rural areas, avoiding any important buildings/functional sites, and does not cross-national designated cycle routes, minor negative effects are anticipated.  <b>Operational Effects:</b> During operation the pipeline will be buried and effects towards built assets and infrastructure will be negligible.  The option does not involve reducing leakage from the supply network.	<b>Construction mitigation:</b> Consider tunnelling all crossings. Minimise works on infrastructure where open cut during peak periods  <b>Operation mitigation:</b> No further mitigation proposed	0	0	0	0

<b>Element Name</b>	River Vyrnwy Mitigation – Shrewsbury Redeployment (25Mld)
<b>Description</b>	<p>This scheme comprises redeployment of the existing River Severn abstraction at Shrewsbury via diversion of 25 Ml/d treated water from United Utilities (UU) Oswestry WTW to Shrewsbury to supply Severn Trent Water (STW) customers normally supplied from STW's Shelton WTW thus reducing abstraction from the River Severn and temporary transfer of licence to the STT Interconnector transfer point of abstraction. Abstraction at Shrewsbury currently serves STW customers in Shrewsbury and Oswestry. This option would reduce abstraction from the upper River Severn by 25Ml/d at Shrewsbury and leave water in the river for abstraction at Deerhurst.</p> <p>The element has a deployable output benefit of 25Ml/d.</p> <p>Construction requirements for this scheme include minor distribution network enhancements (small booster stations) and WTW process upgrades at the following locations:</p> <ul style="list-style-type: none"> <li>• Enhancements at the Shelton WTW</li> <li>• Upgrade of the Ford pumping station (PS) within the existing site boundary</li> <li>• A new PS for Pant DSR, to be located at Llyncllys</li> <li>• A new booster station to Shelton WTW, to be located to the west of Kinnerley</li> </ul> <p>For each of the new PS and booster stations a construction area and site compound area of 500m<sup>2</sup> has been assumed.</p> <p>This element would only become operational after the 25 Ml/d Vyrnwy Reservoir Release support element, the 155Ml/d Vyrnwy Bypass release, the 35Ml/d Netheridge WwTW effluent diversion support element and the 15 Ml/d Mythe support element have been made available for abstraction at Deerhurst. In consequence, this assessment has had regard to the water environment that includes for this additional water being in the River Severn.</p>

SEA topic	SEA objective	Construction Effects		Operational Effects		Effect Description (including embedded mitigation)	Further Mitigation	Residual Construction Effects		Residual Operational Effects	
		+ve	-ve	+ve	-ve			+ve	-ve	+ve	-ve
	1.1 To protect designated sites and their	0	0	0	0	<b>Construction effects:</b>	<b>Construction mitigation:</b> No further mitigation proposed.	0	0	0	0

SEA topic	SEA objective	Construction Effects		Operational Effects		Effect Description (including embedded mitigation)	Further Mitigation	Residual Construction Effects		Residual Operational Effects	
		+ve	-ve	+ve	-ve			+ve	-ve	+ve	-ve
Biodiversity, flora, and fauna	qualifying features					<p>This element comprises an agreement by Severn Trent Water to reduce abstraction from the upper River Severn at Shrewsbury by 25MI/d, to leave water in the river for abstraction by Thames Water approximately 70 miles downstream at Deerhurst.</p> <p>Potential effects on Midlands Meres Mosses Phase 1 and 2 Ramsar, the Tanat and Vyrnwy Bat Sites SAC, the Severn Estuary SAC, SPA and Ramsar were considered in HRA screening, which concluded no Likely Significant Effect (LSE) on any of these sites. Construction effects are assessed as negligible with only minor works required at existing operational sites (upgrade of existing Ford PS and process enhancements at the Shelton WTW) and the small footprint of the new infrastructure and construction works required (PS and booster stations).</p> <p>The new pumping station for Pant DSR at Llyncllys is located 500m from Llyanymynech and Llyncllys Hills SSSI and over 1km from Morton Pool and Pasture SSSI and Sweeney Fen SSSI. The River Severn SSSI is located 1km from the upgrades at Ford pumping station.</p> <p>The new pumping station for Pant DSR is located within 500m from two areas of priority habitat (deciduous woodland). Several areas of priority habitat are located within 500m of Shelton WTW where enhancements to the works will be required within the existing site. Given the small land take required for the new PS and booster stations (500m<sup>2</sup> each) and assuming best practice construction standards, neutral effects are anticipated during construction.</p> <p><b>Operational effects:</b></p> <p>During operation of this element there is potential for hydrological changes to impact on the Midland Meres and Mosses Phase 1 and Phase 2, Tanat and Vyrnwy Bat Sites SAC and the Severn Estuary SAC, SPA and Ramsar site. As the Midland Meres and Mosses Ramsar sites are not hydrologically dependent on the River Vyrnwy or River Severn for maintenance of the water level or condition of adjacent wetland habitats and lesser horseshoe bats are not classed as water dependent, no LSE from the operation of Shrewsbury redeployment are anticipated. Although hydrologically connected to the Severn Estuary, no LSE are anticipated when considering the Shrewsbury redeployment in isolation, due to the small abstraction reduction proposed in comparison to the natural flows present in the estuary.</p>	Operation mitigation: No further mitigation proposed.				
	1.2 To avoid a net reduction, and where possible enhance, in non-monetised natural capital assets	0	0	+	0	<p><b>Construction Effects:</b></p> <p>This assessment assumes minor upgrade works only which will not cause any permanent change to habitats, natural capital or ecosystem services.</p> <p>The Draft Natural Capital Assessment found neutral effects during construction.</p> <p><b>Operational effects:</b></p> <p>Minor benefit to biodiversity natural capital is possible as priority habitats along the riverbank may be better supported during low flow conditions due to increased river flow during drought conditions. Potential minor benefits to water purification and carbon regulation ecosystem services due to improved condition of vegetation.</p> <p>The Draft Natural Capital Assessment found a minor positive effect during operation.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	0	+	0
	1.3 To protect and enhance biodiversity, priority habitats and species	0	0	0	0	<p><b>Construction effects:</b></p> <p>The existing operational sites (Ford PS and Shelton WTW) are located within the Meres Mosses National Priority Focus Area. All rivers are considered to be priority habitats under the National Priority Habitats Inventory.</p> <p>Construction effects are assessed as neutral with only minor works required at existing operational sites (Ford PS and Shelton WTW) and minor new infrastructure requirements (PS and booster stations).</p> <p><b>Operational effects:</b></p> <p>European eel (<i>Anguilla anguilla</i>) and lamprey have been recorded in the waterbody. In operation there would be a 25MI/d reduction in abstraction from the River Severn at Shrewsbury for intermittent periods. These flow changes would continue along the River Severn to the re-abstraction location with no overall change in flows to the Severn Estuary. In leaving 25MI/d in the River Severn, the impact will be neutral.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	0	0	0
	1.4 To avoid and, where required, manage invasive and non-native species (INNS)	0	0	0	0	<p><b>Construction effects:</b></p> <p>There is a risk of introducing INNS through construction activities, although only minor construction works are required. During construction mitigation measures will be in place to avoid spread of INNS. Invasive species on site are to be identified and removed or treated in advance of construction works. In consideration of best practice mitigation measures the risk is considered neutral.</p> <p><b>Operational effects:</b></p> <p>The operation of this scheme would provide a pathway for distribution of INNS; however, this pathway is already present and will not be considered new. The increased volume of the releases could result in a slight increase in the distribution of INNS, but the impact would be considered negligible, given the scale of the existing regulation releases from Vyrnwy reservoir to the River Vyrnwy and the INNS risks in the catchment.</p> <p>Equally, the scheme is assessed as having a negligible beneficial effect on controlling the spread of INNS in the river system. In operation there would be an additional 25MI/d transfer to the River Thames at times when transfer is required below the Hands off Flow conditions on the River Severn. Overall, neutral effects are anticipated in operation.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	0	0	0
	1.5 To meet WFD objectives relating to biodiversity	0	0	0	0	<p><b>Construction effects:</b></p> <p>Construction effects are assessed as neutral with only minor works required at existing operational sites and small land take required for new infrastructure requirements.</p> <p><b>Operational effects:</b></p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p>	0	0	0	0

SEA topic	SEA objective	Construction Effects		Operational Effects		Effect Description (including embedded mitigation)	Further Mitigation	Residual Construction Effects		Residual Operational Effects	
		+ve	-ve	+ve	-ve			+ve	-ve	+ve	-ve
						In operation there would be a 25MI/d reduction in abstraction from the River Severn at Shrewsbury for intermittent periods. These flow changes would continue along the River Severn to the re-abstraction location with no overall change in flows to the Severn Estuary. In leaving 25MI/d in the River Severn, the risk to WFD deterioration is considered negligible given the relative flows in the Severn at this location compared to the flow release volume.	<b>Operation mitigation:</b> No further mitigation proposed.				
Soil	2.1 To protect and enhance the functionality, quantity, and quality of soils, including the protection of high-grade agricultural land	0	-	0	0	<p><b>Construction effects:</b> Shelton WTW and other sites for network enhancement, are located in Grade 3 agricultural land. The Shrewsbury intake is located on the western bank of the River Severn, near Shrewsbury, also within Grade 3 agricultural land.</p> <p>There are 14 historic landfill sites within 3km of the Shelton WTW and Shrewsbury intake. There are three historic landfill sites within 3km of the Ford PS site. There is one historic landfill site within 3km of and the booster station to Shelton. There are two historic landfill sites within 3km of the Pant DSR.</p> <p>Given the minor infrastructure requirements and small permanent land take required (500m<sup>2</sup> for each new PS and booster stations (0.2ha total)), there will be limited impacts on land, soils, or geology. Overall, minor negative effects are anticipated.</p> <p><b>Operational effects:</b> There are no catchment management practices associated with the scheme and there are no opportunities to directly promote catchment land management.</p> <p>The operation of the scheme will not affect land use, soils, or geology.</p>	<p><b>Construction mitigation:</b> Review location of Booster 2 station to avoid location within Grade 2 agricultural land.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	-	0	0
Water	3.1 To minimise or manage flood risk, taking climate change into account	0	0	0	0	<p><b>Construction effects:</b> The Shelton WTW and network enhancements are not located in proximity to any watercourses or within EA Flood Zones 2 and 3. The intake is however located on the western bank of the River Severn, near Shrewsbury, within EA Flood Zones 2 and 3. Given that no construction is required at the intake, no effects on flood risk are anticipated.</p> <p><b>Operational effects:</b> In operation there would be a 25MI/d reduction in abstraction from the River Severn at Shrewsbury typically in the months July to October, peaking in August at 47% of days in August. Outside this period, there would be less regular flow changes in June and November, with changes very rare in May, December and January and not anticipated in February, March, or April. These flow changes would continue along the River Severn to the re-abstraction location with no overall change in flows to the Severn Estuary. In the River Severn effects towards flows and existing flood risk would be neutral.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	0	0	0
	3.2 To enhance or maintain groundwater quality and resources	0	0	0	0	<p><b>Construction effects:</b> Construction effects are assessed as neutral with only minor works required at existing operational sites and small land take required for new infrastructure requirements.</p> <p><b>Operational effects:</b> Scheme operational effects will not impact on groundwater.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	0	0	0
	3.3 To enhance or maintain surface water quality, flows and quantity	0	0	0	0	<p><b>Construction effects:</b> Construction effects are assessed as neutral with only minor works required at existing operational sites and small land take required for new infrastructure requirements (i.e., network enhancements), which are not located in proximity to any watercourses.</p> <p><b>Operational effects:</b> In operation there would be a 25MI/d reduction in abstraction from the River Severn at Shrewsbury for typically in the months July to October, peaking in August at 47% of days in August. Outside this period, there would be less regular flow changes in June and November, with changes very rare in May, December and January and not anticipated in February, March or April. These flow changes would continue along the River Severn to the re-abstraction location with no overall change in flows to the Severn Estuary. In the River Severn flow effects would be neutral.</p> <p>As the element is a reduction in abstraction there are no adverse water quality considerations.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	0	0	0
	3.4 To meet WFD objectives	0	0	0	0	<p><b>Construction effects:</b> Option construction impacts are neutral for WFD compliance with only minor works required at existing operational sites and small land take required for new infrastructure requirements.</p> <p><b>Operational effects:</b> The tests of constraint of the option against WFD regulations objectives identify no potential non-compliance with ecology or chemical status targets. This is assessed as a neutral effect.</p> <p>As well as the tests of WFD constraint, other WFD objectives relate to whether the option assists the meeting of WFD objectives for the water body, for associated WFD protected areas or reduces the treatment needed to produce drinking water and look to work in partnership with others. The option is considered neutral for these during construction and operation.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	0	0	0
	3.5 To improve water efficiency through provision of	0	0	++	0	<p><b>Construction effects:</b> Construction effects are assessed as neutral with only minor works required at existing operational sites and small land take required for new infrastructure requirements.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p>	0	0	++	0

SEA topic	SEA objective	Construction Effects		Operational Effects		Effect Description (including embedded mitigation)	Further Mitigation	Residual Construction Effects		Residual Operational Effects	
		+ve	-ve	+ve	-ve			+ve	-ve	+ve	-ve
	access to a resilient and sustainable supply of water.					<b>Operational effects:</b> The scheme makes use of an existing licensed source of water and uses a surplus, sustainable abstraction volume. The scheme would not have direct effects on water efficiency but would enable the 25 Ml/d to be made available for Thames Water. A moderate beneficial effect is considered to result from this option.	<b>Operation mitigation:</b> No further mitigation proposed.				
Air	4.1 To minimise air emissions during construction and operation	0	0	0	0	<b>Construction effects:</b> The scheme construction works will take place within 500m of the following urban areas: Shrewsbury (Shelton WTW and intake), Ford (Ford PS), Llnclys (PS at Pant DSR). However, it is only envisaged a requirement for some 120 HGVs over a two-year period associated with the development proposed under this option. In consequence there are no effects expected on air quality or AQMA's resulting from this option. <b>Operational effects:</b> The operational site at the Shrewsbury intake is located within 2km of the Shrewsbury AQMA No.3. In operation, a negligible number of HGV movements (5/year) would be required for transportation of chemicals for treatment at Shelton WTW and waste to landfill, resulting in a negligible impact on local emissions to air.	<b>Construction mitigation:</b> No further mitigation proposed.  <b>Operation mitigation:</b> No further mitigation proposed.	0	0	0	0
Climatic Factors	5.1 To introduce climate mitigation where required and improve the climate resilience of assets and natural systems	0	0	++	0	<b>Construction effects:</b> Construction effects are assessed as neutral with only minor works required, including process enhancements at the Shelton WTW, upgrades at the Ford PS and construction of two new PS and booster stations. <b>Operational effects:</b> The operation of this scheme would provide a deployable output benefit of 25Ml/d through transfer of flows in the River Thames and increased resource availability in the London and the South East during times of low flow conditions and/or drought conditions, reducing the vulnerability to drought risk associated with climate change. A moderate beneficial effect is considered to result from this option.	<b>Construction mitigation:</b> No further mitigation proposed.  <b>Operation mitigation:</b> No further mitigation proposed.	0	0	++	0
	5.2 To minimise embodied and operational emissions	0	-	0	--	<b>Construction effects:</b> Construction associated with this scheme is minor of scale with a small increase in CO <sub>2</sub> emissions (488.5t CO <sub>2</sub> e), limited to process enhancements at the Shelton WTW, upgrades at the Ford PS and construction of two new PS and booster stations. <b>Operational effects:</b> The operation of this option proposes the use of renewable energy. However, in operation, the scheme will result in an increase in CO <sub>2</sub> emissions (4,078t CO <sub>2</sub> e/year), which will have a moderate negative effect on this objective.	<b>Construction mitigation:</b> Investigate use of renewables during construction and operation for energy supply and use of materials with lower embodied carbon. Carbon footprint study could help identify areas for carbon savings or alternative materials. <b>Operation mitigation:</b> No further mitigation proposed.	0	-	0	--
Landscape	6.1 To conserve, protect and enhance landscape and townscape character and visual amenity	0	0	0	0	<b>Construction effects:</b> Construction associated with this scheme is minor of scale, limited to process enhancements at the Shelton WTW, upgrades at the Ford PS and construction of two new PS and booster stations. There are no AONBs, national parks, Greenbelt areas or viewpoints within 3km of the scheme and there would not be any effects on the local landscape or townscape. <b>Operational effects:</b> No impacts on landscape or visual amenity along the River Severn are expected in operation.	<b>Construction mitigation:</b> No further mitigation proposed.  <b>Operation mitigation:</b> No further mitigation proposed.	0	0	0	0
Historic Environment	7.1 To conserve/protect and enhance historic assets/cultural heritage and their setting, including archaeological important sites	0	0	0	0	<b>Construction effects:</b> There are several scheduled monuments within 3km of the scheme, including Offa's Dyke, Blodwell Rock Camp, Belan Bank, Knockin Castle, a Motte and Bailey Castle, Alberbury Castle, Wattlesborough Castle, Ringwork and Bailey Castle, Little Shawaradine Motte and Bailey Castle and Shawaradine Castle. There are two registered parks and gardens within 2km of the scheme, including the Berwick Park registered Park and Gardens and the Pradoc registered Park and Gardens and there are numerous listed buildings within 1km of the scheme. Construction associated with this scheme is, however, of a minor of scale, limited to process enhancements at the Shelton WTW, upgrades at the Ford PS and construction of new PS and booster stations. In consequence, the construction of this option will have no effect on heritage assets or archaeology. <b>Operational effects:</b> No impacts towards cultural or heritage assets are expected in operation.	<b>Construction mitigation:</b> No further mitigation proposed.  <b>Operation mitigation:</b> No further mitigation proposed.	0	0	0	0
Population and Human Health	8.1 To maintain and enhance the health and wellbeing of the local community, including	0	0	++	0	<b>Construction effects:</b> The scheme is located in an area with low levels of deprivation for socio-economic criteria, including income, employment, healthcare, and crime, according to the IMD index of multiple deprivation. Construction associated with this scheme is minor of scale, limited to process enhancements at the Shelton WTW, upgrades at the Ford PS and construction of new PS and booster stations. The construction of this option would represent limited capital investment which is expected to generate limited employment opportunities and supply chain benefits. Overall, the construction effects are expected to be neutral. <b>Operational effects:</b>	<b>Construction mitigation:</b> No further mitigation proposed.  <b>Operation mitigation:</b> No further mitigation proposed.	0	0	++	0

SEA topic	SEA objective	Construction Effects		Operational Effects		Effect Description (including embedded mitigation)	Further Mitigation	Residual Construction Effects		Residual Operational Effects	
		+ve	-ve	+ve	-ve			+ve	-ve	+ve	-ve
	economic and social wellbeing					During operation, the scheme will help to support a sustainable socio-economy, through a resilient 25MI/d benefit associated with water transfer to the River Thames. In turn, this will support economic and population growth generating a moderate positive effect on this objective.					
	8.2 To maintain and enhance tourism and recreation	0	0	0	0	<p><b>Construction effects:</b> Construction associated with this scheme is minor of scale, limited to process enhancements at the Shelton WTW, upgrades at the Ford PS and construction of new PS and booster stations. Overall, the construction effects are expected to be neutral.</p> <p><b>Operational effects:</b> In operation water will be abstracted from an existing intake at times of low flows in the lower River Severn, with no overall change in flows to the Severn Estuary. Therefore, there will be no impact on recreation, tourism, or navigation.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	0	0	0
	8.3 To secure resilient water supplies for the health and wellbeing of customers	0	0	++	0	<p><b>Construction effects:</b> Construction associated with this scheme is minor of scale, limited to process enhancements at the Shelton WTW, upgrades at the Ford PS and construction of new PS and booster stations. Overall, the construction effects are expected to be neutral.</p> <p><b>Operational effects:</b> The scheme will support the transfer of raw water supplies into the Thames Water area by up to 25MI/d and therefore helping to ensure provision of access to a secure resilient water supply to support health and well-being. Thereby generating a moderate positive effect on this objective.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	0	++	0
	8.4 To increase access and connect customers to the natural environment, provide education or information resources for the public	0	0	0	0	<p><b>Construction effects:</b> The scheme is located in an area with low levels of deprivation for socio-economic criteria, including education, skills, and training, according to the IMD index of multiple deprivation. The construction associated with this scheme is minor of scale, limited to process enhancements at the Shelton WTW, upgrades at the Ford PS and construction of new PS and booster stations. Overall, the construction effects are expected to be neutral.</p> <p><b>Operational Effects:</b> Neutral operational effects are anticipated.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	0	0	0
Material Assets	9.1 To minimise resource use and waste production	0	-	+	-	<p><b>Construction Effects:</b> Construction effects are assessed as minor negative, given the low number of HGV movements over the 24-month construction period (120), small amount of waste generated during construction (250m<sup>3</sup>) and the minor works required at existing operational sites (limited to process enhancements at the Shelton WTW, upgrades at the Ford PS) and small land take (0.2ha) required for the new infrastructure (new PS and booster stations).</p> <p><b>Operational Effects:</b> The water abstracted at Thames Water intakes will require some treatment chemicals (17,703 kg/year) and power use for the additional pumping and process enhancements at the Shelton WTW (7,594,920 kWh). However, 100% of the power requirements of the scheme will be supplied by a renewable energy source. Given the size of the scheme the effects from this are assessed as minor.</p> <p>There may also be some beneficial impacts regarding efficient material usage as the scheme makes use of existing intake infrastructure and requires limited construction. Furthermore, the use of an existing licence could be considered a minor positive effect regarding efficient water resources management.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	-	+	-
	9.2 To avoid negative effects on built assets and infrastructure	0	0	0	0	<p><b>Construction Effects:</b> Construction associated with this scheme is minor of scale, limited to process enhancements at the Shelton WTW, upgrades at the Ford PS and construction of new PS and booster stations. This option will not result in any material effects on built assets or infrastructure.</p> <p><b>Operational Effects:</b> During operation effects towards built assets and infrastructure will be neutral.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed.</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	0	0	0

<b>Element Name</b>	Full STT solution- pipeline conveyance, Deerhurst to Culham 500 MI/d
<b>Description</b>	<p>Water would be pumped from a new River Severn abstraction (up to 500MI/d) at Deerhurst near Tewkesbury, over the Cotswold hills, and then discharged into the River Thames near Culham. The main components are:</p> <ul style="list-style-type: none"> <li>• Abstraction from the River Severn via a river intake structure at Deerhurst including inlet screens and a twin pipeline (365m) to a low lift pump station</li> <li>• Raw water (low lift) pumping station (PS) transferring raw water via a twin pipeline (1.1km) to treatment works</li> <li>• Treatment works to control phosphorous, suspended solids, algae, and invasive species</li> <li>• Treated water PS (high lift) with standby pumps</li> <li>• A rising main (21.5km) to the break pressure tank</li> <li>• A break pressure tank at the high point near Farmcote</li> <li>• A gravity main (63.7km) to outfall structure at Culham</li> <li>• An outfall at Culham with an actuated valve and an aeration cascade</li> <li>• Washouts along the route provided with permanent discharge pipework to adjacent watercourses</li> </ul>

SEA topic	SEA objective	Construction Effects		Operational Effects		Effect Description (including embedded mitigation)	Further Mitigation	Residual Construction Effects		Residual Operational Effects	
		+ve	-ve	+ve	-ve			+ve	-ve	+ve	-ve
Biodiversity, flora and fauna	1.1 To protect designated sites and their qualifying features	0	--	+	--	<p><b>Construction effects:</b></p> <p>Construction areas comprise the pipeline (85km with up to 40m temporary working width with some sections being 20m and 0m); nine main construction compounds (35,000m<sup>2</sup>); 437 satellite compounds (20,000m<sup>2</sup>) and areas adjacent to permanent sites (total 42,600m<sup>2</sup>).</p> <p>The potential for effects on Cothill Fen SAC, Little Wittenham SAC, Bredon Hill SAC, Chilterns Beechwoods SAC, Hartslock Wood SAC, and were considered in the HRA screening, which concluded no Likely Significant Effect (LSE) in all these cases. LSE were identified in relation to the Dixton Wood SAC due to an area of deciduous woodland identified within the footprint of the proposed pipeline that could be functionally linked habitat for violet click beetle <i>Limoniscus violaceus</i> (within 1 km from Dixton Wood SAC) and the potential for increased air pollution. However, the appropriate assessment concluded that due to the low habitat suitability of the woodland present within the footprint of the proposed pipeline, the distance of the site and the temporary nature of the construction activities no adverse effects are identified.</p> <p>The HRA screening also concluded LSE for the Severn Estuary SAC, Severn Estuary SPA and Severn Estuary Ramsar designations, due to the potential for effects on functionally linked habitat for qualifying fish species and supporting habitat for qualifying bird species. However, based on the short-term nature of proposed construction works and small area of impact in relation to the River Severn, no adverse effects on qualifying fish of the Severn Estuary SAC and Ramsar are anticipated, and with implementation of suitable mitigation measures no adverse effects are anticipated on the qualifying bird species of the SPA and Ramsar site.</p> <p>Best practice construction techniques such as biosecurity measures, in accordance with Pollution Prevention Guidelines are assumed as embedded mitigation combined with mitigation measures to reduce in-river disturbance during construction (no night time works and restricted timing outside of migration periods) plus best practice biosecurity and pollution incident avoidance</p> <p>Within 1km of the scheme are six SSSIs these are Grafton Lock Meadows, Chimney Meadows, Harford Railway Cutting, Turvey's Piece, Lark Wood and Dixton Wood (Lamb and Flag Quarry is a geological SSSI within 1km). Mitigation includes application of best practice construction techniques and approved Construction and Environmental Management Plan.</p> <p>The scheme is within 1km of a number of areas of ancient woodland with 20 areas located within 350m of the pipeline route. In particular the route is adjacent to areas of ancient woodland in the vicinity of Guiting Wood. Where close to ancient woodland and wood pasture habitat areas, tree surveys will be undertaken prior to construction to assist tree retention. Protection requirements will be identified to ensure the final pipeline route avoids unnecessary removal of trees, hedgerows or other important vegetation. Any affected hedgerows will be reinstated. In proximity to Ancient Woodland locations soils are to be stored and reinstated following construction to maintain seedbanks. Construction compounds would be sited sensitively and away from designated habitats and working widths of construction will avoid designated areas. In consideration of these mitigation measures the impacts of these risks are considered moderate.</p> <p><b>Operational effects:</b></p> <p>For the Severn Estuary SAC and Severn Estuary Ramsar designated areas the hands off flow condition will provide protection to the downstream river environment and aquatic ecology, including migratory fish species.</p> <p>The available data (modelled and measured) indicates that changes in flow, velocity and depth will not be discernible and will not result in a change in the quality or quantity of supporting habitat within the River Severn (and tributaries) or within the Severn Estuary. As such, no risk to adverse effects on site integrity have been identified for the Severn Estuary SAC and Severn Estuary Ramsar designated. This is because the changes in flow including pass forward flow into the estuary) and the resulting changes in velocity, depth and water level will be within the interannual variations that would be observed under baseline conditions. The available data also indicates that changes in water quality will be minimal.</p> <p>In addition, the use of two stage screening (bar and band) will reduce the likelihood of entrapment during operation. This includes large bar screens and band screens fitted with fish return channels to isolate fish and return individuals directly back to the watercourse. Considering the proposed mitigation measures for this option component, the appropriate assessment concluded no adverse effect on site integrity. Eel regulation compliant inlet screens are proposed.</p> <p>The land take for the permanent above ground features of the scheme totals 87,176m<sup>2</sup> and comprises the intake at the River Severn, the raw water low lift pump station and associated electrical building, the treatment works, the break pressure tank and the outfall at the River Thames. The abstracted water would be discharged into the River Thames at Culham which has been carefully selected as the discharge location to minimise any adverse effects on the river environment. The abstracted</p>	Construction mitigation: Discussions with NE regarding ancient woodland protection measures.  The detail of the working areas (and in some cases construction areas and pipeline itself) will be reviewed with HE and NE as part of the further detailed design of the scheme.	0	-	+	-

SEA topic	SEA objective	Construction Effects		Operational Effects		Effect Description (including embedded mitigation)	Further Mitigation	Residual Construction Effects		Residual Operational Effects	
		+ve	-ve	+ve	-ve			+ve	-ve	+ve	-ve
						<p>water will be pre-treated to address water quality risks and risks of the spread of INNS and therefore, no adverse impacts on Culham Brake SSSI is expected.</p> <p>Taking account of these water treatment mitigation measures, the likely residual adverse effects of the discharge to the River Thames relate to the increases in the low flow to extreme low flow arising from the discharge of 500 Ml/d, in particular risks to the flow regime of the weir pools in the reaches below the discharge point - higher flows and/or more variable changes in flow under low flow conditions may lead to a loss of shallows and increased flow velocities which can reduce habitat availability for the full range of fish, invertebrates and plants living in these reaches. Overall, the operational impacts are considered moderate.</p> <p>Opportunity for habitat enhancement when reinstating land as well as biodiversity net gain opportunities resulting in minor positive effect.</p>					
	1.2 To avoid a net reduction, and where possible enhance, in non-monetised natural capital assets	0	--	0	-	<p><b>Construction Effects:</b> Construction will lead to loss or degradation of enclosed farmland, woodland and freshwater natural capital stock, with potential associated disbenefits to biodiversity, carbon regulation, natural hazard regulation and water purification services. There is also potential short-term impacts to recreation and wellbeing if construction causes loss of access to recreation sites within the zone of influence. The Draft Natural Capital Assessment found a moderate negative effect during construction.</p> <p><b>Operational effects:</b> The Draft Natural Capital Assessment found a minor negative effect during operation.</p>	<p><b>Construction mitigation:</b> Minimise impact on key habitat areas especially woodland which will also ensure carbon sequestration rate reduction is not compromised. Investigate further key areas of BNG opportunity with an additional focus on aquatic area as this if currently under represented during to lack of information and will affect benefits scoring</p> <p><b>Operation mitigation:</b> Delivery of required Biodiversity net gain (BNG) to offset construction losses (woodland and traditional orchard creation) will result in benefits to natural capital stocks and ecosystem service provision, including biodiversity, carbon regulation, natural hazard regulation and water purification. Potential benefits to recreation are dependent on design of BNG mitigation.</p>	0	--	++	-
	1.3 To protect and enhance biodiversity, priority habitats and species	0	--	0	--	<p><b>Construction effects:</b> The intake is within an area of coastal and floodplain grazing marsh priority habitat. The raw water PS and the WTW are adjacent to deciduous woodland priority habitat. The pipeline route passes through a number of additional areas of priority habitat (traditional orchards; lowland meadows, lowland calcareous grassland; deciduous woodland) and the majority of the scheme is located within a National Priority Focus Area. If site specific ecological assessments identify any impacts to protected species or habitats associated with the construction work, appropriate mitigation measures including (where appropriate) relocation of such species will be undertaken in advance of the works being undertaken. On account of the number of priority areas and habitats impacted and duration of construction works moderate negative effects are expected during construction.</p> <p><b>Operational effects:</b> Loss of priority habitat would have occurred during construction. Maintenance activities to avoid priority habitat areas. Priority habitats and species have been identified within the River Thames downstream of the discharge location. Increased water levels could result in inundation of floodplain and grazing marshes during the summer periods resulting in minor to moderate impacts.</p>	<p><b>Construction mitigation:</b> Tunnelling for all sections of route which goes through priority habitat. The detail of the working areas (and in some cases construction areas and pipeline itself) will be reviewed with NE as part of the further detailed design of the scheme.</p> <p><b>Operation mitigation:</b> Further monitoring required to confirm the potential impact on priority habitats</p>	0	-	0	-
	1.4 To avoid and, where required, manage invasive and non-native species (INNS)	0	0	0	0	<p><b>Construction effects:</b> Whilst there is a potential risk of spreading INNS during construction. Mitigation measures including best practice construction practices, the identification and removal of invasive species on site in advance of construction and pipeline commissioning with treated water. In consideration of these mitigation measures the impacts of these risks are considered neutral.</p> <p><b>Operational effects:</b> A risk assessment adopting the EA pathway approach has identified that this element presents a high risk for the transfer and distribution of INNS. This assessment does not consider the implementation of any mitigation measures. However, INNS transfer from the River Severn is not considered likely. The main treatment works is located close to the intake to help ensure that INNS will be removed as far as reasonably practicable before transfer, reducing the risk of accidental release into the River Thames catchment. Inlet screens and rapid gravity filtration (removes 99 % of 5 µm sized particles) with bypass safeguards will be used to remove larvae of invasive species before transfer of raw water from Deerhurst to Culham. Overall, the operational impacts are considered neutral.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	0	0	0
	1.5 To meet WFD objectives	0	-	0	--	<p><b>Construction effects:</b> There will be numerous watercourse crossings during pipeline construction. Construction impacts, including intake, pipeline and outfall headworks construction are assessed as a minor negative effect.</p>	<p><b>Construction mitigation:</b> Tunnelling for all water courses where needed in addition to those specified.</p>	0	0	0	-



SEA topic	SEA objective	Construction Effects		Operational Effects		Effect Description (including embedded mitigation)	Further Mitigation	Residual Construction Effects		Residual Operational Effects	
		+ve	-ve	+ve	-ve			+ve	-ve	+ve	-ve
	relating to biodiversity					<p><b>Operational effects:</b></p> <p>The River Severn water body is associated with a nutrient sensitive area; however, the scheme will not affect the management of the protected area and no material changes in water quality are expected. The abstracted water would be discharged into the River Thames at Culham. The operation of the scheme during dry periods would lessen the pressure on other sources that abstract from more limited water resources that could be under particular pressure at such times.</p> <p>The WFD assessment identified that the effects of the discharge on the waterbodies downstream of the discharge/augmentation point at Culham (GB106039030334; GB106039030331; GB106039023233; and GB106039023232) are unlikely to lead to a change in WFD ecological status, but there may be some adverse effects on the habitat conditions in the river reaches immediately downstream of Culham. Confidence in the extent of changes in wetted habitat, water quality and water chemistry would require further investigation and potentially further treatment of discharged water. Having regard to the pipeline capacity moderate adverse effects are anticipated.</p>	With further consideration of watercourses to cross without in-channel works, construction impacts would be neutral for WFD compliance.				
Soil	2.1 To protect and enhance the functionality, quantity and quality of soils, including the protection of high-grade agricultural land	0	--	0	0	<p><b>Construction effects:</b></p> <p>The scheme passes through numerous areas of best and most versatile agricultural land. This includes areas of Grade 2 land near Bishop's Cleve (approximately 720m), Lechlade (approximately 5km), Hinton Waldrest (approximately 2km), Marcham (approximately 500m) and Culham (approximately 1km). The potential effects on soils are mostly temporary in nature and these effects will be reversible.</p> <p>One geological SSSI (Lamb and Flag Quarry) is located in close proximity to the pipeline construction area (approximately 190m from the construction area). However, with a 40m wide easement corridor during pipeline construction the potential for adverse effects on this designated site is considered negligible.</p> <p>The scheme is within 350m of three historic landfill sites and within 350m of permitted landfills at Walton Hill Farm and Sutton Wick (three sites) near Culham. The scheme runs adjacent to the Sutton Wick landfills. However, the regulation of these sites should mitigate any contamination issues.</p> <p>Mitigation measures include the storage of topsoil and subsoils to minimise natural drainage flow paths. Measures will also be taken to protect any temporary exposure of bare soil from runoff during heavy rainfall events. Earthwork's drainage will be controlled including use of temporary settlement ponds.</p> <p>Overall, the construction impacts are considered moderate</p> <p><b>Operational effects:</b></p> <p>The operation of the scheme will not affect land use, soils, or geology.</p>	<p><b>Construction mitigation:</b></p> <p>Review the pipeline route to minimise disruption to best and most versatile agricultural land. Limiting the extent of pipeline construction at any one time i.e., to the minimum required and reducing the working area will minimise soil disturbance.</p> <p>Ensure construction areas avoid SSSIs.</p> <p><b>Operation mitigation:</b></p> <p>No further mitigation proposed.</p>	0	-	0	0
Water	3.1 To minimise or manage flood risk, taking climate change into account	0	--	0	0	<p><b>Construction effects:</b></p> <p>The scheme would pass through a number of rivers. These include those to the south of Tewkesbury in the vicinity of the Deerhurst WTW; to the south of Northleach; to the north and east of Lechlade; to the south of Marcham and around Culham. Five main rivers would be crossed via tunnelling. Eight rivers and 25 streams will be crossed by the pipeline.</p> <p>The scheme is within flood zone 3 at the intake and near Deerhurst; Southrop; a large area to the south of Clanfield; south of Kingston Bagpuize; large area near Marcham; large area near Culham. The scheme also passes through a number of areas of flood zone 2.</p> <p>Existing flood defences are in the vicinity of Deerhurst WTW.</p> <p>Construction compounds would be sited sensitively and away from flood risk zones. Adequate methods of construction will be adopted to minimise the impact, including sheet piling, dewatering and treatment of the groundwater prior to discharge. Flood compensation ponds will be constructed as part of the enabling works. Earthwork's sequencing will include cofferdam formation to avoid flooding of borrow areas during construction.</p> <p>Given the scope of the construction works a moderate significant effect on flood risk has been identified.</p> <p><b>Operational effects:</b></p> <p>The scheme would not affect flood storage once operational and the necessary flood plain compensation complete.</p>	<p><b>Construction mitigation:</b></p> <p>Further mitigation measures will be set out in the applications for Flood Defence Consents where these are required for the river crossing construction works.</p> <p>The intake and outfall sites would be located within the flood plain and as such compensation may be required. This would be assessed during detailed design.</p> <p><b>Operation mitigation:</b></p> <p>No further mitigation proposed.</p>	0	-	0	0
	3.2 To enhance or maintain groundwater quality and resources	0	-	0	0	<p><b>Construction effects:</b></p> <p>Most of the scheme is within a WFD groundwater body.</p> <p>Following the rerouting of the pipeline during Gate 2 the scheme does not pass through any Source Protection Zones.</p> <p>During construction of the pipeline, areas with high permeability and high groundwater levels would require permits to be obtained by the contractor from the relevant authorities for the disposal of the groundwater to a suitable location. Where possible water would be retained and used for hydrostatic testing of the next section. There would also be a need for lagoons to intercept and treat the commissioning wastewater. The lagoons would need to be available prior to pressure testing and land would be reinstated after commissioning. All vehicles and any chemical/oil storage will be fully bunded to prevent any accidental pollution of groundwater.</p> <p>Overall, a minor negative effect on groundwater is considered.</p> <p><b>Operational effects:</b></p> <p>The scheme would not affect groundwater quality and resources once operational.</p>	<p><b>Construction mitigation:</b></p> <p>Further mitigation measures will be developed in consultation with the regulators as part of the detailed design process</p> <p><b>Operation mitigation:</b></p> <p>No further mitigation proposed.</p>	0	0	0	0
	3.3 To enhance or maintain surface water	0	--	0	--	<p><b>Construction effects:</b></p>	<p><b>Construction mitigation:</b></p> <p>Further mitigation measures will be set out in the applications for Flood Defence</p>	0	-	0	-

SEA topic	SEA objective	Construction Effects		Operational Effects		Effect Description (including embedded mitigation)	Further Mitigation	Residual Construction Effects		Residual Operational Effects	
		+ve	-ve	+ve	-ve			+ve	-ve	+ve	-ve
	quality, flows and quantity					<p>The pipeline routes would have several major crossings. Five main rivers would be crossed via tunnelling and 25 streams will be crossed by the pipeline. Construction of discharge and abstraction points and pipeline river crossings have the potential to affect water quality in the rivers.</p> <p>For construction purposes a temporary commissioning lagoon would be constructed near the outfall location. A proposed location of the temporary lagoon required at the outfall to treat the first flush at commissioning has been chosen outside Flood Zones 2 and 3. The storage of materials including any topsoil and subsoils removed during construction is to be undertaken to minimise natural drainage flow paths. Measures will be taken to protect any temporary exposure of bare soil from runoff during heavy rainfall events. All vehicles and any chemical/oil storage will be fully bunded to prevent any accidental pollution of watercourses. Pre-construction land drainage will be installed as part of the enabling works and land drainage will be fully re-established during the reinstatement. Where land is sloping towards a watercourse, a buffer grass strip and straw bales will be provided as appropriate to stop sediment from the site running off-site untreated (usually cut off drains are installed).</p> <p>Given the scale of the construction activities required, moderate negative effects are anticipated.</p> <p><b>Operational effects:</b> In operation there would be up to 500MI/d abstraction from the lower River Severn for intermittent periods.</p> <p>The indicative system operation pattern shows the STT solution abstraction occurring in 24 of the 47 years, and on 11% of days overall. This would include unsupported abstraction from the lower River Severn at times of moderate or moderate low flows in the River Severn, particularly in the October and November period, subject to tiered hands-off flow conditions with abstraction not reducing flows below 2,568MI/d. At times of low flows locally abstraction would be lower, partially or wholly supported by STT support releases with no overall change in flows to the Severn Estuary. The potential changes in flow in the River Severn (as associated with either a supported or unsupported STT) are not considered discernible and will likely fall within the inter annual variations that would be observed under reference conditions.</p> <p>Releases to the middle River Thames at the Culham outfall would follow this pattern. The overall pattern of transfer is in response to low river flows in the lower River Thames, and lower than target reservoir storage. The STT solution would episodically augment flow via up to 500 MI/d unsupported, 353 MI/d supported, or 20 MI/d for pipeline maintenance. These flow changes would be large when augmenting low flow periods in the River Thames and would occur for long durations when in use. In the 100km reach of the River Thames from the transfer outfall to Windsor, where re-abstraction would commence, the flow effect of the STT transfer releases would be a moderate negative flow effect. This effect would reduce to a minor negative flow effect in the 27km reach of the lower River Thames from Windsor to the tidal limit at Teddington and in the estuarine Thames Tideway flow effects would be neutral.</p> <p>In operation, STT transfer releases into the middle River Thames would have minor negative impacts on water quality due to the dilution capacity at low flows. Discharge would be subject to treatment and regulatory permitting of water quality to ensure no effect on WFD status.</p>	Consents where these are required for the river crossing construction works.				
	3.4 To meet WFD objectives	0	-	0	0	<p><b>Construction effects:</b> Four main rivers would be crossed via tunnelling. Five rivers and 25 streams crossed by the pipeline. Construction impacts, including intake, pipeline and outfall headworks construction are assessed as a minor negative effect.</p> <p><b>Operational effects:</b> The tests of constraint of the option against WFD regulations objectives identify potential non-compliance with physico-chemical and chemical water quality status targets episodically. This is assessed as minor negative effect. The treatment of transferred water to be included in option design can be made to be suitable mitigation to reduce effects to neutral and WFD compliant. The change in usable habitat in the River Thames from transfer is assessed as neutral and WFD compliant.</p> <p>As well as the tests of WFD constraint, other WFD objectives relate to whether the option assists the meeting of WFD objectives for the water body, for associated WFD protected areas or reduces the treatment needed to produce drinking water and look to work in partnership with others. The option is considered neutral for these during construction and operation.</p>	<p><b>Construction mitigation:</b> Tunnelling for all water courses where needed in addition to those specified. With further consideration of watercourses to cross without in-channel works, construction impacts would be neutral for WFD compliance.</p> <p><b>Operation mitigation:</b> No further mitigation proposed</p>	0	0	0	0
	3.5 To improve water efficiency through provision of access to a resilient and sustainable supply of water.	0	0	+++	0	<p><b>Construction effects:</b> Construction effects are assessed as neutral.</p> <p><b>Operational effects:</b> During operation there would be major positive effect due to the option contributing to a resilient water supply. This option will provide additional water resource and it will provide essential water supply infrastructure to help support a sustainable socio-economy.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed</p> <p><b>Operation mitigation:</b> No further mitigation proposed</p>	0	0	+++	0
Air	4.1 To minimise air emissions during construction and operation	0	-	0	-	<p><b>Construction effects:</b> The duration of construction would be 67 months. HGV movements during construction would be approximately 33,650 all of which will result in vehicle emissions to air. There are no AQMAs within 1km of the scheme however there are four within 3km and these are Tewkesbury Town Centre, Cheltenham Whole Borough, Abingdon and Marcham.</p>	<p><b>Construction mitigation:</b> Consider use of rail for transporting materials.</p>	0	-	0	-

SEA topic	SEA objective	Construction Effects		Operational Effects		Effect Description (including embedded mitigation)	Further Mitigation	Residual Construction Effects		Residual Operational Effects	
		+ve	-ve	+ve	-ve			+ve	-ve	+ve	-ve
						<p>There are a number of urban areas within 1km of the scheme. Mitigation measures to minimise the adverse effects associated with construction activities are outlined for Population and Health below. Therefore, there is potential for minor adverse effects on air emissions from construction activities.</p> <p><b>Operational effects:</b> Maximum traffic movements per year likely to be approximately 126 for treatment chemicals, 5 for polymer delivery and 332 for sludge cake disposal. Over the year this is a low number of traffic movements therefore a minor negative effect.</p>	<p><b>Operation mitigation:</b> No further mitigation proposed</p>				
Climatic Factors	5.1 To introduce climate mitigation where required and improve the climate resilience of assets and natural systems	0	0	+++	0	<p><b>Construction effects:</b> Construction effects are assessed as neutral</p> <p><b>Operational effects:</b> This option provides additional water resource and will during operation assist the reliable transfer of water, therefore reducing the vulnerability to drought risks associated with climate change and improving resilience to the likely effects of climate change. Major positive effects are anticipated.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed</p> <p><b>Operation mitigation:</b> No further mitigation proposed</p>	0	0	+++	0
	5.2 To minimise embodied and operational emissions	0	-	0	---	<p><b>Construction effects:</b> Overall construction carbon is estimated to be 293,081 tCO2e over 67 months. Overall, during construction this option is considered to have a minor negative environmental effect on this objective.</p> <p><b>Operational effects:</b> The operation of this option will require the use of additional resources Overall maximum operational carbon is estimated to be 58,654tCO2e/yr. In operation, there will be power requirements for full flow for the raw water PS (39,191MWh/year), treated water PS (2,881MWh/year) and WTW (2650MWh/year). Overall, during operation this option is considered to have a major negative environmental effect on this objective.</p>	<p><b>Construction mitigation:</b> Investigate use of renewables during construction and operation for energy supply and use of materials with lower embodied carbon. Carbon footprint study could help identify areas for carbon savings or alternative materials.</p> <p><b>Operation mitigation:</b> Potential for an energy recovery option although this would require investigation.</p>	0	-	0	---
Landscape	6.1 To conserve, protect and enhance landscape and townscape character and visual amenity	0	---	0	-	<p><b>Construction effects:</b> Approximately 27km of the pipeline is with the Cotswolds AONB. There is therefore the potential for a major negative effect on the AONB. The route passes through a number of areas identified as Priority Habitat, Deciduous woodland and close to a number of areas of ancient woodland. Part of the scheme at Culham is within the South Oxfordshire Green Belt. The scheme is within approximately 300m of the Tewkesbury Green Belt in the vicinity of Stoke Orchard and within 3km of the scheme are sections of the Vale of White Horse Green Belt. The scheme is within 3km of the Stockwell Common viewpoint. Mitigation measures include protection of trees including identification of construction exclusion zones and erection of tree protection fences. Where possible temporary compounds would be located on brownfield sites, hard surfacing, existing car parks or compounds to minimise disturbance to existing landscape features and visual amenity. Temporary and permanent compounds, cabins and car parks will be sited away from sensitive receptors such as residential areas. The use of existing planting for screening will be maximised. Land take for construction will be minimised to reduce landscape and visual impact and subsequent extent of area to be reinstated. Disturbance to or removal of key landscape features or amenity features that are distinctive, rare and/or are characteristic of the area will be avoided (e.g., landscape around Deerhurst Priory and Village Greens such as those north and south of Caldcot), by appropriate siting and routing of temporary and permanent works.</p> <p><b>Operational effects:</b> Permanent structures would comprise the intake at the River Severn, raw water (low lift) PS, treated water (high lift) PS, treatment works, break pressure tank and the outfall at the River Thames. Landscape planting will be provided to screen new infrastructure. Any impact on local trees would be compensated for in a post construction landscape planting plan. It is proposed that surplus excavated material from the construction of the works, if suitable, will be re-used to modify the existing ground levels. Re-profiling will be supplemented with planting to screen new infrastructure and aid integration into the landscape, minimising the impact on existing landscape character and the settings of existing landscape features such as the Cotswolds AONB. In the short to medium term fields would return to their original condition. In the long-term planting would mature, and hedgerow connections re-established, aiding integration of the new facilities into the landscape and setting of the AONB. Overall, the operational impacts are considered minor.</p>	<p><b>Construction mitigation:</b> Consider minimising the extent of construction works within the AONB and near to the viewpoints at any one time. Use of trenchless techniques for pipeline construction</p> <p><b>Operation mitigation:</b> Use of traditional building materials such as for facades may further assist integration into the landscape.</p>	0	--	0	0
Historic Environment	7.1 To conserve/protect and enhance historic assets/cultural heritage and their setting,	0	--	0	-	<p><b>Construction effects:</b> There are 12 scheduled monuments within 500m of the scheme:</p> <ul style="list-style-type: none"> <li>Gretton Church (ruins of)</li> <li>Earthwork N of Lyne's Barn</li> <li>Sutton Wick settlement site</li> <li>Milhampost Roman site</li> </ul>	<p><b>Construction mitigation:</b> The alignment of the pipeline should be developed further during design development and further consultation with Historic England should be undertaken during this process. This should include refining mitigation</p>	0	-	0	0

SEA topic	SEA objective	Construction Effects		Operational Effects		Effect Description (including embedded mitigation)	Further Mitigation	Residual Construction Effects		Residual Operational Effects	
		+ve	-ve	+ve	-ve			+ve	-ve	+ve	-ve
	including archaeological important sites					<ul style="list-style-type: none"> <li>Dixton Hill camp</li> <li>Site SE of Noah's Ark Inn, Frilford</li> <li>Enclosures and trackways</li> <li>Ring ditches</li> <li>Bowl barrow 310m SSW of Pinnock Wood Farm</li> <li>Round barrow 300m west of Church Farm</li> <li>Hailes Abbey and ringwork</li> <li>Dovecote at Culham Manor, 110m south west of St Paul's Church</li> </ul> <p>Wadfield Roman Manor and Roman small town at Wycomb and Romano-British villa at Withington, Enclosures and trackways, Ring ditches and Chedworth Woods Roman Temple are within close proximity to the pipeline route. The scheduled monument is approximately 135m from the pipeline route.</p> <p>There is one Registered Park and Garden Grade II* (Sherbourne House) approximately 100m from the pipeline. Five other Registered Parks and Gardens are between 500m and 1km of the scheme. There are a number of listed buildings within 500m of the scheme including some that are immediately adjacent to the pipeline route including a number in the vicinity Grafton, Carswell Marsh, Buckland, Garford and Drayton. Wightfield Manor is within 500m of the WTW site. There is a Registered Battlefield (Battle of Tewkesbury 1471) approximately 2km to the north of the scheme near the Deerhurst WTW.</p> <p>There are a number of conservation areas within 500m including some that are immediately adjacent to the scheme (e.g., Guiting Power, Sherbourne, Langford, Filkins and Broughton Poggs) and there is therefore the potential for direct effects. There are also a number of conservation areas within 3km with the potential for effects on views.</p> <p>The embedded mitigation comprises a buffer area between the works and scheduled monuments to minimise development activity which would adversely affect these heritage features and their setting. Initial archaeological investigations prior to construction works and use of qualified archaeologists to provide a watching brief during the works will be undertaken. Buffer areas in relation to excavation and earth moving works between the works and this location will also be established.</p> <p>Regarding the working width for the pipeline (of up to 40m) no working areas will stray into designated areas.</p> <p>Although the pipeline works will be temporary, these works are proposed to be undertaken over a 67-month period. The extent and effectiveness of the buffer areas have also still to be defined as such it is considered that there remain potential moderate negative effects on a number of heritage assets.</p> <p><b>Operational effects:</b></p> <p>There are a number of heritage assets within 3km of the works that would be visible following construction. Therefore, there minor adverse effects may arise due to potential impacts on the settings of heritage assets.</p>	measures in particular in relation to the scheduled monuments, listed buildings and conservation areas within proximity of the pipeline route.				
Population and Human Health	8.1 To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing	++	--	+++	0	<p><b>Construction effects:</b></p> <p>The construction of this option would represent significant capital investment which is expected to generate a number of employment opportunities and supply chain benefits. The degree of this benefit will be dependent on the contractor's recruitment and supply chain practices and will be temporary. Overall, the benefits are expected to be moderate.</p> <p>There will be adverse effects such as noise, dust and vibrations during construction associated with construction activities and vehicles (this includes construction of the intake, outfall, treatment works, pumping stations and pipeline) which could cause impacts on health and wellbeing at nearby sensitive receptors such as residential properties. Regarding noise, there are two Noise Action Planning Important Areas within 1km of the scheme. There are also sensitive receptors such as schools and places of worship within 500m of the scheme.</p> <p>There are areas identified in Indices of Multiple Deprivation for Income in areas of Tewkesbury to the north, and Cheltenham and Gloucester to the south and also just over 1km from the scheme in Abingdon to the north of Culham. There are areas identified in Indices of Multiple Deprivation for Health for Cheltenham and Gloucester to the south. And in relation to Crime in areas of Tewkesbury to the north, and Cheltenham and Gloucester to the south, Oxford to the north and Didcot to the south and also around 2km from the scheme in Abingdon to the north of Culham. For Income areas around 1km to the north of the scheme at Abingdon are identified.</p> <p>Construction compounds would be sited sensitively and away from residential areas. Construction compounds along the pipeline will be next to a main road, so that there is least disturbance to local traffic. The hours of working associated with the construction of the treatment works, other sites and pipeline route will be limited to minimise amenity and environmental impacts. Use of plant silencers, damping down of workings, temporary site screening measures and use of wheel wash equipment as appropriate will further mitigate amenity and environmental impacts.</p> <p>Due to the scale and duration of the construction works (67 months) and proximity of sensitive receptors a moderate negative effect is anticipated.</p> <p><b>Operational effects:</b></p> <p>In operation, this scheme will increase regional resilience which may support economic and population growth. It will help to ensure provision of access to a secure resilient supply of drinking water including during times where additional water resources may not be available. Therefore, generating a major positive effect.</p> <p>Traffic during operation expected to be limited to small operations vans, primarily visiting the low lift pump station and the treatment sites. Limited noise could occur from pump operation and cleaning of screens at the river intake. Therefore, a neutral negative effect is anticipated during operation.</p>	<p><b>Construction mitigation:</b></p> <p>Local employment policies.</p> <p>Tunnelling for all rail and A road crossings.</p> <p><b>Operation mitigation:</b></p> <p>Noise insulation for pumping operation and cleaning of screens.</p>	++	-	+++	0

SEA topic	SEA objective	Construction Effects		Operational Effects		Effect Description (including embedded mitigation)	Further Mitigation	Residual Construction Effects		Residual Operational Effects	
		+ve	-ve	+ve	-ve			+ve	-ve	+ve	-ve
	8.2 To maintain and enhance tourism and recreation	0	--	0	0	<p><b>Construction effects:</b> The scheme would cross two National Trails (Cotswold Way and Thames Path) and would pass within 100m of the Thames Path near Culham. The intake structure is in the vicinity of another national trail, the Severn Way, which may require modification. The route also crosses a number of other PRoWs. Two Sustrans cycle routes would cross the scheme near Northleach and Culham and another passes just over 1km to the west of the scheme near the Deerhurst WTW.</p> <p>There are a number of recreational facilities within 500m of the scheme. Recreational facilities within 500m includes playing fields, a golf course, local parks and common land. The scheme also crosses a number of rivers which might be used for recreation. Therefore, there are potential effects on a number of recreational resources including those that are water based, both direct and those affecting the amenity of those resources.</p> <p>All reasonable effort will be made to avoid temporary closure of public rights of way and diversions will be provided instead. Public rights of way will be reinstated following construction completion. Careful siting and use of screening where work locations are in proximity to public rights of way will be undertaken.</p> <p>Overall, during construction this option is considered to have a moderate negative effect on this objective.</p> <p><b>Operational effects:</b> In operation, there will be limited effects on recreational resources.</p>	<p><b>Construction mitigation:</b> Consider reviewing route to avoid recreational areas.</p> <p><b>Operation mitigation:</b> There is the opportunity to improve footpaths and connections in and around proposed pipeline route as part of the construction work, giving rise to a permanent minor beneficial effect.</p>	0	-	+	0
	8.3 To secure resilient water supplies for the health and wellbeing of customers	0	0	+++	0	<p><b>Construction effects:</b> Construction effects are assessed as neutral.</p> <p><b>Operational effects:</b> The option would contribute by providing a resilient water supply. It will provide essential water supply infrastructure to help support a sustainable socio-economy and therefore is considered to have a major positive effect.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed</p> <p><b>Operation mitigation:</b> No further mitigation proposed</p>	0	0	+++	0
	8.4 To increase access and connect customers to the natural environment, provide education or information resources for the public	0	0	0	0	<p><b>Construction effects:</b> The scheme is not anticipated to increase access to the natural environment or provide education or information sources. Construction effects are assessed as neutral for this objective.</p> <p><b>Operational Effects:</b> Operational effects are assessed as neutral for this objective.</p>	<p><b>Construction mitigation:</b> No further mitigation proposed</p> <p><b>Operation mitigation:</b> No further mitigation proposed</p>	0	0	0	0
Material Assets	9.1 To minimise resource use and waste production	0	--	0	--	<p><b>Construction Effects:</b> The option would require significant use of raw materials and energy to construct (see also embedded carbon for Climate Change above). The option would generate construction wastes which would include excavated materials (75,000m3). Although it is expected that the excavated materials will be clean material that can be reused to minimise disposal off site e.g., trench backfill for pipeline and screening bunds. Overall, the construction impacts are considered a moderate negative effect.</p> <p><b>Operational Effects:</b> Approximately 15,790,000kg/yr sludge cake would be produced as waste. In addition, the scheme would involve the generation of 'waste' in the form of sweetening flow during the periods when the pipeline is not used for the transfer of water for supply.</p> <p>Large amounts of waste generated therefore a moderate negative effect.</p>	<p><b>Construction mitigation:</b> Adoption of waste minimisation measures where practicable. Source materials locally and reinstate excavated materials where possible.</p> <p><b>Operation mitigation:</b> Investigate waste minimisation where feasible. Investigate energy recovery opportunities.</p>	0	--	0	-
	9.2 To avoid negative effects on built assets and infrastructure	0	--	0	0	<p><b>Construction Effects:</b> A number of urban areas are within 500m of the scheme. The route crosses two railway lines, one motorway (M5), 18 A roads and a number of B roads and unclassified roads. There would be tunnelling for the two railway crossings, motorway crossing and two A roads to mitigate disruption. Four dirt roads (towpath) and 36 minor roads would be crossed by the pipeline. During construction there would be potential disruption to built assets, although this would be mitigated through the use of tunnelling and good construction working practices, which would be set out in the Construction Environmental Management Plans. The works will also be temporary in nature. Due to the scale and duration of the proposed works the construction impacts are considered moderate negative.</p> <p><b>Operational Effects:</b> Operational effects are assessed as neutral for this objective.</p>	<p><b>Construction mitigation:</b> Consider tunnelling all A roads. Minimise works on infrastructure where open cut during peak periods</p> <p><b>Operation mitigation:</b> No further mitigation proposed.</p>	0	-	0	0