Assessment Cover Information	
WRE Option ID	03-0478
Option Name	Water Reuse Treatment at Caister EFR (AW) and transfer from Caister to Ormesby Raw Water Tank
Water company	Essex & Suffolk Water
Option Description	Water Reuse Treatment (16.4 Ml/d max) within existing site footprint at Caister Effluent Reuse Plant (Anglian Water) and transfer from Caister to Ormesby Raw Water Tank (transfer length approx. 7.2 km).
WRZ	Essex & Suffolk Water

Option selected in the following plans:

- Best Environment
- High PCC
- North Suffolk Reservoir
- Habs Regs SR

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SEA Topic	SEA Objective	Construction Effects +	Construction Effects -	Operational Effects +	Operational Effects -	Comment	Mitigation	Residual Construction Effects +	Residual Construction Effects -	Residual Operational Effects +	Residual Operational Effects -
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	--	0	-	The option does not overlap any designated sites, however the following sites are within 2km with potential for indirect impact: Breydon Water Ramsar; Broadland Ramsar; The Broads SAC; Southern North Sea SAC; Breydon Water SPA; Broadland SPA; Great Yarmouth North Denes SPA; Outer Thames Estuary SPA; Greater Wash SPA; and Trinity Broads SSSI. No direct effects are anticipated, but there may be disturbance effects during the construction phase. No MCZ or LNR within 500m. The HRA ToLS identified eight Natura 2000 sites that could be affected: Southern North Sea SAC (UK0030395) (~0.55km), Outer Thames Estuary SPA (UK9020309) (~0.55km), Breydon Water Ramsar (UK11008) (~4.5km), Breydon Water SPA (UK9009181) (~4.5km), The Broads SAC (UK0013577) (~4.5km), Broadland SPA (UK9009253) (~6km), Broadland Ramsar (UK11010) (~6km), Great Yarmouth North Denes SPA (UK9009271) (~8km). Potential for likely significant effects were identified for Outer Thames Estuary SPA and Southern North Sea SAC due to its designation for bird and porpoise species and the potential for disturbance on designated features (visual, noise, dust, etc.) leading to habitat avoidance and rapid population fluctuation. LSE also identified for Breydon Water Ramsar and SPA, The Broads SAC, and Broadland SPA and Ramsar as a result of potential disturbance to supporting bird habitats during the construction phase and localised water quality effects as a result of increased effluent discharge during operation. No LSE were identified for Great Yarmouth North Denes SPA. Following HRA AA, it is considered that with aderence to the proposed mitigation, the proposed works associated with this option are not expected to have adverse effects on the overall integrity of the designated sites and their qualifying features during the construction phase of this option. However, further investigation is recommended to assess potential effects in more detail on the qualifying features and to determine more targeted mitigation measures and to rduce uncertainty for the following sites: Broadland SPA (in relation to bird species), The Broads SAC (in relation to otter species), and Broadland Ramsar (in relation to both bird and otter species). No pathways for adverse effectswere identified during the operation phase of this option.	For the following Designated Sites low and localised effects may still be possible during both the construction and operation phases. These effects cannot be ruled out due to uncertainty, thus further studies to better understand how the qualifying species use the linked habitats are required to determine more targeted mitigation measures. These Designated Sites are: River Wensum SAC (no residual construction effects, but potential residual operational effects), The Broads SAC, and Broadland SPA and Ramsar. However, it is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened. This option will need to be included in the in-combination assessment.	0	-	0	-
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	---	0	--	The pipeline passes adjacent to and through Decidious Woodland Priority Habitat. There is potential for permanent loss of these Priority Habitats. No direct effects on other Priority Habitats but there may be disturbance effects during the construction phase and potential effects on protected species. Trinity Broads (SSSI) Groundwater Dependent Terrestrial Ecosystem (GWDTE) is within 500m of the option. Treated effluent to be stored in Ormesby Raw Water Tank, however there is potential for changes in water levels, flows and chemistry in waterbodies connected to the reuse plant intake- and discharge points during operation of the option. The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. The percentage change is -33.95% (lower impact score if under 20%). Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost.	Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid woodland habitat, in particular Ancient Woodland and BAP Priority Habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened.	0	--	0	-
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	Low risk of transfer of INNS as the treated source water is likely to be entirely free of INNS. Construction phase risk of INNS is also considered to be low.	During construction, best practice will be implemented to prevent the spread of INNS.	0	0	0	0
	To meet WFD objectives relating to biodiversity.	0	-	0	-	The WFD Phase 1 assessment results show there would be a low risks for ecology during construction due to installation and repairs to tunnels, conduits and other below ground structures, additionally low impacts are anticipated during operation due to the draining of pipelines into local watercourses for maintenance. One waterbody was identified at Level 1 as requiring further assessment: Bure & Waveney & Yare & Lothing transitional waterbody. Level 2 WFD assessment identified possible detereioration risks to biological elements and hyrdological regime, largely due to changes in flow velocity as a result of the cessation of an existing discharge. Therefore, this assessment concluded a precautionary biodiversity compliance risk, pending further investigation. No risks to achieving water body objectives were identified in relation to biodiversity.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless technique where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0

Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	---	0	0	The option crosses grade 1, 2, and 3 agricultural land with disturbance to these soils during construction. During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any permanent loss of land quality from the transfer pipeline. The location of the pumping station is currently unknown, however any land loss resulting from its construction will be permanent. The proposed water treatment extension is located within the existing site footprint at Caister Effluent Reuse Plant, therefore no permanent loss of agricultural land from its construction is expected. The option direcly overlaps two historic landfill sites with potential to disturb contaminated soils during construction.	Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to minimise land permanently taken or temporarily disturbed. There is potential for permanent loss of agricultural land as a result of the new pumping station. Permanent loss should be on non-BMV land where possible and only on BMV land where there are no other alternatives. Reinstatement or reprovision required post construction. Pipeline realignment or trenchless techniques to avoid historic landfills. Best practice techniques to prevent disturbance of contaminated material during construction.	0	-	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	-	0	-	Most of the option is within Flood Zone 1, however a section of the pipeline as well as the water treatment extension south-west of West Caister is in Flood Zone 3. Additional above ground infrastructure in the flood zone could reduce capacity in the flood plain, and flooding could pose risk to the option assets during constuction and operation. The option is in close proximity (~500 m) to EA flood defences. The pumping station will increase hardstanding in the area which may increase the risk of surface water flooding.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. Permanent structures should be designed to be flood resilient and an FRA may be required to appropriately quantify flood risk.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	--	The transfer pipeline crosses some minor watercourses, therefore there is potential for impacts on water quality during the construction phase. Potential for changes in water levels, flows and chemistry in waterbodies connected to the reuse plant intake and discharge points during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless technique where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction. Monitoring water levels in relevant water bodies will be undertaken during operation.	0	0	0	-
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option overlays the Broadland Rivers Chalk & Crag Groundwater unit with potential for low levels of impact on water quality during the construction phase and operation.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	-	The WFD Phase 1 assessment determined that the option would have a low level of effect on three waterbodies during the construction phase and the operation phase. Level 2 assessment for the Bure & Waveney & Yare & Lothing transitional waterbody identified precautionary compliance risks, pending further investigation. However, no risks to achieving waterbody objectives were identified.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	The option involves reuse of water reducing demand, which may help to build resilience during potential future drought scenarios.	N/A	0	0	+	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA, nor are there any within 2km. Construction likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	Effects during construction of the option due to resource use and emissions from construction traffic and activities, and effects during the operational phase as the option requires a pumping station.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	+	--	Effects on water levels will depend where the effluent is being diverted from and whether this would affect water levels in that waterbody. Reusing water instead of increasing abstraction may increase climate resilience through relieving or preventing additional pressure on the water system.	N/A	0	0	+	--
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	-	0	-	The option is located in the North East Norfolk and Flegg (0.05%); and The Broads (0.01%) NCAs (with % showing the proportion of the NCA affected). Negative effects during construction likely as excavation will be required for the transfer pipeline. New above ground infrastructure may permanently change the landscape character of the area and affect visual amenity, however impacts from water treatment extension are considered negligible as this is located within site of existing treatment plant.	Best practice measures to be implemented to minimise effects during construction, although temporary effects during construction may remain. Land reinstated upon completion where possible.	0	-	0	0

Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	0	-	0	0	The option is within 500m of Ormesby St Margaret Conservation Area, 10 listed buildings, and two scheduled monuments. Construction may affect the setting of these heritage sites and assets, however this is likely to be temporary as the pipeline will be buried. There is potential for the excavation of the pipeline to impact buried archaeology if present. The water treatment extension will be located within existing site at Caister Effluent Reuse Plant.	Best practice measures to be implemented to minimise setting effects for other historic heritage during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	0
Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	-	0	0	The option is within 500m of two allotments, two country parks, two golf courses, The Broads national park, an open access site, two sports facilities, two play spaces, a public park/garden, two registered common lands, a place of worship and a religious ground. There is no direct land take from these areas, but likely to be temporary disturbance to users of these sites and the local community during construction. This option may contribute to the local economy through employment opportunities during the construction phase. During operation, it is unlikely to contribute to the local economy. IMD deciles along the pipeline route vary from four to seven.	Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur during construction.	+	-	0	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	+	0	Through water treatment and reuse, this option provides water to users without additional abstraction, therefore improving water supply when in operation. There are no Shellfish classification zones within 5 km. There are four bathing waters monitoring sites within 2km-5km of the option. All potable water transfers have been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	N/A	0	0	+	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	-	0	0	There may be temporary disturbance to users of walking, cycling and other public rights of way during the construction phase. This option does not propose any opportunities of associated environmental and recreational benefits.	N/A	0	-	0	0
	Maintain and enhance tourism and recreation	0	-	0	-	The option is within 500m of of two allotments, two country parks, two golf courses, The Broads national park, an open access site, two sports facilities, two play spaces, a public parks/garden, two registered common lands, a place of worship and a religious ground, and impacts watercourses and habitat areas/ woodland that could be used for recreation. Therefore, there may be temporary effects on recreation, angling and other water based activities during the construction phase. During operation, discharge to into waterbodies may impact flows which could disrupt recreational use.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	-
Material Assets	Minimise resource use and waste production	0	-	0	0	New infrastructure required for option which will use materials and generate waste. Laying pipeline will involve excavated material.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	0
	Avoid negative effects on built assets and infrastructure	0	-	0	0	The option crosses two major roads, with likely temporary impacts during construction due to disruption for users. It is assumed that trenchless techniques will be used for pipelines that cross roads. During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
Option ID	ESW_DMO_High
Option Name	Demand Management Strategy High (Aspirational)
Water company	Essex and Suffolk
Option Description	This option includes compulsory Metering by 2035 and 50% leakage reduction by 2050. It also includes a medium impact "enhanced" water efficiency plan comprising 12 household water efficiency options within 5 categories (Water Use Audit and Inspection, Advice and Information on Leakage Detection and Fixing Techniques, Water Efficiency Enabling Activities, Promotion of Water Saving Devices, and Targeted Water Conservation Information (advice on appliance water usage). The DMO-High package targets a NHH water efficiency reduction of 9% by 2037/8. The water efficiency activity is predicted to contribute to an annual PCC reduction of 1.27 l/hd/d and would cost approx. £1.62M per year. The most substantial expenses are related to water use audits and inspections. For the whole Essex & Suffolk supply area, the combined High Impact Demand Management Option's package (ESW-DMO-High) is not predicted to yield any annual water savings until 2034/35, with anticipated savings of 938.05 Ml for the year 2034/35 (2.57 Ml/d average), rising to 30,623.50 Ml for the year 2074/75 (83.90 Ml/d average). A deficit of -52,811.85 Ml is predicted for the year 2024/25 (-144.69 Ml/d average) between the option's anticipated savings and baseline DYAA Dry year DI.
WRZ	Essex and Suffolk

Option rejected. Further information can be found in Section 12.2 of the Demand Forecast Technical Report.

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	--	++	0	Specific locations unknown, however potential for moderate negative effects during construction on biodiversity and habitats in close proximity for activities required to resolve leakage issues. Moderate positive effects upon operation due to improved water efficiency and leakage works resulting in lower water demand therefore less extraction of water from natural environments for human consumption, potentially benefiting designated sites and their qualifying features.	Ensure best practicable means to prevent loss of habitat during leakage works. Use of access shafts (or similar) for leakage works would be used to avoid ecologically sensitive locations. Residual minor construction impact due to mains replacement may remain.	0	-	++	0
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	0	++	0	Specific locations unknown however metering and leakage works will be specific to distribution pipes/underground pipework and households - which are areas already impacted. Potential for indirect benefits on chalk streams due to keeping water within the natural environment, hence a moderate positive effect during the operational phase.	Best practice mitigation methods i.e., creating a narrow corridor during construction in vulnerable habitats for undertaking leakage works to minimise exposure and protect tree roots. Re-instating any disturbed habitats during mains replacement to a better condition. Potential for improvement in ecology of nearby vulnerable habitats e.g. chalk rivers.	0	0	++	0
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	Specific locations unknown however metering and leakage works will be specific to distribution pipes/underground pipework and households hence negligible effect.	Best practice mitigation methods i.e. wash work boots on site after conducting leakage works to prevent any spread of INNS.	0	0	0	0
	To meet WFD objectives relating to biodiversity.	0	-	++	0	Potential minor negative impact during construction in regard to mains replacement with potential to contaminate nearby vulnerable habitats. Moderate positive effects during operation as option types will lead to better water usage efficiency - leaving more water in the environment.	Best practice construction methods - creating a narrow corridor during construction in vulnerable habitats for undertaking leakage works to minimise exposure and protect tree roots. Residual minor construction impact due to mains replacement may remain.	0	-	++	0

Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	--	0	0	Moderate negative impact during the construction phase as there is potential to disturb contaminated material and/or high quality agricultural soils during construction phase (leakage works) due to digging for mains replacement.	Land reinstated upon completion of leakage works. Best practice construction measures to be implemented. Construction impact from risk of disturbing contaminated soils remains.	0	-	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	0	0	0	Specific location unknown, however strategy not expected to increase flood risk.	Measures to reduce the impact on flooding during the construction phase (leakage works) should still be implemented.	0	0	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	++	0	Specific locations unknown. Minor negative effects during construction (leakage works) due to potential for contamination of water resources. Whilst the option is not predicted to yield any annual water savings until 2034/35, with a short-term annual deficit between anticipated savings and baseline DYAA Dry year DI predicted up to this point, moderate positive effects are expected during operation due to long-term improved water efficiency and leakage works (50% by 2050), resulting in 2.57 Ml/d average savings for the year 2034/35, rising to 83.9 Ml/d average savings in the year 2074/75. Consequently, there will be less abstraction for human consumption, and thus more water being kept within the environment. Nevertheless, there is potential for initial short-term negative effects on surface water quality, flows and quantitiy during operation until the option starts to yield annual water savings.	Best practice methods during construction to reduce contamination of surface waters i.e., creating an access channel and a clear work area boundary. Residual minor construction impact due to mains replacement may remain.	0	-	++	0
	To enhance or maintain groundwater quality and resources.	0	-	++	0	Specific locations unknown. Minor negative effects during construction (leakage works) on water resources. Moderate positive effects upon operation due to improved water efficiency and leakage works resulting in less abstraction for human consumption and more water being kept within the environment. There is, however, potential for initial short-term negative effects on groundwater quality and resources during operation until the option starts to yield annual water savings.	Best practice methods during construction to reduce contamination of groundwater i.e., creating an access channel and a clear work area boundary. Residual minor construction impact due to mains replacement may remain.	0	-	++	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	0	+++	0	Water efficiency advise, metering and leakage works allocated in new areas will result in major positive effects in the operational phase due to less abstraction for human consumption and more water being kept within the environment..	N/A	0	0	+++	0
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+++	0	Water efficiency advise, metering and leakage works allocated in new areas will result in major positive effects in the operational phase due to less abstraction for human consumption and more water being kept within the environment. Whilst the option is not predicted to yield any annual water savings until 2034/35, with a short-term annual deficit between anticipated savings and baseline DYAA Dry year DI predicted up to this point, moderate positive effects are expected during operation due to long-term improved water efficiency and leakage works (50% by 2050), resulting in 2.57 Ml/d average savings for the year 2034/35, rising to 83.9 Ml/d average savings in the year 2074/75. Nevertheless, there is potential for initial short-term negative effects to the reslience of water supplies and natural systems to droughts until the option starts to yield predicted annual water savings.	N/A	0	0	+++	0

Air	To reduce and minimise air emissions during construction and operation.	0	--	0	0	Specific location unknown, however construction works (leakage works - mains replacement) likely to have moderate negative impact. Moderate negative impacts from water efficiency measures due to use of combustion engine vehicles to complete audits, metering installation, and maintenance.	Best practice mitigation measures implemented during construction. Consider shift of employee fleet to electric vehicles to lessen impact from maintenance, audit, and installation visits.	0	-	0	0
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	--	+	0	The option is estimated to have moderate negative effects during the construction phase and minor positive effects during the operations phase. Carbon will be generated from materials used to manufacture infrastructure associated with metering (embodied carbon) and construction (leakage works) activities. There are also travel-related emissions associated with water efficiency activities (e.g. audits) and installation of metering devices. Minor positive effects upon operation due to repairing rather than replacing existing infrastructure.	Best practice mitigation measures implemented during construction. Consider shift of employee fleet to electric vehicles to lessen impact from maintenance, audit, and installation visits. Residual carbon emissions to remain.	0	-	+	0
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	++	0	Moderate positive effects during operation phase due to water efficiency improvements and leakage works resulting in long-term improved resilience of asset efficiency to water scarcity, and therefore less water extracted from the environment for human consumption. Nevertheless, there is potential for initial short-term negative effects to the climate reslience of assets and natural systems until the option starts to yield predicted annual water savings. The option is not predicted to yield any annual water savings until 2034/35, with a short-term annual deficit between anticipated savings and baseline DYAA Dry year DI predicted up to this point. However, moderate positive effects are expected during operation due to long-term improved water efficiency and leakage works (50% by 2050), resulting in 2.57 Ml/d average savings for the year 2034/35, rising to 83.9 Ml/d average savings in the year 2074/75.	N/A	0	0	++	0
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	--	+	0	Specific locations unknown, however potential for moderate negative effects during construction (leakage works) on landscape. Minor positive effects upon operation due to long-term improved water efficiency and leakage works resulting in less water abstracted for human consumption and more water being kept within the environment, which could conserve or improve landscape character. However, there is potential for initial short-term negative effects to landscape character and visual amentiy during operation until the option starts to yield predicted annual water savings, however, this is likely to be negligible.	Best practice measures will likely be implemented to minimise effects during construction (leakage works), however minor and temporary impacts may remain.	0	-	+	0
Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	0	--	0	0	Specific location unknown, however potential for moderate negative effects during construction (leakage works) on historic environment.	Best practice measures will likely be implemented to minimise effects during construction (leakage works), however minor and temporary impacts may remain.	0	-	0	0
	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	0	--	++	0	Specific location unknown, however potential for moderate negative effects during construction (leakage works) on health and wellbeing of community due to disruption. Metering may cause disruption however effects considered negilible. Moderate positive operational effects identified due to increased water efficiency awareness and long-term water availability through DMO savings. However, there is potential for initial short-term negative effects to the health and wellbeing of the local community during operation until the option starts to yield predicted annual water savings.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction (leakage works). However, minor and temporary effects are likely to still occur.	0	-	++	0

Population and Human Health	To secure resilient water supplies for the health and wellbeing of the community.	0	0	+++	0	A major long-term positive effect in the operational stage as DMOs make the overall water management network more resilient due to less supply options needed in the future as an impact of reduced water demand. Whilst there is potential for initial short-term negative effects to the resilience of water supplies for the health and wellbeing of the community until the option starts to yield predicted annual water savings as the option is not predicted to yield any annual water savings until 2034/35, with a short-term annual deficit between anticipated savings and baseline DYAA Dry year DI predicted up to this point, moderate positive effects are expected during operation due to long-term improved water efficiency and leakage works (50% by 2050), resulting in 2.57 Ml/d average savings for the year 2034/35, rising to 83.9 Ml/d average savings in the year 2074/75.	N/A	0	0	+++	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	0	+++	0	Water efficiency advise, especially focused on gardening, campaigns for vulnerable people and app improvement will result in major positive impacts during operation. Smart metering will allow for behavioural changes in water usage by customers due to access to usage data.	N/A	0	0	+++	0
	Maintain and enhance tourism and recreation.	0	**0**	0	0	Specific locations unknown. Effects during construction (leakage works) on tourism and recreation are negligible due to use of access shafts (or similar) and implementation of appropriate diversions.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction (leakage works).	0	0	0	0
Material Assets	Minimise resource use and waste production.	0	--	0	0	Moderate negative impact during construction as metering and leakage works (pressure management and mains replacement) involve use of materials and may generate waste.	Ensure best practice methods to reduce waste through accurate planning for metering and leakage work areas.	0	-	0	0
	To avoid negative effects on built assets and infrastructure (including green infrastructure).	0	--	0	0	Specific location unknown, however potential for moderate negative effects during construction (leakage works) and introduction of main pipes on built assets and infrastructure if roads need to be closed or roadworks put in place.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction (leakage works). However, minor and temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-DMO-Low
Option Name	Demand Management Option Low (High Demand)
Water company	Essex and Suffolk
Option Description	This option includes low metering, AMI Smart metering (3 AMP - 15 year roll-out from 2025) and 30% leakage reduction by 2050. It also includes a Low impact water efficiency plan comprising 6 household water efficiency options within 3 categories (Water Use Audit and Inspection, Advice and Information on Leakage Detection and Fixing Techniques, and Targeted Water Conservation Information (advice on appliance water usage). The DMO-Low package targets a NHH water efficiency reduction of 2% by 2037/8. The Low impact water efficiency plan is predicted to contribute to an annual PCC reduction of 0.49 l/hd/d and would cost approx. £0.58M per year. The most substantial expenses are related to visits and retrofitting/repair. For the whole Essex & Suffolk supply area, the combined Low Impact Demand Management Option's package (ESW-DMO-Low) is predicted to yield annual water savings of 1,485.55 Ml for the year 2024/25 (4.07 Ml/d average), and 16,359.30 Ml for the year 2074/75 (44.82 Ml/d average).
WRZ	Essex and Suffolk

Option rejected. Further information can be found in Section 12.2 of the Demand Forecast Technical Report.

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	-	0	0	Specific locations unknown, however there is potential for minor negative effects during construction on biodiversity and habitats in close proximity for activities required to resolve leakage issues. Negligible effects upon operation due to low impact on natural environment from low water efficiency activity and leakage works.	Best practice construction phase mitigation measures to be employed to prevent loss of habitat during leakage works. Use of access shafts (or similar) to avoid ecologically sensitive locations.	0	0	0	0
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	-	0	0	Specific locations unknown, however metering and leakage works will be specific to distribution pipes/underground pipework and households - which are areas with limited existing biodiversity. However, there is potential for limited vegetatation removal as part of the leakage works. No new habitat change is expected from the limited mains replacement, hence a negligible effect. Potential indirect benefits for chalk streams due to keeping water within the natural environment, however, for the low DMO strategy, this impact is considered negligible.	Best practice mitigation methods i.e., creating a narrow corridor during construction in vulnerable habitats for undertaking leakage works to minimise exposure and protect tree roots. Re-instating any disturbed habitats during mains replacement to a better condition.	0	0	0	0
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	Specific locations unknown, however metering and leakage works will be specific to distribution pipes/underground pipework and households therefore a neglible effect is anticipated.	Best practice mitigation methods i.e. wash work boots on site after conducting leakage works to prevent any spread of INNS.	0	0	0	0
	To meet WFD objectives relating to biodiversity.	0	0	0	0	Negligible effects during construction and operation as metering and leakage works will be specific to distribution pipes/underground pipework and households.	Best practice construction methods - creating a narrow corridor during construction in vulnerable habitats for undertaking leakage works to minimise exposure and protect tree roots.	0	0	0	0

Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	-	0	0	Minor negative impact during construction as there is potential to disturb contaminated material and top soils during construction (leakage works) due to digging for mains replacement.	Land reinstated upon completion of leakage works. Best practice construction measures to be implemented. Construction impact from risk of disturbing contaminated soils remains.	0	-	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	0	0	0	Specific location unknown, however strategy not expected to increase flood risk.	Measures to reduce the impact on flooding during the construction phase (leakage works) should still be implemented.	0	0	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	0	0	0	Specific locations unknown. Negative effects during construction (leakage works) on water resources are negligible due to use of access shafts (or similar). Negligible effects during operation due to metering and leakage works being specific to distribution pipes/underground pipework and households.	Best practice methods during construction to reduce contamination of surface waters i.e., creating an access channel and a clear work area boundary.	0	0	0	0
	To enhance or maintain groundwater quality and resources.	0	0	+	0	Specific locations unknown. Negative effects during construction (leakage works) on water resources are negligible due to use of access shafts (or similar). Minor positive effects upon operation due to improved water efficiency (4.07 Ml/d average savings in 2024/25 and 44.82 Ml/d average savings in 2074/75) and leakage works (30% reduction by 2050) resulting in more water being kept within the environment.	Best practice methods during construction to reduce contamination of groundwater i.e., creating an access channel and a clear work area boundary.	0	0	+	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	0	+	0	Improved water efficiency measures, metering and leakage works allocated in new areas will result in minor positive effects in the operational phase.	N/A	0	0	+	0
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	Improved water efficiency measures, metering and leakage works allocated in new areas will result in minor positive effects in the operational phase.	N/A	0	0	+	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	Specific location unknown, however construction (leakage works) likely to have minor negative impact during construction phase. Minor negative impacts on air quality from water efficiency measures due to use of combustion engine vehicles to complete audits, metering installation, and maintenance.	Best practice mitigation measures implemented during construction. Consider shift of employee fleet to electric vehicles to lessen impact from maintenance, audit and installation visits.	0	-	0	0

Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	+	0	The option is estimated to have minor negative effects during the construction phase and minor positive effects during the operational phase. Carbon will be generated from materials used to manufacture infrastructure associated with metering (embodied carbon), construction (leakage works) activities. There are also travel-related emissions associated with water efficiency activities (e.g. audits) and installation of metering devices. Minor positive effects upon operation due to repairing rather than replacing existing infrastructure.	Best practice mitigation measures implemented during construction. Consider shift of employee fleet to electric vehicles to lessen impact from maintenance, audit and installation visits. Residual carbon emissions to remain.	0	-	+	0
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	+	0	Minor positive effects during operation phase due to water efficient improvements and leakage works resulting in resilience of asset efficiency to water scarcity, and therefore less water extracted from the environment for human consumption.	N/A	0	0	+	0
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	-	0	0	Specific locations unknown, however potential for minor negative effects during construction (leakage works) on landscape. Negligible effects upon operation.	Best practice measures will likely be implemented to minimise effects during construction (leakage works), however minor and temporary impacts may remain.	0	-	0	0
Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	0	-	0	0	Specific location unknown, however potential for minor negative effects during construction (leakage works) on historic environment.	Best practice measures will likely be implemented to minimise effects during construction (leakage works), however minor and temporary impacts may remain.	0	-	0	0
Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	0	-	+	0	Specific location unknown, however potential for minor negative effects during construction (leakage works) on health and wellbeing of community due to disruption. Metering may also cause disruption however effects considered negilible. Minor positive operational effects identified due to increased water efficiency awareness and water availability through DMO savings.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction (leakage works). However, minor and temporary effects are likely to still occur.	0	-	+	0

	To secure resilient water supplies for the health and wellbeing of the community.	0	0	+	0	A minor positive effect in the operational stage as DMOs make the overall water management network more resilient due to less supply options needed in the future as an impact of reduced water demand.	N/A	0	0	+	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	0	+	0	Improved water efficiency advice relating to customer behavioural trends will result in minor positive impacts during operation. Smart metering will allow for behavioural changes in water usage by customers due to access to usage data.	N/A	0	0	+	0
	Maintain and enhance tourism and recreation.	0	0	0	0	Specific locations unknown. Effects during construction (leakage works) on tourism and recreation are negligible due to use of access shafts (or similar) and implementation of appropriate diversions.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction (leakage works).	0	0	0	0
Material Assets	Minimise resource use and waste production.	0	-	0	0	Minor negative impact during construction as metering and leakage works (pressure management) involve use of materials and may generate waste.	Ensure best practice methods to reduce waste through accurate planning for metering and leakage work areas.	0	-	0	0
	To avoid negative effects on built assets and infrastructure (including green infrastructure).	0	-	0	0	Specific location unknown, however potential for minor negative effects during construction (leakage works) on built assets and infrastructure if roads need to be closed or roadworks put in place.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction (leakage works). However, minor and temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-DMO-Preferred
Option Name	Demand Management Strategy Medium (Preferred)
Water company	Essex and Suffolk
Option Description	This option includes compulsory Metering by 2035 and 40% leakage reduction by 2050. It also includes a Medium impact "enhanced" water efficiency plan comprising 12 household water efficiency options within 5 categories (Water Use Audit and Inspection, Advice and Information on Leakage Detection and Fixing Techniques, Water Efficiency Enabling Activities, Promotion of Water Saving Devices, and Targeted Water Conservation Information (advice on appliance water usage). The DMO-Preferred package targets a NHH water efficiency reduction of 9% by 2037/8. The water efficiency activity is predicted to contribute to an annual PCC reduction of 1.27 l/hd/d and would cost approx. £1.62M per year. The most substantial expenses are related to water use audit and inspections. For the whole Essex & Suffolk supply area, the combined Medium Demand Management Option's package (ESW-DMO-Med) is predicted to yield annual water savings of 1,485.55 Ml for the year 2024/25 (4.07 Ml/d average), and 16,359.30 Ml for the year 2074/75 (44.82 Ml/d average).
WRZ	Essex and Suffolk

Option rejected. Further information can be found in Section 12.2 of the Demand Forecast Technical Report.

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	--	+	0	Specific locations unknown, however potential for moderate negative effects during construction on biodiversity and habitats in close proximity for activities required to resolve leakage issues. Minor positive effects upon operation due to improved water efficiency and leakage works resulting in lower water demand therefore less extraction of water from natural environments for human consumption, potentially benefiting designated sites and their qualifying features.	Ensure best practicable means to prevent loss of habitat during leakage works. Use of access shafts (or similar) for leakage works would be used to avoid ecologically sensitive locations.	0	-	+	0
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	0	+	0	Specific locations unknown however metering and leakage works will be specific to distribution pipes/underground pipework and households - which are areas already impacted. Potential for indirect benefits on chalk streams due to keeping water within the natural environment, hence a minor positive effect during the operational phase.	Best practice mitigation methods i.e., creating a narrow corridor during construction in vulnerable habitats for undertaking leakage works to minimise exposure and protect tree roots and re-instating any disturbed habitats during mains replacement to a better condition. Potential for improvement in ecology of nearby vulnerable habitats e.g. chalk rivers.	0	0	+	0
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	Specific locations unknown however metering and leakage works will be specific to distribution pipes/underground pipework and households hence negligible effect.	Best practice mitigation methods i.e. wash work boots on site after conducting leakage works to prevent any spread of INNS.	0	0	0	0
	To meet WFD objectives relating to biodiversity.	0	-	+	0	Potential minor negative impact during construction phase of leakage works and metering with potential to contaminate nearby vulnerable habitats. Minor positive effects during operation as option types will lead to better water usage efficiency - leaving more water in the environment.	Best practice construction methods - creating a narrow corridor during construction in vulnerable habitats for undertaking leakage works to minimise exposure and protect tree roots.	0	-	+	0

Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	-	0	0	Minor negative impact during construction as there is potential to disturb contaminated material and top soils during construction (leakage works) due to digging for mains replacement.	Land reinstated upon completion of leakage works. Best practice construction measures to be implemented. Construction impact from risk of disturbing contaminated soils remains.	0	-	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	0	0	0	Specific location unknown, however strategy not expected to increase flood risk.	Measures to reduce the impact on flooding during the construction phase (leakage works) should still be implemented.	0	0	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	+	0	Specific locations unknown. Minor negative effects during construction (leakage works) due to potential for contamination of water resources. Minor positive effects upon operation due to improved water efficiency (4.07 Ml/d average savings for the year 2024/25, and 44.82 Ml/d average savings for the year 2074/75), and leakage works (40% reduction by 2050) resulting in less abstraction for human consumption and more water being kept within the environment.	Best practice methods during construction to reduce contamination of surface waters i.e., creating an access channel and a clear work area boundary.	0	-	+	0
	To enhance or maintain groundwater quality and resources.	0	-	+	0	Specific locations unknown. Minor negative effects during construction (leakage works) on water resources. Minor positive effects upon operation due to improved water efficiency and leakage works resulting in less abstraction for human consumption and more water being kept within the environment.	Best practice methods during construction to reduce contamination of groundwater i.e., creating an access channel and a clear work area boundary.	0	-	+	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	0	+	0	Water efficiency advise, metering and leakage works allocated in new areas will result in minor positive effects in the operational phase due to less abstraction for human consumption and more water being kept within the environment.	N/A	0	0	+	0
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	Water efficiency advise, metering and leakage works allocated in new areas will result in minor positive effects in the operational phase due to less abstraction for human consumption and more water being kept within the environment.	N/A	0	0	+	0
Air	To reduce and minimise air emissions during construction and operation.	0	--	0	0	Specific location unknown, however leakage works - mains replacement likely to have moderate negative impact during construction phase. Moderate negative impacts from water efficiency measures due to use of combustion engine vehicles to complete audits, metering installation, and maintenance.	Best practice mitigation measures implemented during construction to minimise air pollution. Consider shift of employee fleet to electric vehicles to lessen impact from maintenance, audit, and installation visits.	0	-	0	0
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	--	+	0	The option is estimated to have moderate negative effects during the construction phase and minor positive effects during the operations phase. Carbon will be generated from materials used to manufacture infrastructure associated with metering (embodied carbon) and construction (leakage works) activities. There are also travel-related emissions associated with water efficiency activities (e.g. audits) and installation of metering devices. Minor positive effects upon operation due to repairing rather than replacing existing infrastructure.	Best practice mitigation measures implemented during construction. Consider shift of employee fleet to electric vehicles to lessen impact from maintenance, audit, and installation visits. Residual carbon emissions to remain.	0	-	+	0
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	++	0	Moderate positive effects during operation phase due to water efficient improvements and leakage works resulting in resilience of asset efficiency to water scarcity, and therefore less water extracted from the environment for human consumption.	N/A	0	0	++	0

Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	--	+	0	Specific locations unknown, however potential for moderate negative effects during construction (leakage works) on landscape. Minor positive effects upon operation due to improved water efficiency and leakage works resulting in less water abstracted for human consumption and more water being kept within the environment, which could conserve or improve landscape character.	Best practice measures will likely be implemented to minimise effects during construction (leakage works), however minor and temporary impacts may remain.	0	-	+	0
Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	0	--	0	0	Specific location unknown, however potential for moderate negative effects during construction (leakage works) on historic environment.	Best practice measures will likely be implemented to minimise effects during construction (leakage works), however minor and temporary impacts may remain.	0	-	0	0
Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	0	--	+	0	Specific location unknown, however potential for moderate negative effects during construction (leakage works) on health and wellbeing of community due to disruption. Metering may cause disruption however effects considered negilible. Minor positive operational effects identified due to increased water efficiency awareness and water availability through DMO savings.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction (leakage works). However, minor and temporary effects are likely to still occur.	0	-	+	0
	To secure resilient water supplies for the health and wellbeing of the community.	0	0	++	0	A moderate positive effect in the operational stage as DMOs make the overall water management network more resilient due to less supply options needed in the future as an impact of reduced water demand.	N/A	0	0	++	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	0	++	0	Water efficiency advise, especially focused on customer behavioural trends e.g. gardening etc will result in moderate positive impacts during operation. Smart metering will allow for behavioural changes in water usage by customers due to access to usage data.	0	0	0	++	0
	Maintain and enhance tourism and recreation.	0	**0**	0	0	Specific locations unknown. Effects during construction (leakage works) on tourism and recreation are negligible due to use of access shafts (or similar) and implementation of appropriate diversions.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction (leakage works).	0	0	0	0

Material Assets	Minimise resource use and waste production.	0	--	0	0	Moderate negative impact construction during construction as metering and leakage works (pressure management) involve use of materials and may generate waste.	Ensure best practice methods to reduce waste through accurate planning for metering and leakage work areas.	0	-	0	0
	To avoid negative effects on built assets and infrastructure (including green infrastructure).	0	--	0	0	Specific location unknown, however potential for moderate negative effects during construction (leakage works) and introduction of main pipes on built assets and infrastructure if roads need to be closed or roadworks put in place.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction (leakage works). However, minor and temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-ABS-002
Option Name	Linford water treatment works
Water company	Essex & Suffolk Water
Option Description	Borehole Abstraction (7 Ml/d DO). New conventional water treatment works built on Linford WTW's existing site. Intake from existing, decommissioned borehole, outfall to existing treated water network.
WRZ	Essex & Suffolk Water

Option rejected in favour of the exclusive option ESW-ABS-003

SEA Topic	SEA Objective	Construction		Operational Effects		Comment	Mitigation	Residual Construction		Residual Operational	
		+	-	+	-			+	-	+	-
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	--	0	-	The option is entirely located within SSSI Impact Risk Zones, however it is over 2km away from any SSSI. There is one LNR (Linford Wood) within 500 metres. Potential for minor, temporary indirect effects on woodland during construction. No operational effects anticipated. There are no NNR, MCZ/MPAs in proximity of the option. No other designated sites within 2km. The HRA ToLS identified two Natura 2000 sites that could be affected: Thames Estuary & Marshes SPA (UK9012021) (~2.4km), and Thames Estuary & Marshes Ramsar (UK11069) (~2.4km). Following HRA AA, it is considered that with aderence to the proposed mitigation, the proposed works associated with this option are not expected to have adverse effects on the overall integrity of the following sites and their qualifying features: Thames Estuary and Marshes SPA and Ramsar.	Best practice methods to be implemented to minimise disturbance effects during construction, specifically pollution control. With this in place, adverse impacts on the Designated Sites will be alleviated during the construction and operation phases of this option.	0	-	0	0
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	0	0	0	There are no Ancient Woodlands, priority habitats or areas of woodland within 2km of this site, therefore no direct effects are anticipated during construction and operation. The option is not expected to cause the loss of BNG units due to no habitat clearance being required for construction.	Best practice methods are assumed to be implemented to minimise disturbance effects.	0	0	0	0
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	Very limited risk as the source water is likely to be entirely free of INNS. It is assumed that groundwater is free of INNS, and that abstracting and transferring groundwater via a pipeline will not cause a risk of INNS transfer.	During construction best practice will be implemented to prevent the spread of INNS.	0	0	0	0
	To meet WFD objectives relating to biodiversity.	0	0	0	0	The Level 2 WFD assessment identified possible deterioration risks to quantitative dependent surface water body status and chemical GWDTE and saline intrusion and general chemical testelements. These are largely due to the new abstraction from the existing boreholes on the WTW site, which have been out of use for some time. Therefore, this assessment concludes a precautionary compliance risk, pending further investigation. No risk to achieving water body objectives was identified.	Best practice construction methods and pollution prevention measures to be implemented. Results from WFD Level 2 assessment indicate tat the optio does not compromise achievment of WFD objectives for the Essex Gravels waterbody.	0	0	0	0

Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	-	0	0	The option is within grade 2 agricultural land with potential disturbance to these soils during construction. During operation, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any loss of land quality from the transfer pipeline. No landfill sites within 500m of the option, therefore potential disturbance of contaminated soils is unlikely.	Ground will be reinstated, therefore long term residual effects on agricultural soils as a result of this option are unlikely.	0	0	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	--	0	--	The option is entirely within Flood Zone 2. New above ground infrastructure may have an impact on flood risk. Potential for flooding to impact construction of the asset, or to damage asset once built. The operation of this option may impact flood risk due to changes abstraction and outfall into the existing water network potentially increasing flows.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. Above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required. The design should consider future potential increased flood risks to ensure operation can continue.	0	-	0	--
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	--	The site is adjacent to a main river therefore construction has the potential to impact water quality. During operation, increased abstraction may reduce water flow and water quality, e.g. through increased salinity in downstream estuary (less fresh water input). Part of the option is within a Nitrate Vulnerable Zone.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction.	0	-	0	-
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option intersects SPZs 1, 2 and 3 with potential for impacts on water quality during the construction phase.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	--	Two waterbodies were considered during the WFD Phase 1 assessment: Thames Middle and Essex Gravels (GW). No effects are anticipated during the construction phase. The assessment determined that the option would have a low level of effect on Thames Middle during operational phase due to maintenance and use of coastal intakes/ outfalls and a medium level impact during operation to Essex Gravels (GW) due to increased abstraction rates. The Level 2 WFD assessment identified possible deterioration risks to quantitative dependent surface water body status and chemical GWDTE and saline intrusion and general chemical testelements. These are largely due to the new abstraction from the existing boreholes on the WTW site, which have been out of use for some time. Therefore, this assessment concludes a precautionary compliance risk, pending further investigation. No risk to achieving water body objectives was identified.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction. Currently no assumed mitigation for operational effects. Further WFD assessment required for both waterbodies.	0	0	0	--
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	0	-	The option may increase groundwater abstraction once operational, thus depleting water resources within the environment. Therefore, an increased vulnerability of the natural environment to drought might be anticipated.	N/A	0	0	0	-

Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA nor are there any within 2km. Construction likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	Carbon will be generated from materials used to construct the new infrastructure (embodied carbon), construction activities and as a result of energy used during operation.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	0	-	The option will increase groundwater abstraction once operational, depleting water resources within the environment. Therefore, an increase in climate change vulnerability might be anticipated.	N/A	0	0	0	-
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	-	0	0	This option overlaps one NCA: Greater Thames Estuary (0.1%); (with % proportion of NCA affected). Negative effects during construction likely as excavation will be required however, the borehole is already existing just decommissioned and within the current abstraction site, therefore visual impact on landscape considered minimal. No operational effects on landscape anticipated.	Best practice measures to be implemented to minimise effects during construction, although temporary effects during construction may remain.	0	-	0	0
Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	0	-	0	0	There is one listed structure within 500 metres (Smithy Cottage grade II listed building). Due to the scope of this option and as the borehole is existing and within the existing abstraction site impacts to any previously undiscovered archaeology is considered minimal. There will be minimal new above ground infrastructure, which is unlikely to have effects on the setting of heritage assets during operation.	Best practice measures to be implemented to minimise setting effects for other heritage assets during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	0
	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	-	0	0	The option is within 500m of religious grounds, one religious building, a play space, play field and one allotment, there is no direct land take from these areas, but likely to be temporary disturbance to users of these sites and the local community during construction. This option may contribute to the local economy through employment opportunities during the construction phase. During operation, it is unlikely to contribute to the local economy. IMD decile within the option footprint is six.	Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur during construction.	+	-	0	0

Population and Human Health	To secure resilient water supplies for the health and wellbeing of customers.	0	0	+	0	There are no shellfish waters or bathing waters within 500m of the option location. All potable water transfers have been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation. Increased groundwater abstraction will improve water supply for human consumption.	N/A	0	0	+	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	-	0	0	The option does not cross any National Trails or National Cycle Network routes. No disruptions to users of these anticipated.	Best practice mitigation measures e.g. noise and traffic management to be implemented to minimise effects during construction, however some temporary impacts will remain.	0	-	0	0
	Maintain and enhance tourism and recreation	0	-	0	0	This site does not cross any open spaces, LNRs or NNRs. It is within 500m of a religious ground, playing fields, play space, and an allotment. Therefore there may be some minor temporary effects on recreation during the construction phase. No operational effects anticipated.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0
Material Assets	Minimise resource use and waste production	0	-	0	0	New infrastructure required for option which will use materials and generate waste and excavated material. Operation of option not anticipated to generate waste.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	0
	Avoid negative effects on built assets and infrastructure	0	-	0	0	The option does not cross any roads, railways or cycle routes. There is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-ABS-003C
Option Name	New Linford WTW (10Ml/d Option)
Water company	Essex and Suffolk
Option Description	Option consits of multiple components: Recommissioned borehole at existing site. Confirmed capacity of 3.5Ml/d; Raw water transfer main from the existing borehole (BH) site to the new WTW site. Capacity of 6.365Ml/d as per current peak daily licence at Linford; 10Ml/d water treatment works (with space to expand to 13Ml/d) and treated water PS to be located at a new site. The site is to also contain a new borehole of capacity 6.6Ml/d. Treatment will include water recycling and solids disposal as well as lagoon settlement prior to a run-to-waste; Treated water main from the new WTW site to feed into a distribution trunk main; Run-to-waste pipeline for commissioning / start-up of the WTW.
WRZ	ESWEssex

Option selected in the following plans:

- Central Preferred
- Least Cost
- Best Value
- Best Environment
- High PCC
- North Suffolk Reservoir
- Habs Regs SR

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
	To protect designated sites and their qualifying features.	0	--	0	--	The option is within 500m of Linford Wood Local Nature Reserve, as well as the Thames Estuary and Marshes Marine Protection Area, Ramsar, SSSI, SPA, and Important Bird Area. Within 2km of the option there are two additional SSSI's: Hangman's Wood & Deneholes, and South Thames Estuary and Marshes SSSI. There is potential for indirect effects to habitats and wildlife within these designated sites through disturbance during the construction phase. The option also passes through and runs adjacent to areas of Priority Habitat (Deciduous woodland, Traditional Orchard, Reedbeds, Coastal saltmarsh, and Mudflats). The option is entirely located in a SSSI Impact Risk Zone, resulting in potential indirect effects to surrounding SSSI through disturbance during the construction phase. All construction effects for this option are considered temporary, however mitigation will still need to be put in place where appropriate to reduce/minimise these effects. During operation, indirect effects may arise through localised and periodic maintenance works, any works during operation will have to consider designated sites and their qualifying features. The HRA ToLS identified two Natura 2000 sites that could be affected; Thames Estuary & Marshes SPA (UK9012021) (approx. 2.4km) and Thames Estuary & Marshes Ramsar (UK9012021) (approx. 2.4km). LSE identified for both sites due to non-physical disturbance and biological disturbance during construction and physical damage, non-toxic contamination and biological disturbance during operation.	Best practice methods to be implemented to minimise disturbance effects. Ecology surveys might be required at future design stages to determine effects and mitigation required.	0	--	0	--

Biodiversity, flora and fauna	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	-	0	0	The option passes through and runs adjacent to areas of Priority Habitat (Deciduous woodland, Traditional Orchard, Reedbeds, Coastal saltmarsh, and Mudflats). Direct effects on Priority Habitats could occur, however there should be no permanent loss of habitat, with any temporarily affected habitat sites to be reinstated post-construction. Indirect effects are anticipated through disturbance effects during the construction phase, thus there are potential temporary effects on protected species. There is no Ancient Woodland within 500m of the option, however there are numerous parcels of woodland that could be indirectly effected during construction There are no Groundwater Dependent Terrestrial Ecosystems (GWDTE) or chalk rivers within 2km of the option. No effects are anticipated during operation. The option is expected to cause the loss of BNG units predominately due to habitat clearance associated with construction. The percentage change is -10.92%. The Natural Capital Assessment concluded the option would result in -£351.01.	Best practice methods are assumed to be implemented to minimise disturbance effects. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required.	0	-	0	0
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	-	0	0	There is a very low risk of transfer/movement of invasive or non-native species during option construction as the proposed pipeline runs adjacent to and/or crosses several waterbodies. During operation, maintenance works are likely to be localised, and so with appropriate mitigation in place the risk of spreading INNS should be minimal.	Best practice methods to be implemented to avoid any potential spreading of INNS, whether it be boot spraying, wheel and equipment washing, or other best practice methods.	0	0	0	0
	To meet WFD objectives relating to biodiversity.	0	0	0	0	The Phase 1 WFD assessment identifies four waterbodies with potential deterioration risks. The assessment results show there would be no effects for ecology during construction or operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	-	0	0	The option crosses Grade 2 and 3 agricultural land. Given the nature of the proposed option, these soils will be directly disturbed during construction. Effects are likely to be temporary as land will be reinstated post-construction, therefore there should be no land permanently lost. Depending on the depth of the pipeline and agricultural operations, it is likely that the land will be able to continue to be used for agricultural purposes during operation of the pipeline, except for localised and periodic maintenance works. There are four authorised landfill sites and seven historic landfill sites within 500m. Whilst not anticipated, there is a potential risk of disturbance to contaminated materials during construction. However, with appropriate mitigation in place, this risk is considered to be minimal. No effects are anticipated during operation.	Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land permanently taken or temporarily disturbed, where possible. There will be permanent loss as a result of the WTW. Best practice techniques to prevent disturbance of contaminated material during construction.	0	-	0	0

Water	To reduce or manage flood risk, taking climate change into account.	0	-	0	0	The option passes through and adjacent to several small areas of both Flood Zone 2 and 3, as well as Flood Warning Area, Flood Risk Area and Flood Alert Area located at the eastern extent of the option. The pipeline crosses and/or runs adjacent to several waterbodies. Given that the pipeline is buried, impacts during operation to the asset from flooding are considered unlikely. The pipeline itself is also unlikely to increase the future risk of flooding in the area. During construction however, the proximity of the option to these flood zones could pose a risk in relation to construction machinery and other assets, as well as to temporary stores of cut and fill material, and any poorly consolidated surface material immediately following construction completion. This could influence susceptibility to erosion, and increase transportation and deposition of sediments during a flood event, potentially having knock-on effects downstream and within surrounding areas of land. Risk of these effects could be minimised/reduced through appropriate mitigation. The pipeline itself is unlikely to increase the risk of flooding. The WTW will increase hardstanding in the area which has the potential to increase flood risk, however this risk is anticipated to be negligible.	Measures to reduce the impact on flooding during the construction phase to be implemented. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	0	The option is located adjacent to waterbodies and watercourses, therefore with potential for effects on water quality during the construction phase. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To enhance or maintain groundwater quality and resources.	0	-	0	0	This option intersects with areas located in SPZ Zone 1 and Zone 2. The option overlays Essex Gravels WFD groundwater bodies, with potential for temporary effects on groundwater quality during the construction phase. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	-	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	---	Four waterbodies were considered during the WFD Phase 1 assessment: Essex Gravels, Thames Middle, Mardyke, and South Essex Lower London Tertiaries. The assessment determined the option would have a high level of effect during operation on Essex Gravels and South Essex Lower London Tertiaries due to new or increased groundwater abstraction. Low or new effects are considered on all four watercourses during the operational phase.	Best practice construction methods and pollution prevention measures to be implemented. However, some residual effects may still remain.	0	-	0	--
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	The option will help to secure resilient water supplies for customers, as it will provide a new WTW and associated infrastructure. The option is anticipated to provide at least a 10Ml/d yield. Therefore, it is anticipated that the option will provide minor positive effects during operation, as it will help to increase resilience of water supplies and natural systems to droughts.	N/A	0	0	+	0

Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA, nor are there any within 2km of the site. Construction is likely to have a temporary impact on air quality in surrounding local areas through emissions from combustion engines associated with machinery and HGVs, congestion and traffic associated with diversions and road closures, as well as dust generated by construction activities. Operation of the boost pump may result in a minor increase of air emissions, however these are expected to be negligible. Operational effects may also arise during maintenance and replacement works, however any effects will be localised and temporary, and should be reduced and/or minimised through appropriate mitigation..	Best practice mitigation measures to be implemented during construction, however short term air quality effects during construction may remain.	0	-	0	0
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	There will be some effects during construction of the option through a large quantity of materials that will be required, and through emissions resulting from construction activities. During operation, the option will also require energy to operate the WTW, and to pump water and waste through the new pipelines. Additionally, any maintenance and/or replacement works will also produce operational carbon emissions.	Investigate use of renewables during construction and operation for energy supply and use of materials with lower embodied carbon. Carbon assessment could help identify areas for carbon savings or alternative materials. As the electricity grid is decarbonised, greener energy will be more available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	0	0	Water levels not predicted to be significantly affected therefore unlikely to affect resilience of the local environment to climate change.	N/A	0	0	0	0
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	-	0	0	The option lies within both the Northern Thames Basin and Greater Thames Estuary National Character Areas. Additionally, there are also numerous local woodlands within proximity to the option. Whilst there may be some loss, any effects are likely to be temporary through construction disturbance. Therefore, minor and temporary negative effects on landscape character and visual amenity are anticipated during construction. During operation, the option is likely to result in a minor change to the landscape character and visual amenity of the area.	Re-routing of the pipeline to minimise damage and disruption to local woodland, or utilise directional drilling or other trenchless techniques to reduce construction effects. Best practice measures to be implemented to minimise effects during construction including although temporary effects during construction and operation may remain.	0	-	0	0
Historic Environment	To conserve/protect and enhance historic environment and heritage assets, and their setting, including archaeologically important sites.	0	-	0	-	There are 23 Grade II listed structures and four Scheduled Monuments within 500m of the option. The option directly intersects with one of these Scheduled Monuments, Crop mark complex Orsett. The option also comes within 500m of the East Tilbury Conservation Area. Construction activities are likely to have a temporary affect to the setting of these historic assets. The presence of new above-ground infrastructure may also affect the setting of these historic assets. There is potential for excavation of the pipeline and groundworks associated with the WTW to impact buried archaeology if present. Whilst effects are likely to be minimised and/or reduced through appropriate mitigation, there is potential for minor negative effects to buried historic assets during construction.	Best practice measures to be implemented to minimise setting effects for other heritage assets during construction and operation. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	0

Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	0	-	0	0	The option lies within both the Northern Thames Basin and Greater Thames Estuary National Character Areas, therefore there is potential for minor negative effects from both construction and operation. There are five Noise Action Planning Important Areas within 500m of the option, and a further five within 2km. There are two allotments or community growing spaces, one golf course, one play space, one playing field, one religious building and one religious ground within 500m of the option. Increased construction deliveries, and any road closures / diversions, could increase road traffic and congestions, as well as potentially restricting access. These effects are likely to be minor, temporary and localised, however they could have an effect on the health and wellbeing of the local community. The option may contribute to the local economy through employment opportunities during the construction phase. IMD deciles vary along the option from 2 to 7. No effects are anticipated during operation.	Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	+	0	There are no shellfish waters or official bathing waters within 500m of the option location. There are no Shellfish Classification Zones within 10km of the site. Whilst the movement of water from one point to another increases the risks of disease transmission, the option will provide additional pumping and water storage capacity, thus helping to secure resilient water supplies for the health and wellbeing of customers upon operation. The option is anticipated to provide at least a 10Ml/d yield. No construction effects are anticipated.	N/A	0	0	+	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	-	0	0	The option is unlikely to increase access and connect customers to the natural environment. During construction, the option could cause temporary disturbance to users of the natural environment. Construction activities may generate noise, vibration, and dust which could affect any nearby trails or other outdoor activities such as fishing. In addition, any temporary road closures required for the works will effect access. No effects are anticipated during operation.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Impacts to recreational sites to be avoided where possible. However, temporary effects are likely to still occur during construction.	0	-	0	0
	Maintain and enhance tourism and recreation	0	-	0	0	There are two allotments or community growing spaces, one golf course, one play space, one playing field, one religious building and one religious ground within 500m of the option. The option is also located nearby to open spaces, watercourses and habitat areas/woodland that could be used for recreation. Therefore, the option could have temporary minor negative effects on tourism and recreation during the construction phase. No effects are anticipated during operation.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Impacts to recreational sites to be avoided where possible. However, temporary effects are likely to still occur during construction.	0	-	0	0
	Minimise resource use and waste production	0	-	0	-	There will be some effects during construction of the option through resource use and materials required for construction. There may be some waste production, however the option should be designed to use as much of the existing infrastructure and materials as possible. In addition, any generated waste should be dealt with appropriately. During operation the option will require energy to operate the WTW, and potentially additional resources for any maintenance and/or replacement works.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that minor negative effects during construction and operation will remain.	0	-	0	-

Material Assets	Avoid negative effects on built assets and infrastructure	0	-	0	0	The option does not intersect within any railway lines or parts of the National Cycle Network. During the construction phase, there is likely to be some disruption to the local traffic network where the option will intersect with small sections of the road network, as well as from likely increases in traffic volumes due to deliveries of construction materials and through any road closures and/or diversions. During the operational phase, there is unlikely to be any disturbance to the transport network, apart from where effects may arise from localised and temporary maintenance works.	Best practice measures to be included. A Traffic Management Plan might be required to minimise disturbance during construction. However, temporary effects during construction are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-ASR-004
Option Name	Abberton ASR Scheme
Water company	Essex & Suffolk
Option Description	ASR scheme located on neighbouring land to Layer de la Haye WTW. New borehole reaching Abberton chalk aquifer. Two variations: A & B. Only A has been sent for environmental screening as it has a larger footprint. Option A - new treatment works and borehole: •Raw water transfer from Abberton Reservoir, via existing main to new ASR site and associated WTW •Raw water treated on site at new WTW •Potable water injected into borehole •Raw water abstracted from borehole •Raw borehole water treated on site at new WTW •Potable water transfer from new WTW to existing service reservoir at Layer de la Haye WTW
WRZ	Essex & Suffolk

Option rejected. Further information can be found in Section 2.2.6 of the Supply Option Development Technical Report.

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	---	0	--	The option is within 1km of Abberton Reservoir Ramsar and SSSI (100% favourable). No direct impacts likely but there may be disturbance effects during the construction phase, especially for water dependent SSSIs as groundwater levels may change. The option is within 2km from Roman River SSSI (100% favourable) and the Blackwater Estuary SSSI (24% favourable, 75% unfavourable - no change, 1% unfavourable - declining) which are water dependant SSSIs and are hydrologically connect to the river and therefore may be affected by abstractions. The option is within 2km of the Lexden Park LNR. The whole of the option is located within an SSSI Impact Risk Zones. The HRA ToLS identified likely significant effects on seven Natura 2000 sites, Abberton Reservoir SPA (0.6km), Abberton Reservoir Ramsar (0.6km), Essex Estuaries SAC (5.5km), Colne Estuary (Mid-Essex Coast Phase 2) SPA (5km), Colne Estuary (Mid-Essex Coast Phase 2) Ramsar (5km), Blackwater Estuary (Mid-Essex Coast Phase 4) SPA (5.5km) and Blackwater Estuary (Mid-Essex Coast Phase 4) Ramsar (5.5km). Potential for likely significant effects identified for the Abberton Reservoir SPA and Ramsar due to potential contamination of the groundwater body during drilling which partially overlaps with the surface waters of the Abberton Reservoir potentially leading to toxic contamination and non-physical disturbances. No likely significant effects for the other five sites.	Best practice methods to be implemented to minimise disturbance effects. Ecology surveys will be required at future design stages to determine effects and mitigation required. Groundwater levels should be monitored during operation. HRA AA required to determine the likely significant effects for the Abberton Reservoir SPA and Ramsar.	0	--	0	-
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	---	0	---	The option does not intersect any priority habitats and there are no areas of ancient woodland within 500m of the option. The option is within 2km of Roman River Groundwater Dependent Terrestrial Ecosystems (GWDTE) and from Blackwater Estuary GWDTE which have the potential to be impacted due to abstractions and changes in water levels. There are no chalk rivers within 2km of the option. The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. The percentage change is -64.63%. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost.	Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid woodland habitat, in particular Ancient Woodland and Priority Habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required.	0	--	0	--
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	Very low risk of transfer of INNS as the treated source water is likely to be entirely free of INNS. Construction phase risk of INNS is also considered to be very low.	N/A	0	0	0	0
	To meet WFD objectives relating to biodiversity.	0	0	0	0	The WFD Phase 1 assessment results show there would be no effects on ecological during construction or operation.	N/A	0	0	0	0

Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	-	0	-	The option is located within Grade 3 agricultural land with disturbance to this soils during construction and operation as the new WTW would result in permanent loss of this land. There are no authorised or historic landfill sites within 2km of the option.	Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land permanently taken or temporarily disturbed. Best practice techniques to prevent disturbance of contaminated material during construction.	0	-	0	-
Water	To reduce or manage flood risk, taking climate change into account.	0	-	0	-	The option is located within Flood zone 1. New above ground infrastructure may have an impact on flood risk. Potential for flooding to impact construction of the asset, or to damage asset once built. The operation of this option may impact flood risk due to changes abstraction and outfall into the existing water network potentially increasing flows.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain.	0	-	0	-
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	-	The option does not cross any watercourses, therefore no effects on watercourses likely during construction. During operation, at some times of the year surface water will be abstracted from the river, treated and injected into the boreholes and at other times the groundwater from the boreholes will be abstracted. Potential for effects on surface water is abstraction affects flows.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction. Monitoring of river flows required to determine when surface water can be abstracted.	0	0	0	-
	To enhance or maintain groundwater quality and resources.	0	-	0	--	The option is wholly within source protection zone 3 with potential for impacts on water quality during the construction phase. During operation, potential for significant effects on groundwater due to changes in water levels, although surface water injection will help groundwater levels.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction. Monitor groundwater levels during operation to minimise effect on groundwater.	0	0	0	-
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	-	Two waterbodies were considered during the WFD Phase 1 assessment: Roman River and Essex Gravels (GW). The assessment determined that the option would have a low level of effect on both waterbodies during construction and operation.	Best practice construction methods and pollution prevention measures to be implemented. Phase 2 WFD assessment is required.	0	-	0	-
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	-	The options uses groundwater abstraction from boreholes and surface water abstraction to recharge the groundwater sources. Potential for some resilience as surface water can be abstracted when flows are high to support groundwater levels. However, potential to reduce both surface water and groundwater levels causing resilience issues.	N/A	0	0	+	-
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	There are no AQMAs within 2km of the option. Construction likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	Effects during construction of the option due to resource use and emissions, and effects during the operational phase as the option involves pumping.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	0	--	Water levels in aquifers may change, reducing resilience of the local environment to climate change.	Ensure sustainable use of water to reduce vulnerability of the local environment.	0	0	0	--

Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	-	0	-	The option is located within the Northern Thames Basin NCA (0.01%) (with % proportion of NCA affected). Negative effects during construction likely as excavation will be required for the transfer pipeline. New above ground infrastructure expected therefore potential for operational impact.	Best practice measures to be implemented to minimise effects during construction including although temporary effects during construction may remain. Best practice techniques implemented in landscape design of WTW so with mitigation, no residual effects are likely to remain during operation.	0	-	0	0
Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	0	-	0	-	The option is within 500m of a number of listed buildings. Construction may affect the setting of these historic assets, however this is likely to be temporary as the pipeline will be buried. New above ground infrastructure may impact the setting of the listed buidlings during operation. There is potential for the excavation of the pipeline to impact buried archaeology if present.	Best practice measures to be implemented to minimise setting effects for other heritage assets during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	-
Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	-	0	0	The option is within 500m of religious grounds. There is likely to be temporary disturbance to users of this site and the local community during construction. This option may contribute to the local economy through employment opportunities during the construction phase. During operation, it is assumed that employment opportunities within the WTW will be negligble therefore neutral impacts are expected. The option is located within IMD decile five.	Route alignment to be amended or trenchless techniques to be used to avoid direct impacts on property and community assets. Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction and land will be reinstated. However, temporary effects are likely to still occur during construction.	+	-	0	0
	To secure resilient water supplies for the health and wellbeing of the community.	0	0	0	0	There are no shellfish waters or bathing waters within 500m of the option location. The movement of water from one point to another increases the risks of disease transmission. All water transfers have been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	N/A	0	0	0	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	-	0	0	There may be temporary disturbance on walking and cycling routes, and other public rights of way during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. There could be potential to enhance the cycleways as part of the works (e.g. during re-instatement).	0	-	0	0
	Maintain and enhance tourism and recreation.	0	-	0	0	The pipeline is within 500m of religious grounds. Therefore there may be some temporary effects on recreational activities during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0

Material Assets	Minimise resource use and waste production.	0	-	0	0	New infrastructure required for option which will use materials and generate waste and excavated material.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	0
	Avoid negative effects on built assets and infrastructure.	0	-	0	0	The option crosses one minor road. Likely to be temporary impacts during construction due to disruption for users. It is assumed that trenchless techniques will be used for pipelines which cross roads. During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-DES-001
Option Name	Canvey Island Terrestrial Desalination (Maximum Capacity)
Water company	Essex & Suffolk Water
Option Description	Seawater Desalination Plant (190Ml/d DO). Abstraction from the Thames Estuary, discharge to Hanningfield Service Reservoir. Service reservoir located off site. Transfer length between plant and reservoir approximately 20.7 km.
WRZ	Essex & Suffolk Water

Option selected in the following plan:

- Best Environment

SEA Topic	SEA Objective	Construction Effects +	Construction Effects -	Operational Effects +	Operational Effects -	Comment	Mitigation	Residual Construction Effects +	Residual Construction Effects -	Residual Operational Effects +	Residual Operational Effects -
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	---	0	--	The option intersects the Canvey Wick SSSI (100% favourable) and the Blackwater, Crouch, Roach and Colne Estuaries Marine Conservation Zone and has the potential for direct impacts. Construction of the pipeline from the desalination plant is likely to affect the features of the SSSI and MCZ (on land, within the intertidal zone and the estuary) Holehaven Creek SSSI (100% favourable) and Hanningfield Reservoir SSSI (100% favourable) are within 500m of the option. The option is within 500m of the Thames Estuary and Marshes RSPB site. No direct effects likely but there may be disturbance effects during the construction phase. The HRA ToLS identified 12 Natura 2000 sites that could be affected. Ramsar's: Benfleet and Southend Marshes Ramsar (approx. 0.5km), Thames Estuary and Marshes Ramsar (approx. 1.5km), Foulness (Mid-Essex Coast Phase 5) Ramsar (approx. 14km), Crouch & Roach Estuaries (Mid-Essex Coast Phase 3)Ramsar (approx. 1.3km), Medway Estuary & Marshes Ramsar (approx. 8km). SPAs: Benfleet and Southend Marshes SPA (approx. 0.5km), Thames Estuary and Marshes SPA (approx. 1.5km), Outer Thames Estuary SPA (approx. 7.5km), Foulness (Mid-Essex Coast Phase 5) SPA (approx. 15km), Crouch & Roach Estuaries (Mid-Essex Coast Phase 3) SPA (approx. 1.3km), Medway Estuary & Marshes SPA (approx. 8km). SAC: Essex Estuaries SAC (approx. 1.3km). Likely significant effects concluded for all sites due to construction and operational effects from hydrological links. Desalination options require discharge of saline solution. This may lead to adverse effects to designated sites during operation. The HRA AA deteremined that assuming aherence to proposed mitigation, the options is not anticipated to have adverse effects on any of the above mentioned designated sites.	Route re-alignment recommended if possible to avoid direct impacts with the SSSI and MCZ or trenchless techniques to be used. Best practice methods to be implemented to minimise disturbance effects to the SSSIs. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual operational effects are lessened although this wouldn't negate the need for a potential appropriate assessment. HRA AA required to assess effects on designated sites including saline discharge.	0	-	0	-
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	---	0	--	The pipeline passes through areas of the following priority habitats; coastal and floodplain grazing marsh; mudflats; coastal saltmarsh and deciduous woodland. Potential permanent loss of these priority habitats. The option passes within 500m of ancient woodland. No direct effects on ancient woodland but there may be disturbance effects during the construction phase and potential effects on protected species. The Hanningfield Reservoir Groundwater Dependent Terrestrial Ecosystems (GWDTE) is within 500m of the option. The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. The percentage change is -53.47%. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost.	Consider minor rerouting to avoid most high value habitats. Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid priority habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual operational effects are lessened.	0	--	0	-

	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	--	0	-	High risk of INNS being abstracted at source and transferred through pipeline but low risk of INNS being introduced into reservoir due to water treatment prior to storage. There are known to be several high-impact INNS in the River Thames. The route crosses several WFD Management catchments and several small rivers and drainage trenches. Potential risk of pipe bursts could cause INNS to be released to the environment if in the location of watercourses which would be crossed. This may be considered unlikely and therefore a low risk, though higher than if treatment occurred prior to transfer.	N/A	0	-	0	-
	To meet WFD objectives relating to biodiversity.	0	-	0	0	The WFD Phase 1 assessment results show there would be a low risk for ecology during construction but no effects during operation. One waterbody was identified as requirng further assessment: Lower thames transitional body. Level 2 WFD assessment identified potential major deterioration risks to biological status elements and physio chemical quality elements, largely due to the new abstraction and the highly saline discharge from the new desalination plant. Therefore, this assessment concludes a precautionary compliance risk, pending further investigation. A risk to achieving good status was also identified due to dissolved inorganic nitrogen, due to the potential impact of the discharge, reducing the future improvements which could be made.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	--	0	0	The option crosses grade 2 and 4 agricultural land with disturbance to these soils during construction. During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any loss of land quality from the transfer pipeline. The location of the desalination plant is on Grade 4 agricultural land and this land will be permanently lost. The option intersects the Dollymans Farm authorised landfill site and the Benfleet Creek historic landfill site and is within 500m of four other historical landfill sites. This option has the potential to disturb contaminated material during construction.	Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land permanently taken or temporarily disturbed. Ground will be reinstated therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. There will be permanent loss as a result of the desal plant. Best practice techniques to prevent disturbance of contaminated material during construction.	0	-	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	--	0	--	The transfer pipeline will pass through Flood Zones 2 and 3 which may have an impact on construction; however the operation of the pipeline is unlikely to be affected by flooding as it is underground. The desalination plant is to be constructed in Flood Zone 3 for tidal flooding, therefore the desalination plant will be at risk of flooding. Flood defences are in place along the coastline.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required. The design should consider the future potential increased flood risks for the desalination plant, to ensure operation can continue.	0	-	0	-
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	0	The transfer pipeline crosses watercourses therefore potential for impacts on water quality during the construction phase. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction.	0	-	0	0
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option overlies Essex Gravels WFD groundwater bodies. Potential for temporary effects on groundwater balance from shafts for crossings.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	--	0	--	The WFD Phase 1 assessment determined that the option would have a moderate level of effect on one or more waterbodies during the construction phase and during operation phase. Level 2 WFD assessment identified a compliance risk, pending further investigation, and a risk to achieving good status due to dissolved inorganic nitrogen. This will reduce the future improvements which could be made.	Best practice construction methods and pollution prevention measures to be implemented. However, some residual effects may still remain.	0	-	0	-
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	++	0	During the operational phase, the desalination plant would have positive effects on water supply resilience due to not relying on freshwater sources. The option will also improve the resilience of water supplies as it proposes to supply a base supply even during drought conditions.	N/A	0	0	++	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA nor are there any within 2km. Construction likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0

Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	--	0	---	Effects during construction of the option due to resource use and emissions, and effects during the operational phase due to energy intensive process.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	--
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	+	-	Using tidal water will reduce the need to abstract from over inland rivers. Future climate effects on sea level rise should be considered when siting the desalination plant.	N/A	0	0	+	-
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	--	0	0	Option intersects the London area Greenbelt and passes through the Northern Thames Basin (0.01%) and Greater Thames Estuary (0.03%) NCAs (with % proportion of NCA affected). Negative effects during construction likely as excavation will be required for the transfer pipeline. Construction will also result in permanent loss of woodland, with impacts on landscape character. The construction of the desalination plant may temporarily affect the NCA character, however during operation, it would be a large-scale industrial building which is in keeping with the NCA for this area.	Re-routing of the pipeline to minimise damage and disruption to woodland, or utilise directional drilling or other trenchless techniques to reduce construction effects. Best practice measures to be implemented to minimise effects during construction including although temporary effects during construction may remain. Land reinstated upon completion so with mitigation, no residual effects are likely to remain during operation.	0	-	0	0
Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting	0	-	0	0	The option is within 500m of a scheduled monument and is within proximity of a number of listed buildings, the option intersects four councils - Castle Point, Rochford, Basildon, and Chelmsford - for which conservation area data has not been made available. Construction may affect the setting of these historic assets, however this is likely to be temporary as the pipeline will be buried. There is potential for the excavation of the pipeline to impact buried archaeology if present. The location of the desalination plant is unlikely to affect the setting of any historical assets as there are none within 500m.	Best practice measures to be implemented to minimise setting effects for other heritage assets during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	0
Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	-	+	0	The pipeline intersects two Noise Action Planning Important Areas and sports facilities. The option is within 500m of a medical care facility, infant schools, primary schools, secondary schools, playing fields, golf course, allotments, religious grounds and public park and gardens. There is likely to be temporary disturbance to users of these sites and the local community during construction. This option may contribute to the local economy through employment opportunities during the construction phase and operational phase due to employment opportunities at the desalination plant, although this is likely to be a small number. IMD deciles along the pipeline route vary from two and nine	Route alignment to be amended or trenchless techniques to be used to avoid direct impacts on property and community assets. Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur during construction.	+	-	+	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	0	0	There are no shellfish waters or bathing waters within 500m of the option location. The movement of water from one point to another increases the risks of disease transmission. All potable water transfers have been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	N/A	0	0	0	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	-	0	0	There may be temporary disturbance on walking and cycling routes, and other public rights of way during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. There could be potential to enhance the cycleways as part of the works (e.g. during re-instatement).	0	0	0	0
	Maintain and enhance tourism and recreation	0	-	0	0	The pipeline route crosses open spaces, watercourses and habitat areas/woodland that could be used for recreation. Therefore there may be some temporary effects on recreation, angling and other water based activities during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0

Material Assets	Minimise resource use and waste production	0	--	0	--	New infrastructure required for option which will use materials and generate waste and excavated material.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	-
	Avoid negative effects on built assets and infrastructure	0	--	0	0	The option crosses three railway lines and major roads. Likely to be temporary impacts during construction due to disruption for users. It is assumed that trenchless techniques will be used for pipelines which cross railway lines and major roads. During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-DES-002 (formerly ESW-DES-002A)
Option Name	Tilbury Terrestrial Desalination (Max Capacity)
Water company	Essex & Suffolk Water
Option Description	Brackish desalination plant at Tilbury (25MLD) with a transfer to Herongate SR. The intake / outfall will be via a pier type structure.
WRZ	Essex & Suffolk Water

Option rejected. Further information can be found in Section 2.2.6 of the Supply Option Development Technical Report.

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
	To protect designated sites and their qualifying features.	0	--	0	-	Langdon Ridge SSSI (19.5% favourable, 80.5% unfavourable - recovering) is within 500m of the option. No direct effects but there may be disturbance effects during the construction phase. Other designated sites within 2km- Thames Estuary and Marshes is a RAMSAR and SPA which may be indirectly affected. The option is entirely located within SSSI Impact Risk Zones. There are no MCZ/MPAs within 500m of the option. The HRA ToLS identified nine Natura 2000 sites that could be affected. Thames Estuary & Marshes SPA (approx. 2.1km), Outer Thames Estuary SPA (approx. 20km), Benfleet and Southend Marshes (SPA) (approx. 15.5km), Crouch & Roach Estuaries (Mid-Essex Coast Phase 3) SPA (approx 15km), Medway Estuary & Marshes SPA (approx. 20km), Thames Estuary and Marshes Ramsar (approx. 2.1km), Benfleet and Southend Marshes Ramsar (approx. 15.5km), Crouch & Roach Estuaries (Mid-Essex Coast Phase 3) Ramsar (approx. 15km), Medway Estuary & Marshes Ramsar (approx. 20km). Likely significant effects concluded for Thames Estuary & Marshes SPA and Ramsar; Outer Thames Estuary SPA; and Benfleet and Southend Marshes SPA and Ramsar due to construction and operational effects from hydrological links. Desalination options require discharge of saline solution. This may lead to adverse effects to designated sites during operation. No LSE concluded for the other 4 sites.	Consider refining pipeline alignment or use trenchless techniques to avoid Ramsar, SSSI, and SPA. Best practice methods to be implemented to minimise disturbance effects to the Ramsar, SAC, SPA and SSSI. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual operational effects are lessened, although this wouldn't negate the need for a potential appropriate assessment.	0	-	0	-

Biodiversity, flora and fauna	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	--	0	--	The pipeline passes through areas of the following BAP priority habitats; coastal and floodplain grazing marsh; deciduous woodland; coastal saltmarsh and mudflats. Potential permanent loss of these BAP priority habitats resulting from construction. The option passes within 500m of ancient woodland. There are no direct effects on ancient woodland but there may be disturbance effects during the construction phase and potential effects on protected species. There is also potential for operational impacts on habitats from saline discharge. There are no Groundwater Dependent Terrestrial Ecosystems (GWDTE) or chalk rivers within 2km of the option. The southern section of the pipeline is within an Important Bird Area (RSPB). Potential for disturbance during construction and potential for permanent loss of habitat. The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. The percentage change is -12.27%.	Consider minor rerouting to avoid most high value habitats. Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid woodland habitat, in particular Ancient Woodland and BAP Priority Habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual operational effects are lessened.	0	-	0	-
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	--	0	-	Modearte risk of INNS. Pipeline crosses two waterbodies which could result in introduction of INNS if pipeline is damaged and raw water enters waterbodies. The route crosses several WFD Management catchments and several small rivers and drainage trenches. As the River Thames is known to have several high impact INNS species present, there could be a risk of INNS transmission if the water is not treated at the source.	N/A	0	--	0	-
	To meet WFD objectives relating to biodiversity.	0	-	0	-	The WFD Phase 1 assessment results show there would be a moderate risks for ecology on one or more waterbodies during the construction and operation phase.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	---	0	0	The option crosses grade 2 and 3 agricultural land with disturbance to these soils during construction. During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any loss of land quality from the transfer pipeline. The location of the pumping station is currently unknown. However, it is likely that this land, if agricultural, will not be reinstated as it is a permanent structure, therefore this land would be permanently lost. The option is directly within authorisied landfill sites -Tilbury Ash disposal site and within 500m of other authorisied landfill sites. Major negative rating because this option has the potential to disturb contaminated material during construction.	Footprint to be amended to avoid direct impacts to landfill sites. Consider implication of building on ash landfill – health and safety/ environmental issues. Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land permanently taken or temporarily disturbed. Ground will be reinstated therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. There will be permanent loss as a result of the desalination plant. Best practice techniques to prevent disturbance of contaminated material during construction.	0	--	0	0

Water	To reduce or manage flood risk, taking climate change into account.	0	--	0	0	The transfer pipeline will pass through different flood zones with works in Flood Zones 2 and 3 potentially having an impact on construction; however, its operation is unlikely to be affected by flooding as it is underground. The desalination plant is to be constructed in Flood Zone 3 for tidal flooding, therefore the desalination plant will be at risk of flooding. This section of the coastline is protected by a sea flood defence. Potentially, in the future the existing defences may not provide the same level of flood protection from increased storm events and sea level rise associated with climate change, and the desalination plant may therefore be at increased flood risk, which may affect its operation and therefore the resilience of water supplies.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required. The design should consider the future potential increased flood risks for the desalination plant, to ensure operation can continue.	0	--	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	0	The transfer pipeline crosses watercourses therefore potential for impacts on water quality during the construction phase. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option is located within a number of groundwater SPZs with potential for impacts on water quality during the construction phase.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	--	0	--	The WFD Phase 1 assessment determined that the option would have a medium level of effect on one or more waterbodies during the construction and operation phase.	Best practice construction methods and pollution prevention measures to be implemented. However, some residual effects may still remain.	0	-	0	-
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	++	0	During the operational phase, the desalination plant would have positive effects on water supply resilience due a reduction in the reliance on freshwater sources. The option will also improve the resilience of water supplies as it proposes to supply a base supply even during drought conditions.	N/A	0	0	++	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA although Gravesham A226 Onewy system AQMA is within 2km. Construction likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	--	Effects during construction of the option due to resource use and emissions, and effects during the operational phase due to energy intensive process.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	0	0	Water levels not predicted to be significantly affected therefore unlikely to affect resilience of the local environment to climate change.	N/A	0	0	0	0

Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	--	0	0	The option is located in the Greater Thames Estuary (0.02%), Northern Thames Basin (0.01%) NCAs. Negative effects during construction likely as excavation will be required for the transfer pipeline. Construction will also result in permanent loss of woodland, with impacts on landscape character. The construction of the desalination plant may temporarily affect the NCA character, however during operation, it would be a large-scale industrial building which is in keeping with the NCA for this area.	Re-routing of the pipeline to minimise damage and disruption to woodland, or utilise directional drilling or other trenchless techniques to reduce construction effects. Best practice measures to be implemented to minimise effects during construction including although temporary effects during construction may remain. Land reinstated upon completion so with mitigation, no residual effects are likely to remain during operation.	0	-	0	0
Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	0	-	0	0	The option is within 500m of Herongate, Orsett, Thorndon Park and West Tilbury Conservation Area, and is within proximity of a number of listed buildings. Registered Battlefields II* Thordon Hall, plus scheduled monuments are within 500m. Construction may affect the setting of these historic assets, however this is likely to be temporary as the pipeline will be buried. There is potential for the excavation of the pipeline to impact buried archaeology if present. The construction of the desalination plant may affect the setting of heritage assets during construction and operation.	Best practice measures to be implemented to minimise setting effects for other heritage assets during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	0
Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	-	+	0	The transfer pipeline is within 500m of a primary school, a cemetry, churches, golf courses, playing fields, and an allotment. There is no direct land take from these areas. There is likely to be temporary disturbance to users of these sites and the local community during construction. Seven Noise Action Planning Important areas are within 500m. Operation of the desalination plant is also unlikely to cause general nuisance, being situated away from residential buildings and situated within industrial land-use and infrastructure. This option may contribute to the local economy through employment opportunities during the construction phase. During operation, it may contribute to the local economy through employment opportunities at the desalination plant as this is a new plant, although the number of jobs is likely to be small. IMD deciles along the pipeline route vary from 1 to 10.	Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur during construction.	+	-	+	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	0	0	There are no shellfish waters or bathing waters within 500m of the option location. It is unlikely that this option would affect disease transmission during operation. Diseases in seawater that affect humans are associated with the presence of pollutants such as sewage (rather than the water itself) and the water will be treated as part of the desalination process.	N/A	0	0	0	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	-	0	0	The proposed pipeline route will cross one National Cycle Network route. There may be temporary disturbance on users of these, as well as other walking and cycling routes, and other public rights of way during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. There could be potential to enhance the cycleways as part of the works (e.g. during re-instatement).	0	0	0	0
	Maintain and enhance tourism and recreation	0	-	0	0	The pipeline route is within 500m of golf courses, playing fields, allotments, a cemetry and crosses open spaces, watercourses and habitat areas/woodland that could be used for recreation. Therefore there may be some temporary effects on recreation, angling and other water based activities during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0

Material Assets	Minimise resource use and waste production	0	-	0	0	New infrastructure required for option which will use materials and generate waste and excavated material.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that some negative effects will remain.	0	-	0	0
	Avoid negative effects on built assets and infrastructure	0	--	0	0	The option crosses railway lines, a major road and a National Cycle Network route. Likely to be temporary impacts during construction due to disruption for users. It is assumed that trenchless techniques will be used for pipelines which cross railway lines and major roads. During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network, with only a small number of additional journeys for workers at the desalination plant.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-DES-003
Option Name	Sizewell beach desalination
Water company	Essex & Suffolk Water
Option Description	Seawater Desalination Plant. Abstraction from the North Sea, discharge to Saxmundham Tower. Service reservoir located off site. Two transfers required. Transfer 1 from beach wells/infiltration galleries to the desalination plant (raw water), approximately 2.2km. Transfer 2 from the desalination plant to Saxmungham (treated water), approximately 10.1km.
WRZ	Essex & Suffolk Water

Option rejected. Further information can be found in Section 2.2.6 of the Supply Option Development Technical Report.

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	---	0	--	The option intersects the Leiston - Aldeburg SSSI (58% favourable, 39% unfavourable - recovering , 2% unfavourable - declining), the Outer Thames Estuary Marine Protected Area (MPA) and the Haven, Aldeburgh LNR so there is the potential for direct impacts. Construction of the pipeline from the desalination plant is likely to affect the features of the SSSI and MPA (on land, within the intertidal zone and the estuary) Sizewell Marshes SSSI (100% favourable) is within 500m of the option. The option is within 500m of the Suffolk Sandlings and the Alde-Ore Estuary RSPB sites. No direct effects likely but there may be disturbance effects during the construction phase. The HRA ToLS identified 11 Natura 2000 sites that could be affected, Southern North Sea SAC (0km), Outer Thames Estuary SPA (0km), Sandlings SPA (0.2km), Alde-Ore & Butley Estuaries SAC (0.6km), Alde-Ore Estuary SPA (0.6km), Aldre-Ore Estuary Ramsar (0.6km), Orfordness-Shingle Street SAC (1.8km), Minsmere to Walberswick Heaths & Marshes SAC (1.8km), Minsmere-Walberswick SPA (1.8km), Minsmere-Walberswick Ramsar (1.8km) and Dew's Pond SAC (7.5km). Likely significant effects concluded for the following 10 sites, Southern North Sea SAC (0km), Outer Thames Estuary SPA (0km), Sandlings SPA (0.2km), Alde-Ore & Butley Estuaries SAC (0.6km), Alde-Ore Estuary SPA (0.6km), Aldre-Ore Estuary Ramsar (0.6km), Orfordness-Shingle Street SAC (1.8km), Minsmere to Walberswick Heaths & Marshes SAC (1.8km), Minsmere-Walberswick SPA (1.8km), Minsmere-Walberswick Ramsar (1.8km) due to construction and operational effects from hydrological links. Desalination options require discharge of saline solution. This may lead to adverse effects to designated sites during operation. No LSE concluded for the other one site.	Route re-alignment recommended if possible to avoid direct impacts with the SSSI and MPA or trenchless techniques to be used. Best practice methods to be implemented to minimise disturbance effects to the SSSIs. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual operational effects are lessened although this wouldn't negate the need for a potential appropriate assessment. HRA AA required to assess effects on the 10 designated sites including saline discharge.	0	--	0	--
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	---	0	---	The pipeline passes through areas of the following priority habitats; coastal vegetated shingle, lowland dry acid grassland, deciduous woodland, traditional orchard and no main habitat but additoinal habitats present. Potential permanent loss of these priority habitats. The option passes within 500m of ancient woodland. No direct effects on ancient woodland but there may be disturbance effects during the construction phase and potential effects on protected species. The Leiston-Aldeburdg Groundwater Dependent Terrestrial Ecosystems (GWDTE) is intersected by the option with direct effects likely, Sizewell Marshes GWDTE is within 500m of the option, no direct affects likely. The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. The percentage change is -49.17%. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost.	Consider minor rerouting to avoid most high value habitats. Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid priority habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual operational effects are lessened.	0	--	0	--

	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	--	0	-	As source water is untreated, there is a risk of INNS transfer from source and potential for pipe bursts to cause water to be released to the environment (creating pathway for the transfer of INNS). Several designated sites found within 1km of transfer and along the section of raw water transfer. Transfer from the desalination plant to Saxmundham Tower involves treated water in a closed system therefore the risk of INNS introduction is negligible.	During construction best practice will be implemented to prevent the spread of INNS.	0	--	0	-
	To meet WFD objectives relating to biodiversity.	0	0	0	0	The WFD Phase 1 assessment results show there would be no effects for ecology during construction or operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	--	0	0	The option crosses grade 2, 3 and 4 agricultural land with disturbance to these soils during construction. During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any loss of land quality from the transfer pipeline. The location of the desalination plant is on Grade 3 agricultural land and this land will be permanently lost. The option is within 500m of four historical landfill sites. This option has the potential to disturb contaminated material during construction.	Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land permanently taken or temporarily disturbed. Ground will be reinstated therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. There will be permanent loss as a result of the desalination plant. Best practice techniques to prevent disturbance of contaminated material during construction.	0	-	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	--	0	0	The transfer pipeline will pass through Flood Zones 2 and 3 which may have an impact on construction; however the operation of the pipeline is unlikely to be affected by flooding as it is underground. The desalination plant is to be constructed in Flood Zone 1. Flood defences are in place along the coastline.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required. The design should consider the future potential increased flood risks for the desalination plant, to ensure operation can continue.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	0	The transfer pipeline crosses watercourses therefore potential for impacts on water quality during the construction phase. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction.	0	-	0	0
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option intersects source protection zones 1, 2 and 3 with potential for impacts on water quality during the construction phase.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	---	Five waterbodies were considered during the WFD Phase 1 assessment: Suffolk, Hundred River, Leiston Beck, Fromus and Waveney and East Suffolk Chalk & Crag (GW). The assessment determined that the option would have a high level of effect on Suffolk and Waveney and East Suffolk Chalk & Crag during operational phase due to new or increased groundwater abstraction and new discharge of highly saline water to a coastal or traditional waterbody and a low level of effect on the other three waterbodies. There is a low level effect on all waterbodies during construction.	Best practice construction methods and pollution prevention measures to be implemented. However, some residual effects may still remain.	0	-	0	--

	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	++	0	During the operational phase, the desalination plant would have positive effects on water supply resilience due to not relying on freshwater sources. The option will also improve the resilience of water supplies as it proposes to supply a base supply even during drought conditions.	N/A	0	0	++	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA, however the The Suffolk Coastal District Council Air Quality Management Area No 3 is within 2km of the option. Construction likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	--	0	---	Effects during construction of the option due to resource use and emissions, and effects during the operational phase due to energy intensive process.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	--
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	+	-	Using tidal water will reduce the need to abstract from over inland rivers. Future climate effects on sea level rise should be considered when siting the desalination plant.	N/A	0	0	+	-
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	--	0	--	Option intersects the Suffolk Coasts and Heath AONB (0.04%) and passes through the South Norfolk and High Suffolk Claylands (0.01%) and the Suffolk Coast and Heaths (0.03%) NCAs (with % proportion of NCA affected). Negative effects during construction likely as excavation will be required for the transfer pipeline. Construction will also result in permanent loss of woodland, with impacts on landscape character. The construction and operation of the desalination plant may affect the NCA character, as during operation it would be a large-scale industrial building on the outskirts of Leiston in an area which is currently green fields.	Re-routing of the pipeline to minimise damage and disruption to woodland, or utilise directional drilling or other trenchless techniques to reduce construction effects. Best practice measures to be implemented to minimise effects during construction including although temporary effects during construction may remain. Land reinstated upon completion.	0	-	0	--
Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	0	--	0	0	The option intersects the Suffolk Heritage Coast England, the Thorpeness Conservation area and the Aldeburgh Conservation area. The option is also within 500m of a scheduled monument and is within proximity of a number of listed buildings, the option intersects three councils - Essex & Suffolk District, Waveney District and Suffolk Coastal District for which conservation area data has not been made available. Construction may affect the setting of these historic assets, however this is likely to be temporary as the pipeline will be buried. There is potential for the excavation of the pipeline to impact buried archaeology if present. The location of the desalination plant is unlikely to affect the setting of any historical assets as there are none within 500m.	Best practice measures to be implemented to minimise setting effects for other heritage assets during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	0

Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	-	+	0	The pipeline intersects playing fields. The option is within 500m of three primary schools, two secondary school, playing fields, religious grounds, allotments, sports facilities, a golf course and a hospital. There is likely to be temporary disturbance to users of these sites and the local community during construction. This option may contribute to the local economy through employment opportunities during the construction phase and operational phase due to employment opportunities at the desalination plant, although this is likely to be a small number. IMD deciles along the pipeline route vary from 4 to 8.	Route alignment to be amended or trenchless techniques to be used to avoid direct impacts on property and community assets. Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur during construction.	+	-	+	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	0	0	There are no shellfish waters or bathing waters within 500m of the option location. The movement of water from one point to another increases the risks of disease transmission. All potable water transfers have been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	N/A	0	0	0	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	-	0	0	The pipeline intersects one National Cyle Network route. There may be temporary disturbance to users of this and other public rights of way during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. There could be potential to enhance the cycleways as part of the works (e.g. during re-instatement).	0	0	0	0
	Maintain and enhance tourism and recreation	0	-	0	0	The pipeline route crosses an LNR, open spaces, watercourses and habitat areas/woodland that could be used for recreation. Therefore there may be some temporary effects on recreation, angling and other water based activities during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0
Material Assets	Minimise resource use and waste production	0	--	0	--	New infrastructure required for option which will use materials and generate waste and excavated material.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	-
	Avoid negative effects on built assets and infrastructure	0	--	0	0	The option crosses one railway line and major roads. Likely to be temporary impacts during construction due to disruption for users. It is assumed that trenchless techniques will be used for pipelines which cross railway lines and major roads. During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-DES-004
Option Name	California Beach Desalination
Water company	Essex & Suffolk Water
Option Description	Seawater Desalination Plant. Abstraction from the North Sea, discharge to Barsham WTW. Service reservoir located off site. Two transfers required. Transfer 1 from beach wells/infiltration galleries to the desalination plant (raw water), approximately 1.8km. Transfer 2 from the desalination plant to Barsham WTW (treated water), approximately 37km.
WRZ	Essex & Suffolk Water

Option only selected within the following scenarios:

- Low PCC
- Low Demand
- Fast Technology
- Slow Technology

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
	To protect designated sites and their qualifying features.	0	---	0	--	The option intersects the Outer Thames Marine Protected Area (MPA) and the Greater Wash MPA, as well as the Great Yarmouth North Denes SSSI (100% favourable) and the Great Yarmouth North Denes RSPB Important Bird Area and there is potential for direct impacts. Geldeston Meadows SSSI (97% unfavourable - no change, 3% unfavourable - declining) is within 500m of the option. No direct effects likely but there may be disturbance effects during the construction phase. The entire option is within a SSSI Impact risk zone. The HRA ToLS identified nine Natura 2000 sites that could be affected, Broadland SPA (0km), Broadland Ramsar (0km), The Broads SAC (0km), Southern North Sea SAC (0km), Greater Wash SPA (0km), Outer Thames Estuary SPA (0km), Great Yarmouth North Denes SPA (0km), Breydon Water Ramsar (1.8km) and Breydon Water SPA (1.8km). Likely significant effects concluded for all nine sites due to construction and operational effects from hydrological links. Desalination options require discharge of saline solution and well abstraction works. This may lead to adverse effects to designated sites during operation.	Route re-alignment recommended if possible to avoid direct impacts with the SSSI, MPA and the RSPB Important Bird Area or trenchless techniques to be used. Best practice methods to be implemented to minimise disturbance effects to the SSSIs. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual operational effects are lessened although this wouldn't negate the need for a potential appropriate assessment. HRA AA required to assess effects on designated sites including saline discharge.	0	--	0	--
Biodiversity, flora and fauna	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	---	0	--	The pipeline passes through areas of the following priority habitats; Deciduous woodland, Lowland heath, Maritime cliff and slope, Coastal and floodplain grazing marshland, Coastal sand dunes, Good quality semi-improved grassland, Lowland fens, Purple moor grass and rush pastures and No main habitat but additonal habitats present. Potential permanent loss of these priority habitats. The option passes within 500m of ancient woodland. No direct effects on ancient woodland but there may be disturbance effects during the construction phase and potential effects on protected species. Geldeston Meadows Groundwater Dependent Terrestrial Ecosystems (GWDTE) is within 500m of the option, no direct affects likely. The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. The percentage change is -39.43%. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost.	Consider minor rerouting to avoid most high value habitats. Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid priority habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual operational effects are lessened.	0	-	0	-

	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	--	0	--	As source water is untreated, there is a moderate risk of INNS transfer from source and potential for pipe bursts to cause water to be released to the environment (creating pathway for the transfer of INNS). Several designated sites found within 1km of transfer. Transfer crosses two WFD operational catchments. No connections to other waterbodies or washout points are present within the transfer. Transfer from the desalination plant to Barsham WTW involves treated water in a closed system therefore the risk of INNS introduction is negligible.	During construction best practice will be implemented to prevent the spread of INNS.	0	-	0	--
	To meet WFD objectives relating to biodiversity.	0	-	0	0	The WFD Phase 1 assessment results show there would be a low risk for ecology during construction but no effects during operation. No biodiversity risks identified in WFD L2 assessment of Broadland Rivers Chalk and Crag (GW) waterbody. Potential for minor and temporary impacts to water levels and flow in nearby River Waveney due to groundwater dewatering during construction, which could impact habitat suitability short-term. No biodiversity risks identified in WFD L2 assessment of Broadland Rivers Chalk and Crag (GW) waterbody. Potential for minor and temporary impacts to water levels and flow in River Waveney due to dewatering during construction, which could impact habitat suitablility short term. WFD L2 results conclude that the option does not compromise or assist attainment of water body objectives.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	--	0	-	The option crosses grade 1, 2, 3 and 4 agricultural land with disturbance to these soils during construction. During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any loss of land quality from the transfer pipeline. The location of the desalination plant is on Grade 1 agricultural land and this land will be permanently lost. The option intersects the Caister-on-sea historical landfill sites and is within 500m of three other historical landfill sites. This option has the potential to disturb contaminated material during construction.	Consider relocation of desalination plant to avoid Grade 1 agricultural land. Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land permanently taken or temporarily disturbed. Ground will be reinstated therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. There will be permanent loss as a result of the desalination plant. Best practice techniques to prevent disturbance of contaminated material during construction.	0	-	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	--	0	0	The transfer pipeline will pass through Flood Zones 2 and 3 which may have an impact on construction; however the operation of the pipeline is unlikely to be affected by flooding as it is underground. The desalination plant is to be constructed in Flood Zone 1. Flood defences are in place along the coastline.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required. The design should consider the future potential increased flood risks for the	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	0	The transfer pipeline crosses watercourses therefore potential for impacts on water quality during the construction phase. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction.	0	-	0	0
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option intersects source protection zones 1, 2 and 3 with potential for impacts on water quality during the construction phase.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	--	0	---	Six waterbodies were considered during the WFD Phase 1 assessment: Norfolk East, Bure & Waveney & Yare & Lothing, Much Fleet, Yare (Wensum to tidal), Waveney (Ellingham Mill - Burgh St. Peter) and Waveney and East Suffolk Chalk & Crag. High level of effects during operation on the Bure & Waveney & Yare & Lothing waterbody due to a new discharge of highly saline water and on Waveney and East Suffolk Chalk & Crag waterbody due to new or increased surface water abstraction. Moderate effects during construction on Norfolk East waterbody due to construction of below ground structures with associated dewatering within 500m of a sensitive groundwater feature. One waterbody considered in WFD Level 2 assessment: Broadland Rivers Chalk and Crag (GW) (GB40501G400300). WFD L2 results conclude that the option does not compromise or assist attainment of water body objectives.	Best practice construction methods and pollution prevention measures to be implemented. However, some residual effects may still remain.	0	-	0	-
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	++	0	During the operational phase, the desalination plant would have positive effects on water supply resilience due to not relying on freshwater sources. The option will also improve the resilience of water supplies as it proposes to supply a base supply even during drought conditions.	N/A	0	0	++	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA, nor is within 2km of an AQMA. Construction likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0

Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	--	0	---	Effects during construction of the option due to resource use and emissions, and effects during the operational phase due to energy intensive process.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	--
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	+	-	Using tidal water will reduce the need to abstract from over inland rivers. Future climate effects on sea level rise should be considered when siting the desalination plant.	N/A	0	0	+	-
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	--	0	--	The option intersects The Broads National Park and passes through the North East Norfolk and Flegg (0.19%), South Norfolk and High Suffolk Claylands (0.01%), and The Broads (0.07%) NCAs (with % proportion of NCA affected). Negative effects during construction likely as excavation will be required for the transfer pipeline. Construction will also result in permanent loss of woodland, with impacts on landscape character. The construction and operation of the desalination plant may temporarily and permanantly affect the NCA character of the area, as the desalination plant will be contructed in a previously agricultural area.	Re-routing of the pipeline to minimise damage and disruption to woodland, or utilise directional drilling or other trenchless techniques to reduce construction effects. Best practice measures to be implemented to minimise effects during construction including although temporary effects during construction may remain. Land reinstated upon completion.	0	-	0	-
Historic Environment	To conserve/protect and enhance historic environment and heritage assets, and their setting, including archaeologically important sites.	0	-	0	-	The option is within 500m of a Ravingham Hall Registered Park of Garden, Halvergate Marshes heritage at risk area, Halvergate marshes conservation area, Ormesby St Margaret Conservation area, three scheduled monuments and is within proximity of a number of listed buildings, the option intersects four councils - Waveney District, Great Yarmouth District, South Norfolk District and Broadland District for which conservation area data has not been made available. Construction may affect the setting of these historic assets, however this is likely to be temporary as the pipeline will be buried. There is potential for the excavation of the pipeline to impact buried archaeology if present. The location of the desalination plant may affect the setting of listed buildings within the Ormesby St Margaret Conservation area as this conservation area is within 500m of the desalination plant.	Best practice measures to be implemented to minimise setting effects for other heritage assets during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	-
Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	-	+	0	The Option intersects one Noise Action Planning important areas and is within 500m of three further Noise Action Planning important areas. The option intersects one secondary school and playing fields with direct impacts likely. The option is within 500m of two primary schools, a SEN school, a secondary school, religious grounds, a public park or garden, a vehicle ferry terminal, a service station, allotments, playing fields and a golf course. There is likely to be temporary disturbance to users of these sites and the local community during construction. This option may contribute to the local economy through employment opportunities during the construction phase and operational phase due to employment opportunities at the desalination plant, although this is likely to be a small number. IMD deciles along the pipeline route vary from 2 to 9.	Route alignment to be amended or trenchless techniques to be used to avoid direct impacts on property and community assets, including the secondary school. Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur during construction.	+	-	+	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	0	0	There are two bathing water monitoring locations within 500m of the option. There are no shellfish waters within 500m of the option location. The movement of water from one point to another increases the risks of disease transmission. All potable water transfers have been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	N/A	0	0	0	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	-	0	0	The pipeline intersects three National Cyle Network routes. There may be temporary disturbance to users of this and other public rights of way during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. There could be potential to enhance the cycleways as part of the works (e.g. during re-instatement).	0	0	0	0
	Maintain and enhance tourism and recreation	0	-	0	0	The pipeline route crosses open spaces, watercourses and habitat areas/woodland that could be used for recreation. Therefore there may be some temporary effects on recreation, angling and other water based activities during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0
Material Assets	Minimise resource use and waste production	0	--	0	--	New infrastructure required for option which will use materials and generate waste and excavated material.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	-

	Avoid negative effects on built assets and infrastructure	0	--	0	0	The option crosses two railway lines and major roads. Likely to be temporary impacts during construction due to disruption for users. It is assumed that trenchless techniques will be used for pipelines which cross railway lines and major roads. During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-DES-006
Option Name	Canvey Island Barge Mounted Desalination (Max Capacity)
Water company	Essex & Suffolk Water
Option Description	Abstraction from the Thames Estuary, discharge to Hanningfield Service Reservoir. Transfer length between plant and reservoir approximately 20.7 km.
WRZ	Essex & Suffolk Water

Option rejected. Further information can be found in Section 2.2.6 of the Supply Option Development Technical Report.

SEA Topic	SEA Objective	Construction Effects +	Construction Effects -	Operational Effects +	Operational Effects -	Comment	Mitigation	Residual Construction Effects +	Residual Construction Effects -	Residual Operational Effects +	Residual Operational Effects -
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	---	0	---	Canvey wick SSSI (100 % favourable), Holehaven Creek SSSI (100% favourable) and Hanningfield Reservoir SSSI (100% favourable) are within 500m of the option and may be indirectly affected. Other designated sites within 2km- Thames Estuary and Marshes is a RAMSAR and SPA, Benfleet and Southern Marshes RAMSAR and SPA, Crouch & Roach Estuaries (Mid-Essex Coast Phase 3) RAMSAR and SPA and Essex Estuaries SAC which may be indirectly affected. The option is entirely located within SSSI Impact Risk Zones. There is one MCZ within 500m, Blackwater, Crouch, Roach and Colne Estuaries. There are no MPAs within 500m of the option. The HRA ToLS identified 12 Natura 2000 sites that could be affected. Ramsars: Benfleet and Southend Marshes Ramsar (approx. 1km), Thames Estuary and Marshes Ramsar (approx. 1km), Foulness (Mid-Essex Coast Phase 5) Ramsar (approx. 14km), Crouch & Roach Estuaries (Mid-Essex Coast Phase 3)Ramsar (approx. 2km), Medway Estuary & Marshes Ramsar (approx. 18km. SPAs: Benfleet and Southend Marshes SPA (approx. 1km), Thames Estuary and Marshes SPA (approx. 1km), Outer Thames Estuary SPA (approx. 7km), Foulness (Mid-Essex Coast Phase 5) SPA (approx. 14km), Crouch & Roach Estuaries (Mid-Essex Coast Phase 3) SPA (approx. 2km), Medway Estuary & Marshes SPA (approx. 18km). SAC: Essex Estuaries SAC (approx. 2km). Likely significant effects concluded for all of the above listed sites. The effects are due due to construction and operational effects from hydrological links. Desalination options require discharge of saline solution. This may lead to adverse effects to designated sites during operation.	Consider refining pipeline alignment or use trenchless techniques to avoid Ramsar, SSSI, SAC, MCZ and SPA. Best practice methods to be implemented to minimise disturbance effects to the Ramsar, SAC, MCZ, SPA and SSSI. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual operational effects are lessened although this wouldn't negate the need for a potential appropriate assessment.	0	--	0	--
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	---	0	--	The pipeline passes through areas of the following BAP priority habitats; coastal and floodplain grazing marsh; deciduous woodland; coastal saltmarsh and mudflats. Potential permanent loss of these BAP priority habitats. The option passes within 500m of ancient woodland. No direct effects on ancient woodland but there may be disturbance effects during the construction phase and potential effects on protected species. There are four Groundwater Dependent Terrestrial Ecosystems "GWDTE" within 2km of the option potential for indirect impacts. There are no chalk rivers within 2km. The southern section of the pipeline is directly within an Important Bird Area (RSPB). Potential for disturbance during construction and potential for permanent loss of habitat. There are also likely to be operational impacts on habitats from saline discharge. The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. The percentage change is -51.40%.	Consider minor rerouting to avoid most high value habitats. Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid woodland habitat, in particular Ancient Woodland and BAP Priority Habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual operational effects are lessened.	0	--	0	-

	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	--	0	-	High risk of INNS being abstracted at source and transferred through the pipeline but a low risk of INNS being introduced into reservoir due to water treatment prior to storage. The pipeline crosses five drainage channel crossings and Canvey Wick Nature Reserve which could result in introduction of INNS if the pipeline is damaged and raw water enters waterbodies. Additionally, the pipeline would cross several Management Catchments. As the River Thames is known to have several high impact INNS species present, there could be a risk of INNS transmission if the water is not treated at the source.	N/A	0	--	0	-
	To meet WFD objectives relating to biodiversity.	0	--	0	0	The WFD Phase 1 assessment results show there would be a medium risk for ecology during construction but no effects during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	---	0	0	The option crosses grade 3 and 4 agricultural land with disturbance to these soils during construction. During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any loss of land quality from the transfer pipeline. The location of the desalination plant is within grade 4 agricultural land, and will not be reinstated as it is a permanent structure, therefore this land would be permanently lost. The option is directly within Benfleet Creek Historic Landfill and within 500m of other authorised and historic landfill sites. Major negative rating because this option has the potential to disturb contaminated material during construction.	Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land permanently taken or temporarily disturbed. Ground will be reinstated therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. There will be permanent loss as a result of the desalination plant. Footprint to be amended to avoid direct impacts on historic landfill sites. Consider implication of building on landfill – health and safety/ environmental issues. Best practice techniques to prevent disturbance of contaminated material during construction.	0	--	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	--	0	0	The transfer pipeline will pass through different flood zones with works in Flood Zones 2 and 3 potentially having an impact on construction; however, its operation is unlikely to be affected by flooding as it is underground. The desalination plant is to be constructed in Flood Zone 2 & 3 for tidal flooding, therefore the desalination plant will be at risk of flooding. This section of the coastline is protected by a sea flood defence. Potentially, in the future, the existing defences may not provide the same level of flood protection from increased storm events and sea level rise associated with climate change, and the desalination plant may therefore be at increased flood risk, which may affect its operation and therefore the resilience of water supplies.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required. The design should consider the future potential increased flood risks for the desalination plant, to ensure operation can continue.	0	--	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	0	The transfer pipeline crosses watercourses therefore potential for impacts on water quality during the construction phase. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option is not located within groundwater SPZs. Low potential for impacts on water quality during the construction phase.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	--	0	--	The WFD Phase 1 assessment determined that the option would have a medium level of effect on one or more waterbodies during the construction and operation phase.	Best practice construction methods and pollution prevention measures to be implemented. However, some residual effects may still remain.	0	-	0	-
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	++	0	During the operational phase, the desalination plant would have positive effects on water supply resilience due to a reduction in reliance on freshwater sources. The option will also improve the resilience of water supplies as it proposes to supply a base supply even during drought conditions.	N/A	0	0	++	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA. Construction likely to have a low potential for temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0

Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	--	Effects during construction of the option due to resource use and emissions, and effects during the operational phase due to energy intensive process.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	0	0	Water levels not predicted to be significantly affected therefore unlikely to affect resilience of the local environment to climate change.	N/A	0	0	0	0
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	--	0	0	The option is located in the Greater Thames Estuary (0.02%) and Northern Thames Basin (0.01%) NCAs. Negative effects during construction likely as excavation will be required for the transfer pipeline. Construction will also result in permanent loss of woodland, with impacts on landscape character. The construction of the desalination plant may temporarily affect the NCA character, however during operation, it would be a large-scale industrial building which is in keeping with the NCA for this area.	Re-routing of the pipeline to minimise damage and disruption to woodland, or utilise directional drilling or other trenchless techniques to reduce construction effects. Best practice measures to be implemented to minimise effects during construction including although temporary effects during construction may remain. Land reinstated upon completion so with mitigation, no residual effects are likely to remain during operation.	0	-	0	0
Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting	0	-	0	0	The option is within 500m of South Benfleet Conservation Area, and is within proximity of a number of listed buildings. Moreover, the option intersects three councils - Castle Point, Rochford, and Chelmsford - for which conservation area data has not been made available. Scheduled monuments are within 500m. Construction may affect the setting of these historic assets, however this is likely to be temporary as the pipeline will be buried. There is potential for the excavation of the pipeline to impact buried archaeology if present. The desalination plant is not within 500m of any Historical Environments.	Best practice measures to be implemented to minimise setting effects for other heritage assets during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	0
Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	-	+	0	The transfer pipeline is within 500m of infant, primary and secondary schools, hospital, a cemetery, churches, golf courses, playing fields, sport facilities and allotments. There is no direct land take from these areas. There is likely to be temporary disturbance to users of these sites and the local community during construction. Eight Noise Action Planning Important areas are within 500m. Operation of the desalination plant is also unlikely to cause general nuisance, being situated away from residential buildings and situated within industrial land-use and infrastructure. This option may contribute to the local economy through employment opportunities during the construction phase. During operation, it may contribute to the local economy through employment opportunities at the desalination plant as this is a new plant, although the number of jobs is likely to be small. IMD deciles along the pipeline route vary from 2 to 10.	Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur during construction.	+	-	+	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	0	0	There are no shellfish waters or bathing waters within 500m of the option location. It is unlikely that this option would affect disease transmission during operation. Diseases in seawater that affect humans are associated with the presence of pollutants such as sewage (rather than the water itself) and the water will be treated as part of the desalination process.	N/A	0	0	0	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	0	0	0	The proposed pipeline route does not cross any National Cycle Network route or National Trail. There may be temporary disturbance on users of other walking and cycling routes, and other public rights of way during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. There could be potential to enhance the cycleways as part of the works (e.g. during reinstatement).	0	0	0	0

	Maintain and enhance tourism and recreation	0	-	0	0	The pipeline route is within 500m of a golf course, playing fields, allotments, cemetery and crosses open spaces, watercourses, and habitat areas/woodland that could be used for recreation. Therefore there may be some temporary effects on recreation, angling, and other water based activities during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0
Material Assets	Minimise resource use and waste production	0	--	0	0	New infrastructure is required for the option which will use materials and generate waste and excavated material.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	0
	Avoid negative effects on built assets and infrastructure	0	--	0	0	The option crosses railway lines and major roads. Likely to be temporary impacts during construction due to disruption for users. It is assumed that trenchless techniques will be used for pipelines that cross railway lines and major roads. During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network, with only a small number of additional journeys for workers at the desalination plant.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-DES-007
Option Name	Tilbury Barge Mounted Desalination
Water company	Essex & Suffolk Water
Option Description	Brackish Desalination Barge (tanks sized for 250 Ml/d DO). Abstraction from the Thames Estuary, discharge to Herongate Service Reservoir. Transfer length between plant and reservoir approximately 18.5 km.
WRZ	Essex & Suffolk Water

Option rejected. Further information can be found in Section 2.2.6 of the Supply Option Development Technical Report.

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
	To protect designated sites and their qualifying features.	0	---	0	--	The option intersects the Thames Estuary and Marshes RSPB site and has the potential for direct impacts. Construction of the desalination plant is likely to affect the features of the RSPB (on land, within the intertidal zone, and the estuary). The option is within 500m of Langdon Ridge SSSI (19.5% favourable, 80.5% unfavourable - recovering) No direct effects likely but there may be disturbance effects during the construction phase. The HRA ToLS identified 19 Natura 2000 sites that could be affected Thames Estuary & Marshes Ramsar and SPA (2.1km), Outer Thames Estuary SPA (20km), Benfleet and Southend Marshes Ramsar and SPA (15.5km), Foulness (Mid-Essex coast phase 5) Ramsar and SPA (30km), Crouch & Roach Estuaries (Mid-Essex coast phase 3) Ramsar and SPA (15km), Dengie (Mis-Essex coast phase 1) Ramsar and SPA (40km), Essex Estuaries SAC (30km), Margate and Long Sands SAC (40km), Medway Estuary & Marshes Ramsar and SPA (20km), The Swale Ramsar and SPA (38km) and Blackwater Estuary (Mid-Essex coast phase 4) Ramsar and SPA (27km). Likely significant effects concluded for Thames Estuary & Marshes Ramsar and SPA, Outer Thames Estuary SPA, and Benfleet and Southend Marshes Ramsar and SPA due to temporary and permanent construction effects on the sites' designated features. Desalination options require discharge of saline solution. This may lead to adverse effects to designated sites during operation. No LSE concluded for the other 14 sites.	Route re-alignment recommended if possible to avoid direct impacts with the RSPB site or trenchless techniques to be used. Best practice methods to be implemented to minimise disturbance effects to the SSSIs. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual operational effects are lessened.	0	--	0	-

Biodiversity, flora and fauna	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	---	0	--	The pipeline passes through areas of the following BAP priority habitats including; coastal and floodplain grazing marsh; mudflats; coastal saltmarsh and deciduous woodland. Potential permanent loss of these BAP prioirty habitats. The option passes through woodland and within 500m of ancient woodland. Likely no direct effects on ancient woodland, but there may be disturbance effects during the construction phase and potential effects on protected species. There are also likely to be operational impacts on habitats from saline discharge. The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. The percentage change is -73.85%. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost.	Consider minor rerouting to avoid most high value habitats. Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid woodland habitat, in particular Ancient Woodland and BAP Priority Habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual operational effects are lessened.	0	--	0	-
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	--	0	--	Moderate risk of the transfer of INNS during construction and operation as the pipeline crosses several management catchments and two waterbodies, which could result in introduction of INNS if pipeline is damaged and raw water enters waterbodies. As the River Thames is known to have several high impact INNS species present, there could be a risk of INNS transmission if the water is not treated at the source.	N/A	0	--	0	--
	To meet WFD objectives relating to biodiversity.	0	-	0	0	The WFD Phase 1 assessment results show there would be a medium risk for ecology during construction but no effects during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	---	0	0	The option crosses grade 2 and 3 agricultural land with disturbance to these soils during construction. During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any loss of land quality from the transfer pipeline. The location of the desalination plant is on non-agricultural land and this land will be permanently lost. The desalination plant is located on the Tilbury Ash disposal site authorised landfill site and the Tilbury B Power Station Fort Road historic landfill site. The pipeline is within 500m of two other historical landfill sites. Major negative rating because this option has the potential to disturb contaminated material during construction.	Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land permanently taken or temporarily disturbed. Ground will be reinstated therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. There will be permanent loss as a result of the desalination plant, however this is on non-agricultural land. Best practice techniques to prevent disturbance of contaminated material during construction.	0	-	0	0

Water	To reduce or manage flood risk, taking climate change into account.	0	--	0	0	The transfer pipeline will pass through Flood Zones 2 and 3 which may have an impact on construction; however, the operation of the pipeline is unlikely to be affected by flooding as it is underground. The desalination plant is to be constructed in Flood Zone 3 for tidal flooding, therefore the desalination plant will be at risk of flooding. Flood defences are in place along the coastline.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required. The design should consider the future potential increased flood risks for the desalination plant, to ensure operation can continue.	0	--	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	0	The transfer pipeline crosses watercourses therefore potential for impacts on water quality during the construction phase. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option overlies Essex Gravels, South Essex Thurrock Chalk and South Essex London Tertiaries WFD groundwater bodies.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	--	0	--	The WFD Phase 1 assessment determined that the option would have a medium level of effect on one or more waterbodies during the construction and operation phase. Further assessment is required on five waterbodies.	Best practice construction methods and pollution prevention measures to be implemented. However, some residual effects may still remain. A WFD Stage 2 assessment is needed to better understand the effects on the waterbodies during construction and operation.	0	-	0	-
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	++	0	During the operational phase, the desalination plant would have positive effects on water supply resilience due to a reduction in reliance on freshwater sources. The option will also improve the resilience of water supplies as it proposes to supply a base supply even during drought conditions.	N/A	0	0	++	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA but the Gravesham Borough Council AQMA is within 2km. Construction likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	--	Effects during construction of the option due to resource use and emissions, and effects during the operational phase due to energy intensive process.	Investigate the use of renewables during construction and operation for energy supply and the use of materials with lower embodied carbon. Carbon footprint study could help identify areas for carbon savings or alternative materials. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-

	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	+	-	The use of tidal water will reduce the need to abstract from inland rivers. Future climate effects on sea level rise should be considered when siting the desalination plant.	N/A	0	0	+	-
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	--	0	0	Option intersects the London area Green Belt and passes through the Northern Thames Basin (0.01%) and Greater Thames Estuary (0.01%) NCAs (with % proportion of NCA affected). Negative effects during construction are likely as excavation will be required for the transfer pipeline. Construction will also result in permanent loss of woodland, with impacts on landscape character. The construction of the desalination plant may temporarily affect the NCA character, however during operation, it would be a large-scale industrial building which is in keeping with the NCA for this area.	Re-routing of the pipeline to minimise damage and disruption to woodland, or utilise directional drilling or other trenchless techniques to reduce construction effects. Best practice measures to be implemented to minimise effects during construction including although temporary effects during construction may remain. Land reinstated upon completion so with mitigation, no residual effects are likely to remain during operation.	0	-	0	0
Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting	0	-	0	0	The option is adjacent to the West Tilbury Conservation Area, and is within 500m of Orsett Conservation area and Herongate Conservation area. The option is also within 500m of one Grade II* registered park and garden and four scheduled monuments, and is within proximity of a number of listed buildings. Construction may affect the setting of these historic assets, however this is likely to be temporary as the pipeline will be buried. There is potential for the excavation of the pipeline to impact buried archaeology if present. The location of the desalination plant is unlikely to affect the setting of any historical assets as there are none within 500m.	Best practice measures to be implemented to minimise setting effects for other heritage assets during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	0
	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	-	+	0	The pipeline is within 500m of seven Noise Action Planning Important Areas, golf courses, playing fields, religious grounds and allotments. There is likely to be temporary disturbance to users of these sites and the local community during construction. This option may contribute to the local economy through employment opportunities during the construction phase and operational phase due to employment opportunities at the desalination plant, although this is likely to be a small number. IMD deciles along the pipeline route vary from 1 to 9.	Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur during construction.	+	-	+	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	0	0	There are no shellfish waters or bathing waters within 500m of the option. The movement of water from one point to another increases the risks of disease transmission. All potable water transfers have been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	N/A	0	0	0	0

Population and Human Health	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	-	0	0	The Option crosses one National cycle network route, there may be temporary disturbance on this and other walking and cycling routes, and other public rights of way during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. There could be potential to enhance the cycleways as part of the works (e.g. during re-instatement).	0	0	0	0
	Maintain and enhance tourism and recreation	0	-	0	0	The pipeline route crosses open spaces, watercourses and habitat areas/woodland that could be used for recreation. Therefore there may be some temporary effects on recreation, angling and other water based activities during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0
Material Assets	Minimise resource use and waste production	0	--	0	0	New infrastructure required for option which will use materials and generate waste and excavated material.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	0
	Avoid negative effects on built assets and infrastructure	0	--	0	0	The option crosses two railway lines and major roads. Likely to be temporary impacts during construction due to disruption for users. It is assumed that trenchless techniques will be used for pipelines that cross railway lines and major roads. During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-DES-008
Option Name	Corton Beach well desalination
Water company	Essex & Suffolk Water
Option Description	Seawater Desalination Plant. Abstraction from the North Sea, discharge to Barsham WTW. Service reservoir located off site. Two transfers required. Transfer 1 from beach wells/infiltration galleries to the desalination plant (raw water), approximately 722m. Transfer 2 from the desalination plant to Barsham WTW (treated water), approximately 24.7km.
WRZ	Essex & Suffolk Water

Option selected in the following plans:

- Best Environment
- High PCC

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	---	0	--	The option intersects the Corton Cliffs Geological SSSI (100% favourable), the Outer Thames Estuary Marine Protected Area (MPA), the Breydon Water RSPB Important Bird area and the Gunton Warren and Corton Woods LNR, the option has the potential for direct impacts. Construction of the pipeline from the desalination plant is likely to affect the features of the SSSI and MPA (on land, within the intertidal zone and the estuary) Stanley and Alder Carrs, Aldeby SSSI (100% unfavourable - recovering) and Geldeston Meadows SSSI (97% unfavourable - no change, 3% unfavourable - declining) are within 500m of the option. The option is within 500m of the Broadland RSPB Important Bird area. No direct effects likely but there may be disturbance effects during the construction phase. The majority of the option is within a SSSI Impact risk zone. The HRA ToLS identified eight Natura 2000 sites that could be affected Broadland SPA (0km), Broadland Ramsar (0km), The Broads SAC (0km), Southern North Sea SAC (0km), Outer Thames Estuary SPA (0km), Breydon Water Ramsar (3km), Breydon Water SPA (3km) and Great Yarmouth North Denes SPA (7.5km). Likely significant effects concluded for Broadland SPA (0km), Broadland Ramsar (0km), The Broads SAC (0km), Southern North Sea SAC (0km), Outer Thames Estuary SPA (0km) due to construction and operational effects from hydrological links. Desalination options require discharge of saline solution and well abstraction works. This may lead to adverse effects to designated sites during operation. No LSE concluded for the other three sites.	Route re-alignment recommended if possible to avoid direct impacts with the SSSI, MPA and the RSPB Important Bird Area or trenchless techniques to be used. Best practice methods to be implemented to minimise disturbance effects to the SSSIs. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual operational effects are lessened although this wouldn't negate the need for a potential appropriate assessment. HRA AA will be required to assess effects on the five designated sites including saline discharge.	0	--	0	--
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	---	0	---	The pipeline passes through areas of the following priority habitats; Deciduous woodland, Lowland heath, Maritime cliff and slope, Coastal and floodplain grazing marshlan, lowland fens, good quality semi-improved grassland and no main habitat but additoinal habitats present. Potential permanent loss of these priority habitats. The option passes within 500m of ancient woodland. No direct effects on ancient woodland but there may be disturbance effects during the construction phase and potential effects on protected species. Geldeston Meadows and Stanley & Alder Carrs, Aldeby GWDTE are within 500m of the option, no direct affects likely. The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. The percentage change is -40.2%. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost.	Consider minor rerouting to avoid most high value habitats. Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid priority habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual operational effects are lessened.	0	--	0	--

	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	--	0	-	As source water is untreated, there is a moderate risk of INNS transfer from source and potential for pipe bursts to cause water to be released to the environment (creating pathway for the transfer of INNS). Several designated sites found within 1km of transfer. Transfer crosses two WFD managements catchments. No connections to other waterbodies or washout points are present within the transfer. Transfer from the desalination plant to Barsham WTW involves treated water in a closed system therefore the risk of INNS introduction is negligible.	During construction best practice will be implemented to prevent the spread of INNS.	0	--	0	-
	To meet WFD objectives relating to biodiversity.	0	-	0	0	The WFD Phase 1 assessment results show there would be a low risk for ecology during construction but no effects during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	--	0	0	The pipeline intersects the Corton Cliffs Geological SSSI (100% favourable) and direct effects are likely. The option crosses grade 1, 2, 3 and 4 agricultural land with disturbance to these soils during construction. During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any loss of land quality from the transfer pipeline. The location of the desalination plant is on Grade 2 agricultural land and this land will be permanently lost. The option intersects the Disused Railway Cutting off Stirrups Lane and the Hollow Way Road historical landfill sites and is within 500m of four other historical landfill sites. This option has the potential to disturb contaminated material during construction.	Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land permanently taken or temporarily disturbed. Ground will be reinstated therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. There will be permanent loss as a result of the desalination plant. Best practice techniques to prevent disturbance of contaminated material during construction.	0	-	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	--	0	0	The transfer pipeline will pass through Flood Zones 2 and 3 which may have an impact on construction; however the operation of the pipeline is unlikely to be affected by flooding as it is underground. The desalination plant is to be constructed in Flood Zone 1. Flood defences are in place along the coastline.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required. The design should consider the future potential increased flood risks for the desalination plant, to ensure operation can continue.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	0	The transfer pipeline crosses watercourses therefore potential for impacts on water quality during the construction phase. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction.	0	-	0	0
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option intersects source protection zones 1, 2 and 3 with potential for impacts on water quality during the construction phase.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	--	0	---	Four waterbodies were considered during the WFD Phase 1 assessment: Norfolk East, Bure & Waveney & Yare & Lothing, Waveney (Ellingham Mill - Burgh St. Peter) and Waveney and East Suffolk Chalk & Crag (GW). High level effects during operation for Bure & Waveney & Yare & Lothing due to new discharge of hihgly saline water and for Waveney and East Suffolk Chalk & Crag (GW) due to new or increased surface water abstraction. Moderate construction effects on Norfolk East waterbody due to construction of below ground structures with associated dewatering, within 500m of a sensitive feature.	Best practice construction methods and pollution prevention measures to be implemented. However, some residual effects may still remain.	0	-	0	--

	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	++	0	During the operational phase, the desalination plant would have positive effects on water supply resilience due to not relying on freshwater sources. The option will also improve the resilience of water supplies as it proposes to supply a base supply even during drought conditions.	N/A	0	0	++	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA, nor is within 2km of an AQMA. Construction likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	--	0	---	Effects during construction of the option due to resource use and emissions, and effects during the operational phase due to energy intensive process.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	--
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	+	-	Using tidal water will reduce the need to abstract from over inland rivers. Future climate effects on sea level rise should be considered when siting the desalination plant.	N/A	0	0	+	-
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	--	0	0	The option intersects The Broads National Park and passes through the South Norfolk and High Suffolk Claylands (0.01%), the Suffolk Coast and Heaths (0.03%) and The Broads (0.05%) NCAs (with % proportion of NCA affected). Negative effects during construction likely as excavation will be required for the transfer pipeline. Construction will also result in permanent loss of woodland, with impacts on landscape character. The construction of the desalination plant may temporarily affect the NCA character, however during operation there are unlikely to be any effects as it would be a large-scale industrial building on an existing water treatement facility.	Re-routing of the pipeline to minimise damage and disruption to woodland, or utilise directional drilling or other trenchless techniques to reduce construction effects. Best practice measures to be implemented to minimise effects during construction including although temporary effects during construction may remain. Land reinstated upon completion.	0	-	0	0
Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	0	--	0	0	The option intersects an area of Heritage at risk Halvergate Marshes, the Halvergate Marshes Conservation area, Gillingham Conservation area and the Fritton Lakes country park. The option is also within 500m of a scheduled monument and is within proximity of a number of listed buildings, the option intersects five councils - Waveney District, Great Yarmouth District, South Norfolk District, Norwich District and Broadland District for which conservation area data has not been made available. Construction may affect the setting of these historic assets, however this is likely to be temporary as the pipeline will be buried. There is potential for the excavation of the pipeline to impact buried archaeology if present. The location of the desalination plant may affect the setting of one Grade II* listed building as it is within 500m of the desalination plant.	Best practice measures to be implemented to minimise setting effects for other heritage assets during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	0

Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	-	+	0	The Option intersects three Noise Action Planning important areas and is within 500m of five further Noise Action Planning important areas. The option is within 500m of three primary schools, religious grounds, allotments, a public park or garden, two bowling greens, playing fields, sports facilities and three golf courses. There is likely to be temporary disturbance to users of these sites and the local community during construction. This option may contribute to the local economy through employment opportunities during the construction phase and operational phase due to employment opportunities at the desalination plant, although this is likely to be a small number. IMD deciles along the pipeline route vary from four to eight.	Route alignment to be amended or trenchless techniques to be used to avoid direct impacts on property and community assets. Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur during construction.	+	-	+	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	0	0	There is one bathing water monitoring location within 500m of the option. There are no shellfish waters within 500m of the option location. The movement of water from one point to another increases the risks of disease transmission. All potable water transfers have been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	N/A	0	0	0	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	-	0	0	The pipeline intersects three National Cyle Network routes. There may be temporary disturbance to users of this and other public rights of way during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. There could be potential to enhance the cycleways as part of the works (e.g. during re-instatement).	0	0	0	0
	Maintain and enhance tourism and recreation	0	-	0	0	The pipeline route crosses an LNR, open spaces, watercourses and habitat areas/woodland that could be used for recreation. Therefore there may be some temporary effects on recreation, angling and other water based activities during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0
Material Assets	Minimise resource use and waste production	0	--	0	--	New infrastructure required for option which will use materials and generate waste and excavated material.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	-
	Avoid negative effects on built assets and infrastructure	0	--	0	0	The option crosses one railway line and major roads. Likely to be temporary impacts during construction due to disruption for users. It is assumed that trenchless techniques will be used for pipelines which cross railway lines and major roads. During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-EFR-001
Option Name	Southend-on-Sea Effluent Re-use (max capacity)
Water company	Essex & Suffolk Water
Option Description	Effluent re-use plant being fed from Anglian Water's WRC with a transfer to Hanningfield reservoir. Intake from Southend-on-Sea WRC (Anglian Water owned asset), discharge to Hanningfield Service Reservoir. Two transfers required: Southend-on-Sea WRC to new effluent reuse plant (Transfer 1, approximately 990m), new effluent reuse plant to Hanningfield reservoir (Transfer 2, approximately 23.1km).
WRZ	Essex & Suffolk Water

Option selected in the following plans:

- Best Environment

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	---	0	0	The Crouch & Roach Estuaries (Mid-Essex Coast Phase 3) Ramsar, SAC, SPA, and SSSI (28% favourable, 71% unfavourable - recovering, 1% Unfavourable - no change), and The Outer Thames Estuary SPA are directly impacted by the option. Hanningfield Reservoir SSSI (100% favourable) is within 500m of the option, no direct effects but there may be disturbance effects during the construction phase. The option overlaps the Blackwater, Crouch, Roach and Colne Estuaries MCZ and the Crouch & Roach Estuaries MPA and the Outer Thames Estuary MPA. The HRA ToLS identified 12 Natura 2000 sites that could be affected; Crouch & Roach Estuaries (Mid-Essex coast phase 3) Ramsar and SPA (0km), Essex Estuaries SAC (0km), Foulness (Mid-Essex coast phase 5) Ramsar and SPA (7km), Outer Thames Estuary SPA (0km), Benfleet and Southend Marshes Ramsar and SPA (3km), Blackwater Estuary (Mid-Essex coast phase 4) Ramsar and SPA and Thames Estuary & Marshes Ramsar and SPA (8.5km). Potential likely significant effects concluded for Crouch & Roach Estuaries (Mid-Essex coast phase 3) Ramsar and SPA, Essex Estuaries SAC, Foulness (Mid-Essex coast phase 5) Ramsar and SPA, Outer Thames Estuary SPA, Benfleet and Southend Marshes Ramsar and SPA, due to temporary and permanent effects on the sites designated features, and hydrological connection to the sites with potential effects during construction. Residual construction impacts due to habitat fragmentation, however no direct operational impacts anticipated. No LSE concluded for the other four sites. Following the HRA AA, it is considered that with aderence to the proposed mitigation, the proposed works associated with this option are not expected to have adverse effects on the overall integrity of the following sites and their qualifying features: Benfleet and Southend Marshes Ramsar and SPA. For the remaining sites, averse effects cannot be ruled out, and thus further investigation is recommended to assess potential effects in more detail on the qualifying features and determine more targeted mitigation measures as well as to reduce uncertainty: Crouch & Roach Estuaries Ramsar and SPA, Essex Estuaries SAC, Foulness Ramsar, and Outer Thames Estuary SPA.	Consider refining pipeline alignment or use trenchless techniques to avoid Ramsar, SSSI, SAC and SPA. Best practice methods to be implemented to minimise disturbance effects. With this in place, it is anticipated that adverse impacts on the Designated Sites will be alleviated during the construction and operation phases of this option. However, some residual effects may potentially remain.	0	--	0	0
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	---	0	0	The pipeline passes adjacent to and through BAP Priority Habitat (mainly coastal and floodplain grazing marsh, coastal saltmarsh, deciduous woodland and mudflats). Potential permanent loss of BAP Priority Habitats. No direct effects on other Priority Habitats but there may be disturbance effects during the construction phase and potential effects on protected species. Construction may cause habitat fragmentation. There are no chalk rivers within 2km of the option. The pipeline crosses the Crouch and Roach Estuaries Groundwater Dependent Terrestrial Ecosystems (GWDTE) and is within 500m of the Hanningfield Reservoir GWDTE. The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. The percentage change is -29.39%. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost and therefore is considered a constraint.	Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid woodland habitat, in particular Ancient Woodland and BAP Priority Habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened.	0	--	0	0
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	Very low risk of transfer of INNS as the treated source water is likely to be entirely free of INNS. Construction phase risk of INNS is also considered to be very low.	N/A	0	0	0	0

	To meet WFD objectives relating to biodiversity.	0	-	0	0	The WFD Phase 1 assessment results show medium risks for ecology during construction but no effects during operation. Three waterbodies were identified as requiring further assessment. Level 2 WFD assessment for the Lower Thames identified possible deterioration risks to biological elemetns due to changes in water quality as a result of a cessation of an existing discharge (reducing the freshwater flow into this transitional water body). Therefore, this assessment concludes a precautionary biodiversity compliance risk, pending further investigation, and the decrease in freshwater flow could impact on the ability to achieve water body objectives. For the Essex gravles groundwater body potential deterioration risks were identified on quantitative GWDTE statuselements due to possible impacts of construction dewatering on the Crouch and Roach Estuaries SSSI GWDTE. Therefore, a precautionary biodiversity compliane risk is identified, pending further investigation. No risks to achieving water body objectives were identified. For the Crouch transitional water body only minor effects were identified largely due to construction impacts on river flow and quality. No compliance risks or risks to achieving water body objectives were identified as a result of this option in relation to biodiversity.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless technique where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	---	0	0	The option crosses grades 1, 2, 3 and 4 agricultural land with disturbance to these soils during construction. During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any loss of land quality from the transfer pipeline. The location of the pumping station is currently unknown. The current location of the new effluent reuse plant is located within Grade 1 agricultural land. It is likely that the land for the pumping station and effluent reuse plant, if agricultural, will not be reinstated as it is a permanent structure, therefore this land would be permanently lost. The option crosses a historic landfill site and is within 500m of other historic landfill sites with potential to disturb contaminated material during construction. No further effects are anticipated during the operational phase.	Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land permanently taken or temporarily disturbed. Ground will be reinstated therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. There will be permanent loss as a result of the pumping station and new effluent reuse plant. Permanent loss should be on non-BMV land where possible and only on BMV land where there are no other alternatives. Reinstatement or reprovision required post-construction. Pipeline realignment or trenchless techniques to avoid historic landfill. Best practice techniques to prevent disturbance of contaminated material during construction.	0	--	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	-	0	0	The majority of the option is within Flood Zone 1 , however large sections of the route also pass through Flood Zones 2 and 3 and flood defences and may have an impact on construction. Impacts on operation unlikely given the pipeline is buried. The pipeline is unlikely to increase the risk of flooding.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	--	The transfer pipeline crosses watercourses therefore potential for impacts on water quality during the construction phase. Potential for changes in water levels and flows in Hanningfield Reservoir during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless technique where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction. Monitoring water levels in the Hanningfield Reservoir will be undertaken during operation.	0	0	0	-
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option overlies the Essex Gravels groundwater unit with potential for mpacts on water quality during the construction phase and operation.	N/A	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	-	The WFD Phase 1 assessment determined that the option would have a medium level of effect on one or more waterbodies during the construction phase and the operation phase. Further assessment is needed on 3 waterbodies. For Lower Thames, this assessment identified a precautionary compliance risk, and that the decrease in freshwater flow could compromise the achievement of water body objectives. For Essex gravels, a precautionary compliance risk was found, however no risk to achieving water body objectives was identified assuming that appropriate mitigation	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, some residual effects may still be present as a result of construction.	0	-	0	-
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	The option involves reuse of water reducing demand, which may help to build resilence during potential future drought scenarios.	N/A	0	0	+	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA although Southend on Sea Borough Council AQMA is within 2km. Construction is likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however, short term air quality effects may remain.	0	-	0	0

Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	Effects during construction of the option due to resource use and emissions, and effects during the operational phase as the option requires a pumping station.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	+	--	Effects on water levels will depend where the effluent is being diverted from and whether this would affect water levels in that waterbody. Effluent will be discharged into the Hanningfield Reservoir providing additional flows.	N/A	0	0	+	--
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	-	0	0	The option is located in the Northern Thames Basin (0.01%) and the Greater Thames Estuary (0.04%) NCAs (with % showing proportion of NCA affected). Negative effects during construction likely as excavation will be required for the transfer pipeline. Construction will also result in permanent loss of woodland, with impacts on landscape character. Above ground infrastructure may permanently change the landscape character of the area and affect visual amenity. There are not anticipated to be any further landscape effects	Re-routing of the pipeline to minimise damage and disruption to woodland or utilise directional drilling or other trenchless techniques to reduce construction effects. Best practice measures to be implemented to minimise effects during construction including although temporary effects during construction may remain. Land reinstated upon completion where possible.	0	-	0	0
Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	0	-	0	0	The option is within 500m of Marsh Farm Country Park is within proximity of a number of listed buildings. Construction may affect the setting of these heritage assets, however this is likely to be temporary as the pipeline will be buried. There is potential for the excavation of the pipeline to impact buried archaeology if present. The new effluent reuse plant will be located north of the Temple Farm Industrial estate.	Best practice measures to be implemented to minimise setting effects for other historic heritage during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	0
Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	-	0	0	The pipeline is within 500m of London Southend airport, primary and secondary schools, playing fields, sports facilities, public parks and gardens, religious grounds and allotments. There is no direct land take from these areas. There is likely to be temporary disturbance to users of these sites and the local community during construction. This option may contribute to the local economy through employment opportunities during the construction phase. During operation, it is unlikely to contribute to the local economy. IMD deciles along the pipeline route vary from 2 to 10	Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur during construction.	+	-	0	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	-	0	0	The option crosses the Fambridge Shellfish classification zone. The construction of the option may have a temporary negative effect on the quality of this classification zone. There are no bathing waters monitoring sites within 500m of the option. All potable water transfers have been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	Best practice mitigation measures should be implemented during construction to lessen the effect on the Fambridge Shellfish classification zone.	0	0	0	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	-	0	0	There may be temporary disturbance to users of walking, cycling and other public rights of way furing the construction phase. This option does not propose any opportunities of associated environmental and recreational benefits.	N/A	0	-	0	0
	Maintain and enhance tourism and recreation	0	-	0	0	The option is within 500m of Marsh Farm Country Park, London Southend airport, primary and secondary schools, playing fields, sports facilities, public parks and gardens, religious grounds and allotments and crosses watercourses and habitat areas/ woodland that could be used for recreations. Therefore there may be some temporary effects on recreation, angling and other water based activities during the cosntruction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0
	Minimise resource use and waste production	0	-	0	0	New infrastructure required for option which will use materials and generate waste. Laying pipeline will involve excavated material.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	0

Material Assets	Avoid negative effects on built assets and infrastructure	0	--	0	0	The option crosses railway lines and major roads. Likely to be temporary impacts during construction due to disruption for users. It is assumed that trenchless techniques will be used for pipelines which cross railway lines and major roads. During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-EFR-002A
Option Name	Lowestoft water reuse (transfer to River Waveney)
Water company	Essex & Suffolk Water
Option Description	Effluent Reuse Plant (11.1 Ml/d DO). Intake from Lowestoft/Corton WRC (Anglian Water owned asset), discharge to point near Ellingham Mill. Two transfers required: Lowestoft/Corton WRC to new effluent reuse plant (Transfer 1, length approximately 200 m), new effluent reuse plant to Ellingham Mill on the River Waveney (Transfer 2, length approximately 26.3 km)
WRZ	Essex & Suffolk Water

Option selected in the following plans:

- Central Preferred
- Least Cost
- Best Value
- Best Environment
- High PCC
- Habs Regs SR

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	---	0	--	The option does not overlap any sites, however the following designated sites are wihin 2km with potential indirect impacts during the construction phase: Broadland Ramsar; The Broads SAC; Southern Noth Sea SAC; Broadland SPA; Outer Thames Estuary SPA; Stanley and Alder Carrs, Alderby SSSI (100.00% unfavourable recovering); Geldeston Meadows SSSI (97.18% unfavourable - no change; 2.82% unfavourable declining). Both SSSI are GWDTE and within 500m of the option. No MCZ or LNR within 500m of option. The HRA ToLS identified eight Natura 2000 sites that could be affected: Broadland SPA (UK9009253) (approx. 0.4km); Broadland Ramsar (~ 0.4km); The Broads SAC (~ 0.4km); Southern North Sea SAC (~ 0.55km); Outer Thames Estuary SPA (~0.55km); Breydon Water Ramsar (~3.5km); Breydon Water SPA (~3.5km); Great Yarmouth North Denes SPA (~7.5km). Potential likely significant effects concluded for Broadland SPA and Ramsar; The Broads SAC; and Outer Thames Estuary SPA due to hydrological links between the option and these sites and potential for disturbance and pollution during construction, and discharge of treated effluent into River Waveney may cause adverse operational effects on the river and its hydrological links. LSE due to construction-caused habitat disruption to Southern North Sea SAC, Breydon Water Ramsar, and Breydon Water SPA. No LSE for Great Yarmouth North Denes SPA.	Best practice methods to be implemented to minimise adverse effects from constuction and operation, however some impacts likely to remain. HRA AA required to assess uncertain effects on Broadland SPA and Ramsar; The Broads SAC; and Outer Thames Estuary SPA. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened. However, likely to be residual effects in the long term due to proximity to Natura 2000 sites and this would not negate the need for a potential appropriate assessment.	0	--	0	-
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	--	0	--	The pipeline passes adjacent to and through Priority Habitat (mainly coastal and floodplain grazing marsh, deciduous woodland and good quality semi-improved grassland). Potential permanent loss of Priority Habitats. No direct effects on other Priority Habitats but there may be disturbance effects during the construction phase and potential effects on protected species. No direct overlap with Ancient Woodland but there are two ancient woodlands within 500m with potential for indirect impact. There are no chalk rivers within 2km of the option. The pipeline is within 500m of and hydrologically linked to Alder Carrs, Alderby; and Geldeston Meadows Groundwater Dependent Terrestrial Ecosystems (GWDTE). Discharge of treated effluent into the River Waveney may cause adverse operational effects on river habitat and hydrological links. The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. The percentage change is -19.91% Note: Ancient Woodland is excluded from these calculations as this habitat is classed as irreplaceable once lost.	Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid woodland habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened.	0	-	0	-
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	Transfer is within same WFD management catchment and crosses River Waveney and several small drainage ditches/streams. There are no additional connections to other waterbodies. Five internationally designated sites and five SSSIs are present within 1km of this option. However as water is treated at source this poses no additional INNS risk.	During construction best practice will be implemented to prevent the spread of INNS.	0	0	0	0
	To meet WFD objectives relating to biodiversity.	0	0	0	0	The WFD Phase 1 assessment results show low risks for ecology for all waterbodies during the construction phase and the operation phase.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless technique where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction or operation.	0	0	0	0

Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	---	0	0	Broome Heath Pit; and Leet Hill, Kirby Cane; and Corton Cliffs geological SSSI are within 2km. The option crosses grade 1, 2, 3 and 4 agricultural land with disturbance to these soils during construction. Major negative construction impact due to the high quality of agricultural land (Grade 1 and 2). During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any loss of land quality from the transfer pipeline. The location of the pumping station is currently unknown. The proposed location of the new effluent reuse plant is located within Grade 2 agricultural land. Likely the land for the pumping station and effluent reuse plant will not be reinstated as they are a permanent structures, therefore this land would be permanently lost. The option does not directly overlap any landfill sites, however the intake site Lowestoft/Corton WRC sits immediately adjacent a historical landfill site ('Disused Railway Cutting off Stirrups Lane'), with potential to disturb contaminated material during construction.	Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land permanently taken or temporarily disturbed. Ground will be reinstated, therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. There will be permanent loss as a result of the pumping station and new effluent reuse plant. Permanent loss should be on non-BMV land where possible and only on BMV land where there are no other alternatives. Reinstatement or reprovision required post construction. Pipeline realignment or trenchless techniques to avoid historic landfill. Best practice techniques to prevent disturbance of contaminated material during construction.	0	-	0	0	
Water	To reduce or manage flood risk, taking climate change into account.	0	-	0	0	The majority of the option is within Flood Zone 1 , however large sections of the route also pass through Flood Zones 2 and 3 and flood defences, and may have an impact on construction. Impacts on operation unlikely given the pipeline is buried. The pipeline is unlikely to increase the risk of flooding.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required.	0	-	0	0	
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	-	The transfer pipeline crosses watercourses therefore potential for impacts on water quality during the construction phase. Potential for changes in water levels and flows in River Waveney during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless technique where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction. Monitoring water levels in the River Waveney will be undertaken during operation.	0	0	0	-	Will Waterlevels be monitored during operation? Need to check
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option overlies the Broadland Rivers Chalk & Crag groundwater unit with some potential for temporary impacts on water quality during the construction phase. Discharged water during opteration will be treated, therefore peventing operational degradation of water quality.	Best practice construction methods and pollution prevention measures to be implemented, which should prevent adverse impacts during construction. Therefore residual construction impacts lessened to neutral.	0	0	0	0	
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	-	The WFD Phase 1 assessment determined that the option would have a low level of all waterbodies during the construction phase and the operation phase. No further WFD assessments required.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no significant effects are predicted as a result of construction or operation.	0	0	0	0	
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	The option involves reuse of water reducing demand, which may help to build resilience during potential future drought scenarios.	N/A	0	0	+	0	
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA and there are none within 2km. Construction likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0	
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	Effects during construction of the option due to resource use (embodied carbon) and emissions, and emissions from energy use during the operation of the plant.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-	
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	+	--	Effects on water levels will depend where the effluent is being diverted from and whether this would affect water levels in that waterbody. Effluent will be discharged into River Waveney providing additional flows. Reusing water instead of increasing abstraction may increase climate resilience through releiving or preventing additional pressure on the water system.	N/A	0	0	+	--	
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	-	0	-	The option is located in the South Norfolk and High Suffolk Claylands (0.01%); Suffolk Coast and Heaths (0.02%); and The Broads (0.05%) NCAs (with % showing the proportion of the NCA affected). Negative effects during construction likely as excavation will be required for the transfer pipeline. Most of the pipeline will run along an existing road, therefore potential loss of adjacent habitats, and impact to landscape character will likely be less severe than GIS analysis predicts. Above ground infrastructure may permanently change the landscape character of the area and affect visual amenity.	Re-routing of the pipeline to minimise damage and disruption to woodland or utilise directional drilling or other trenchless techniques to reduce construction effects. Best practice measures to be implemented to minimise effects during construction, although temporary effects during construction may remain. Land reinstated upon completion where possible.	0	-	0	0	

Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	0	---	0	0	The option is within three conservation areas and overlaps three Grade II listed structures. Potential for direct impact, therefore major negative construction impact rating (without mitigation / route realignment). It is also within proximity of a number of other listed buildings. Construction may affect the setting of these heritage assets, however this is likely to be temporary as the pipeline will be buried. There is potential for the excavation of the pipeline to impact buried archaeology if present. The new effluent reuse plant will be located where the pipeline crosses road A47, ~200m NW of Lowestoft/Corton WRC.	Pipeline realignment may be required to avoid direct overlap with listed buildings. Construction impact lessened assuming final design will avoid direct impact on heritage assets. Best practice measures to be implemented to minimise setting effects for other historic heritage during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	--	0	0
Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	--	0	0	The option directly overlaps a country park, a golf course, a playing field, a public park and garden, three registered common lands, two religious grounds and The Broads National Park, with a number of other community sites within 500m. There is likely to be temporary disturbance to users of these sites and the local community during construction. This option may contribute to the local economy through employment opportunities during the construction phase. During operation, it is unlikely to contribute to the local economy. IMD deciles along the pipeline route vary from four to eight.	Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur during construction.	+	-	0	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	0	0	No Shellfish classification zones within 5km of the option, and no bathing waters monitoring sites within 500m of the option. All potable water transfers have been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	N/A	0	0	0	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	-	0	0	There may be temporary disturbance to users of walking, cycling and other public rights of way during the construction phase. This option does not propose any opportunities of associated environmental and recreational benefits.	N/A	0	-	0	0
	Maintain and enhance tourism and recreation	0	-	0	0	The option directly overlaps a country park, a golf course, a playing field, a public park and garden, three registered common lands, two religious grounds and The Broads National Park. Potential for direct impacts on users of these sites. It is also within 500m of anumber of other recreational sites and natural habitats and watercourses which could be used for recreation. Therefore there may be some temporary effects on recreation, angling and other water based activities during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0
Material Assets	Minimise resource use and waste production	0	-	0	0	New infrastructure required for option which will use materials and generate waste. Laying pipeline will involve excavated material.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	0
	Avoid negative effects on built assets and infrastructure	0	-	0	0	The option crosses two major roads, one railway track and two National Designated Cycle Routes. Likely to be temporary impacts during construction due to disruption for users. It is assumed that trenchless techniques will be used for pipelines which cross roads. During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-EFR-002B
Option Name	Lowestoft water reuse (transfer to River Waveney)
Water company	Essex & Suffolk Water
Option Description	Effluent Reuse Plant (15Ml/d DO). Intake from Lowestoft/Corton WRC (Anglian Water owned asset), discharge to point near Ellingham Mill. Three transfers required: Lowestoft/Corton WRC to new effluent reuse plant (Transfer 1, length approximately 200 m), new effluent reuse plant to Ellingham Mill on the River Waveney (Transfer 2, length approximately 26.3 km), and a transfer of treated water from Barsham to Holton (Transfer 3, length approximately 12.5 km).
WRZ	Essex & Suffolk Water

Option rejected. Further information can be found in Section 2.2.6 of the Supply Option Development Technical Report.

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	---	0	--	The option overlaps one site: Titsal Wood, Shadingfield (0.08%) SSSI (100.00% unfavourable - declining), with potential for direct impacts. In addition, the following sites are wihin 2km with potential indirect impacts during the construction phase: Broadland Ramsar; The Broads SAC; Southern Noth Sea SAC; Broadland SPA; Outer Thames Estuary SPA; Stanley and Alder Carrs, Alderby SSSI (100.00% unfavourable recovering); Geldeston Meadows SSSI (97.18% unfavourable - no change; 2.82% unfavourable declining). Both those SSSI are GWDTE and within 500m of the option. No MCZ or LNR within 500m of option. The HRA ToLS identified eight Natura 2000 sites that could be affected: Broadland SPA (UK9009253) (approx. 0.4km); Broadland Ramsar (~ 0.4km); The Broads SAC (~ 0.4km); Southern North Sea SAC (~ 0.55km); Outer Thames Estuary SPA (~0.55km); Breydon Water Ramsar (~3.5km); Breydon Water SPA (~3.5km); Great Yarmouth North Denes SPA (~7.5km). Potential likely significant effects concluded for Broadland SPA and Ramsar; The Broads SAC; and Outer Thames Estuary SPA due to hydrological links between the option and these sites and potential for disturbance and pollution during construction, and discharge of treated effluent into River Waveney may cause adverse operational effects on the river and its hydrological links. LSE due to construction-caused habitat disruption to Southern North Sea SAC, Breydon Water Ramsar, and Breydon Water SPA. No LSE for Great Yarmouth North Denes SPA. Following HRA AA, it is considered that with aderence to the proposed mitigation, the proposed works associated with this option are not expected to have adverse effects on the overall integrity of the following sites and their qualifying features: Southern North Sea SAC, and Breydon Water Ramsar and SPA. For the remaining sites, averse effects cannot be ruled out, and thus further investigation is recommended to assess potential effects in more detail on the qualifying features and determine more targeted mitigation measures as well as to reduce uncertainty: The Broads SAC (in relation to otter populations), Broadland Ramsar (in relation to otter and bird populations), Broadland SPA (in relation to bird populations), and Outer Thames Estuary SPA (in relation to bird populations).	Best practice methods to be implemented to minimise disturbance effects. For the following Designated Sites it is anticipated that with adherence to proposed mitigation, adverse impacts on the Designated Sites will be alleviated during the construction and operation phases of this option: Southern North Sea SAC, and Breydon Water Ramsar and SPA. For the remaining sites, low and localised effects may still be possible during both the construction and operation phases. These effects cannot be ruled out due to uncertainty, thus further studies to better understand how the qualifying species use the linked habitats are required and to determine more targeted mitigation measures. This option will need to be included in the in-combination assessment. These Designated Sites are: Broadland SPA, Broadland Ramsar, The Broads SAC, and Outer Thames Estuary SPA. However, it is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened.	0	--	0	-
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	--	0	--	The pipeline passes adjacent to and through Priority Habitat (mainly coastal and floodplain grazing marsh, deciduous woodland and good quality semi-improved grassland). Potential permanent loss of Priority Habitats. No direct effects on other Priority Habitats but there may be disturbance effects during the construction phase and potential effects on protected species. The option pipeline runs along the eastern side of Titsal Wood (0.07%) Ancient Woodland with potential for some direct land take or other impacts. There are also two ancient woodlands within 500m with potential for indirect impact. There are no chalk rivers within 2km of the option. The pipeline is within 500m of and hydrologically linked to Alder Carrs, Alderby; and Geldeston Meadows Groundwater Dependent Terrestrial Ecosystems (GWDTE). Discharge of treated effluent into the River Waveney may cause adverse operational effects on river habitat and hydrological links. The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. The percentage change is -19.91% Note: Ancient Woodland is excluded from these calculations as this habitat is classed as irreplaceable once lost.	Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid woodland habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. It is particularly important to mitigate any impacts on the Ancient Woodland, as this cannot be reinstated. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened.	0	--	0	-
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	Transfer is within same WFD management catchment and crosses River Waveney and several small drainage ditches/streams. There are no additional connections to other waterbodies. Five internationally designated sites and five SSSIs are present within 1km of this option. However as water is treated at source this poses no additional INNS risk.	During construction best practice will be implemented to prevent the spread of INNS.	0	0	0	0

	To meet WFD objectives relating to biodiversity.	0	0	0	0	The WFD Phase 1 assessment results show low risks for ecology for all waterbodies during the construction phase and the operation phase. After the Level 2 WFD assessment, the outcome for all seven waterbodies indicated no further assessment would be necessary for the option as the types of activities do not present a risk to WFD status or objectives for any waterbodies with regards to biodiversity.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction or operation.	0	0	0	0
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	---	0	0	Broome Heath Pit; and Leet Hill, Kirby Cane; Corton Cliffs; and Holton Pit geological SSSI are within 2km. The option crosses grade 1, 2, 3 and 4 agricultural land with disturbance to these soils during construction. Major negative construction impact due to the high quality of agricultural land (Grade 1 and 2). During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any loss of land quality from the transfer pipeline. The location of the pumping station is currently unknown. The proposed location of the new effluent reuse plant is located within Grade 2 agricultural land. Likely the land for the pumping station and effluent reuse plant will not be reinstated as they are a permanent structures, therefore this land would be permanently lost. The option does not directly overlap any landfill sites, however the intake site Lowestoft/Corton WRC sits immediately adjacent a historical landfill site ('Disused Railway Cutting off Stirrups Lane'), with potential to disturb contaminated material during construction.	Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land permanently taken or temporarily disturbed. Ground will be reinstated, therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. There will be permanent loss as a result of the pumping station and new effluent reuse plant. Permanent loss should be on non-BMV land where possible and only on BMV land where there are no other alternatives. Reinstatement or reprovision required post construction. Pipeline realignment or trenchless techniques to avoid historic landfill. Best practice techniques to prevent disturbance of contaminated material during construction.	0	-	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	-	0	0	The majority of the option is within Flood Zone 1 , however large sections of the route also pass through Flood Zones 2 and 3 and flood defences, and may have an impact on construction. Impacts on operation unlikely given the pipeline is buried. The pipeline is unlikely to increase the risk of flooding.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	-	The transfer pipeline crosses watercourses therefore potential for impacts on water quality during the construction phase. Potential for changes in water levels and flows in River Waveney during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless technique where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction. Monitoring water levels in the River Waveney will be undertaken during operation.	0	0	0	-
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option overlies the Broadland Rivers Chalk & Crag; and Waveney and East Suffolk Chalk & Crag groundwater units with some potential for temporary impacts on water quality during the construction phase. Discharged water during opteration will be treated, therefore peventing operational degradation of water quality.	Best practice construction methods and pollution prevention measures to be implemented, which should prevent adverse impacts during construction. Therefore residual construction impacts lessened to neutral.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	-	The WFD Phase 1 assessment determined that the option would have a low level of all waterbodies during the construction phase and the operation phase. After Level 2 WFD assessment, the outcome for all seven waterbodies indicated no further assessment would be necessary for the option as the types of activities do not present a risk to WFD status or objectives for any waterbodies.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no significant effects are predicted as a result of construction or operation.	0	0	0	0
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	The option involves reuse of water reducing demand, which may help to build resilience during potential future drought scenarios.	N/A	0	0	+	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA and there are none within 2km. Construction likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	Effects during construction of the option due to resource use (embodied carbon) and emissions, and emissions from energy use during the operation of the plant.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-

	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	+	--	Effects on water levels will depend where the effluent is being diverted from and whether this would affect water levels in that waterbody. Effluent will be discharged into River Waveney providing additional flows. Reusing water instead of increasing abstraction may increase climate resilience through releiving or preventing additional pressure on the water system.	N/A	0	0	+	--
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	-	0	-	The option is located in the South Norfolk and High Suffolk Claylands (0.01%); Suffolk Coast and Heaths (0.02%); and The Broads (0.05%) NCAs (with % showing the proportion of the NCA affected). Negative effects during construction likely as excavation will be required for the transfer pipeline. Most of the pipeline will run along an existing road, therefore potential loss of adjacent habitats, and impact to landscape character will likely be less severe than GIS analysis predicts. Above ground infrastructure may permanently change the landscape character of the area and affect visual amenity.	Re-routing of the pipeline to minimise damage and disruption to woodland or utilise directional drilling or other trenchless techniques to reduce construction effects. Best practice measures to be implemented to minimise effects during construction, although temporary effects during construction may remain. Land reinstated upon completion where possible.	0	-	0	0
Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	0	---	0	0	The option is within three conservation areas and overlaps three Grade II listed structures. Potential for direct impact, therefore major negative construction impact rating (without mitigation / route realignment). It is also within proximity of a number of other listed buildings. Construction may affect the setting of these heritage assets, however this is likely to be temporary as the pipeline will be buried. There is potential for the excavation of the pipeline to impact buried archaeology if present. The new effluent reuse plant will be located where the pipeline crosses road A47, ~200m NW of Lowestoft/Corton WRC.	Pipeline realignment may be required to avoid direct overlap with listed buildings. Construction impact lessened assuming final design will avoid direct impact on heritage assets. Best practice measures to be implemented to minimise setting effects for other historic heritage during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	--	0	0
Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	--	0	0	The option directly overlaps a country park, a golf course, a playing field, a public park and garden, three registered common lands, two religious grounds and The Broads National Park, with a number of other community sites within 500m. There is likely to be temporary disturbance to users of these sites and the local community during construction. This option may contribute to the local economy through employment opportunities during the construction phase. During operation, it is unlikely to contribute to the local economy. IMD deciles along the pipeline route vary from four to eight.	Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur during construction.	+	-	0	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	0	0	No Shellfish classification zones within 5km of the option, and no bathing waters monitoring sites within 500m of the option. All potable water transfers have been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	N/A	0	0	0	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	-	0	0	There may be temporary disturbance to users of walking, cycling and other public rights of way during the construction phase. This option does not propose any opportunities of associated environmental and recreational benefits.	N/A	0	-	0	0

	Maintain and enhance tourism and recreation	0	-	0	0	The option directly overlaps a country park, a golf course, a playing field, a public park and garden, three registered common lands, two religious grounds and The Broads National Park. Potential for direct impacts on users of these sites. It is also within 500m of a number of other recreational sites and natural habitats and watercourses which could be used for recreation. Therefore, there may be some temporary effects on recreation, angling and other water based activities during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0
Material Assets	Minimise resource use and waste production	0	-	0	0	New infrastructure required for option which will use materials and generate waste. Laying pipeline will involve excavated material.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	0
	Avoid negative effects on built assets and infrastructure	0	-	0	0	The option crosses two major roads, two railway tracks and two National Designated Cycle Routes. Likely to be temporary impacts during construction due to disruption for users. It is assumed that trenchless techniques will be used for pipelines which cross roads. During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-EFR-002
Option Name	Lowestoft water reuse (transfer to Lound Lakes)
Water company	Essex & Suffolk Water
Option Description	Effluent Reuse Plant (11.1 Ml/d DO). Intake from Lowestoft/Corton WRC, discharge to Lound Lakes. Two transfers required: Lowestoft/Corton WRC to new effluent reuse plant (Transfer 1, length approximately 200 m), new effluent reuse plant to Lound Lakes (Transfer 2, length approximately 4.8 km).
WRZ	Essex & Suffolk Water

Option rejected in favour of the exclusive option ESW-EFR-002A

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	--	0	--	The option does not directly overlap any designated sites, however Southern North Sea SAC, Outer Thames Estuary SPA and Corton Cliffs SSSI are within 2km. No direct effects are anticipated, but there may be disturbance effects during the construction phase. No MCZ or LNR within 500m. The HRA ToLS identified eight Natura 2000 sites that could be affected: Southern North Sea SAC (UK0030395) (~0.55km), Outer Thames Estuary SPA (UK9020309) (~0.55km), Breydon Water Ramsar (UK11008) (~4.5km), Breydon Water SPA (UK9009181) (~4.5km), The Broads SAC (UK0013577) (~4.5km), Broadland SPA (UK9009253) (~6km), Broadland Ramsar (UK11010) (~6km), Great Yarmouth North Denes SPA (UK9009271) (~8km). Potential for likely significant effects were identified for Outer Thames Estuary SPA and Southern North Sea SAC due to its designation for bird and porpoise species and the potential for disturbance on designated features (visual, noise, dust, etc.) leading to habitat avoidance and rapid population fluctuation. LSE also identified for Breydon Water Ramsar and SPA, The Broads SAC, and Broadland SPA and Ramsar as a result of potential disturbance to supporting bird habitats during the construction phase and localised water quality effects as a result of increased effluent discharge during operation. No LSE were identified for Great Yarmouth North Denes SPA.	Best practice methods to be implemented to minimise adverse effects from construction and operation, however some impacts likely to remain. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction and operation effects are lessened although this wouldn't negate the need for a potential appropriate assessment. There are likely to be residual effects in the long term due to proximity to Natura 2000 sites.	0	-	0	-
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	---	0	--	The pipeline passes adjacent to and through Priority Habitat, including areas of deciduous woodland at the intake site. Lowland dry acid grassland, Purple moor grass and rush pastures, and deciduous woodland are located at the discharge site. There is potential for permanent loss of these Priority Habitats. No direct effects on other Priority Habitats but there may be disturbance effects during the construction phase and potential effects on protected species. There are no chalk rivers within 2km or Groundwater Dependent Terrestrial Ecosystems (GWDTE) within 5km of the option. Discharge of treated effluent into Lound Lakes Nature Reserve may cause adverse operational effects on these habitats and their hydrological links. The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. The percentage change is -33.95%. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost.	Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid woodland habitat, in particular Ancient Woodland and BAP Priority Habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened.	0	--	0	-
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	Low risk of transfer of INNS as the treated source water is likely to be entirely free of INNS. Construction phase risk of INNS is also considered to be low.	During construction, best practice will be implemented to prevent the spread of INNS.	0	0	0	0
	To meet WFD objectives relating to biodiversity.	0	-	0	-	The WFD Phase 1 assessment results show there would be a low risks for ecology during construction due to installation and repairs to tunnels, conduits and other below ground structures, additionally low impacts are anticipated during operation due to the draining of pipelines into local watercourses for maintenance.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless technique where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0

Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	---	0	0	The option crosses grade 1 and 2 agricultural land with disturbance to these soils during construction. During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any permanent loss of land quality from the transfer pipeline. The location of the pumping station is currently unknown. The proposed location of the new effluent reuse plant is located within Grade 2 agricultural land. Likely the land for the pumping station and effluent reuse plant will not be reinstated as they are permanent structures, therefore this land would be permanently lost. The option does not directly overlap any landfill sites, however Lowestoft/Corton WRC sits immediately adjacent a historical landfill site (Disused Railway Cutting off Stirrups Lane), with potential to disturb contaminated material during construction.	Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to minimise land permanently taken or temporarily disturbed. There will be permanent loss as a result of the pumping station and new effluent reuse plant. Permanent loss should be on non-BMV land where possible and only on BMV land where there are no other alternatives. Reinstatement or reprovision required post construction. Pipeline realignment or trenchless techniques to avoid historic landfill. Best practice techniques to prevent disturbance of contaminated material during construction.	0	-	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	-	0	-	The entire option is within Flood Zone 1, therefore impacts during construction and operation are expected to be negligible. The option is in close proximity to EA flood defences. The effluent reuse plant and pumping station will increase hardstanding in the area which may increase the risk of surface water flooding.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. Permanent structures should be designed to be flood resilient and an FRA may be required to appropriately quantify flood risk.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	--	The transfer pipeline crosses some minor watercourses, therefore there is potential for impacts on water quality during the construction phase. Potential for changes in water levels and flows in Lound Lakes during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless technique where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction. Monitoring water levels in the Abberton Reservoir will be undertaken during operation.	0	0	0	-
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option overlays the Broadland Rivers Chalk & Crag Groundwater unit with potential for low levels of impact on water quality during the construction phase and operation.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	-	The WFD Phase 1 assessment determined that the option would have a low level of effect on three waterbodies during the construction phase and the operation phase. No further assessment is required.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	-
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	The option involves reuse of water reducing demand, which may help to build resilience during potential future drought scenarios.	N/A	0	0	+	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA, nor are there any within 2km. Construction likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	Effects during construction of the option due to resource use and emissions from construction traffic and activities, and effects during the operational phase as the option requires a pumping station.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	+	--	Effects on water levels will depend where the effluent is being diverted from and whether this would affect water levels in that waterbody. Effluent will be discharged into Lound Lakes providing additional flows. Reusing water instead of increasing abstraction may increase climate resilience through relieving or preventing additional pressure on the water system.	N/A	0	0	+	--
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	-	0	-	The option is located in the Suffolk Coast and Heaths (0.01%) NCA (with % showing the proportion of the NCA affected). Negative effects during construction likely as excavation will be required for the transfer pipeline. New above ground infrastructure may permanently change the landscape character of the area and affect visual amenity.	Best practice measures to be implemented to minimise effects during construction, although temporary effects during construction may remain. Land reinstated upon completion where possible.	0	-	0	0

Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	0	-	0	0	The option is within 500m of five listed buildings and a scheduled monument. Construction may affect the setting of these heritage assets, however this is likely to be temporary as the pipeline will be buried. There is potential for the excavation of the pipeline to impact buried archaeology if present. The new effluent reuse plant will be located where the pipeline crosses road A47.	Best practice measures to be implemented to minimise setting effects for other historic heritage during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	0
Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	-	0	0	The option is within 500m of an allotment, a Bowling Green, a country park, two public parks/gardens, a place of worship and two religious grounds. There is no direct land take from these areas. There is likely to be temporary disturbance to users of these sites and the local community during construction. This option may contribute to the local economy through employment opportunities during the construction phase. During operation, it is unlikely to contribute to the local economy. IMD deciles along the pipeline route vary from five to seven.	Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur during construction.	+	-	0	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	+	0	Through water treatment and reuse, this option provides water to users without additional abstraction, therefore improving water supply when in operation. There are no Shellfish classification zones within 5 km. There are two bathing waters monitoring sites within 2km-5km of the option. All potable water transfers have been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	N/A	0	0	+	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	-	0	0	There may be temporary disturbance to users of walking, cycling and other public rights of way during the construction phase. This option does not propose any opportunities of associated environmental and recreational benefits.	N/A	0	-	0	0
	Maintain and enhance tourism and recreation	0	-	0	-	The option is within 500m of an allotment, a Bowling Green, a country park, two public parks/gardens, a place of worship and two religious grounds, and impacts watercourses and habitat areas/ woodland that could be used for recreation. Therefore, there may be temporary effects on recreation, angling and other water based activities during the construction phase. During operation, discharge to Lound Lakes may impact flows which could disrupt recreational use of the Lakes.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	-
Material Assets	Minimise resource use and waste production	0	-	0	0	New infrastructure required for option which will use materials and generate waste. Laying pipeline will involve excavated material.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	0
	Avoid negative effects on built assets and infrastructure	0	-	0	0	The option crosses one Major Road, and is within 500m of a National Designated Cycle Route. Likely to be temporary impacts during construction due to disruption for users. It is assumed that trenchless techniques will be used for pipelines that cross roads. During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-EFR-003
Option Name	Colchester Effluent Re-use
Water company	Essex & Suffolk Water
Option Description	Effluent re-use plant being fed from Colchester WRC (Anglian water owned asset) with a transfer to Abberton Reservoir. Intake from Colchester WRC, discharge to Abberton Reservoir. Two transfers required: Colchester WRC to new effluent reuse plant (Transfer 1, approximately 200m) and new effluent reuse plant to Abberton Reservoir (Transfer 2, approximately 5.4km). New effluent reuse plant.
WRZ	Essex & Suffolk Water

Option rejected. Further information can be found in Section 2.2.6 of the Supply Option Development Technical Report.

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	---	0	--	The Abberton Reservoir Ramsar and SPA is directly impacted by the option. Upper Colne Marshes SSSI (53% favourable, 47% unfavourable - recovering) and Abberton Reservoir SSSI (100% favourable) are directly impacted by the option. Roman River SSSI (100% favourable) is within 500m of the option, no direct effects but there may be disturbance effects during the construction phase. The option is within 500m of Blackwater, Crouch, Roach and Colne Estuaries MCZ and within 500m of the Colne LNR. The HRA ToLS identified eight Natura 2000 sites that could be affected: Abberton Reservoir Ramsar and SPA (0km), Colne Estuary (Mid-Essex coast phase 2) Ramsar and SPA (2.5km), Essex estuaries SAC, Blackwater Estuary (Mid-Essex coast phase 4) Ramsar and SPA (6km) and Outer Thames Estuary SPA (16km). Potential likely significant effects concluded for all sites due to potential temporary and permanent effects on the sites designated features and construction effects from hydrological links of rivers the pipeline crosses to the designated sites. Discharge of treated effluent into the Abberton Reservoir and River Colne may cause adverse operational effects on these and other hydrologically linked sites.	Consider refining pipeline alignment or use trenchless techniques to avoid Ramsar, SSSI, and SPA. Best practice methods to be implemented to minimise adverse effects from constuction and operation, however some impacts likely to remain. HRA AA required to assess uncertain effects on Abberton Reservoir Ramsar and SPA, Colne Estuary Ramsar and SPA, Essex Estuaries SAC, Blackwater Estuary Ramsar and SPA and Outer Thames Estuary SPA. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened. However, likely to be residual effects in the long term due to proximity to Natura 2000 sites.	0	--	0	-
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	---	0	--	The pipeline passes adjacent to and through BAP Priority Habitat (mainly coastal and floodplain grazing marsh, deciduous woodland and good quality semi-improved grassland). Potential permanent loss of BAP Priority Habitats. No direct effects on other Priority Habitats but there may be disturbance effects during the construction phase and potential effects on protected species. There are no chalk rivers within 2km of the option. The pipeline crosses the Upper Colne Marshes GWDTE and is within 500m of the Roman River Groundwater Dependent Terrestrial Ecosystems (GWDTE). Discharge of treated effluent into the Abberton Reservoir and River Colne may cause adverse operational effects on these habitats and their hydrological links. The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. The percentage change is -88.03%. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost.	Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid woodland habitat, in particular Ancient Woodland and BAP Priority Habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened.	0	--	0	-
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	Very low risk of transfer of INNS as the treated source water is likely to be entirely free of INNS. Construction phase risk of INNS is also considered to be very low.	N/A	0	0	0	0
	To meet WFD objectives relating to biodiversity.	0	-	0	-	The WFD Phase 1 assessment results show there would be moderate risks for ecology for one or more waterbodies during the construction phase and the operation phase.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless technique where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0

Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	---	0	0	The option crosses grade 3 and 4 agricultural land with disturbance to these soils during construction. During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any loss of land quality from the transfer pipeline. The location of the pumping station is currently unknown. The current location of the new effluent reuse plant is located within Grade 4 agricultural land. It is likely that the land for the pumping station and effluent reuse plant, if agricultural, will not be reinstated as it is a permanent structure, therefore this land would be permanently lost. The option crosses a historic landfill site and is within 500m of other historic landfill sites with potential to disturb contaminated material during construction.	Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land permanently taken or temporarily disturbed. Ground will be reinstated therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. There will be permanent loss as a result of the pumping station and new effluent reuse plant. Permanent loss should be on non-BMV land where possible and only on BMV land where there are no other alternatives. Reinstatement or reprovision required post construction. Pipeline realignment or trenchless techniques to avoid historic landfill. Best practice techniques to prevent disturbance of contaminated material during construction.	0	-	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	-	0	0	The majority of the option is within Flood Zone 1 , however large sections of the route also pass through Flood Zones 2 and 3 and flood defences, and may have an impact on construction. Impacts on operation unlikely given the pipeline is buried. The pipeline is unlikely to increase the risk of flooding.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	--	The transfer pipeline crosses watercourses therefore potential for impacts on water quality during the construction phase. Potential for changes in water levels and flows in Abberton Reservoir during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless technique where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction. Monitoring water levels in the Abberton Reservoir will be undertaken during operation.	0	0	0	-
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option overlies the Essex Gravels groundwater unit with potential for impacts on water quality during the construction phase and operation.	N/A	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	-	The WFD Phase 1 assessment determined that the option would have a medium level of effect on one or more waterbodies during the construction phase and the operation phase. Further assessment is required for two waterbodies.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction. WFD (stage 2) assessment will be needed on two waterbodies to better understand the effects on the waterbodies during construction and operation.	0	0	0	-
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	The option involves reuse of water reducing demand, which may help to build resilience during potential future drought scenarios.	N/A	0	0	+	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA although the Area 1 - Central Corridors Colchester Borough Council AQMA is within 2km. Construction likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	Effects during construction of the option due to resource use and emissions, and effects during the operational phase as the option requires a pumping station.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	+	--	Effects on water levels will depend where the effluent is being diverted from and whether this would affect water levels in that waterbody. Effluent will be discharged into the Abberton Reservoir providing additional flows.	N/A	0	0	+	--

Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	-	0	-	The option is located in the Northern Thames Basin (0.01%) and the Greater Thames Estuary NCAs (0.01%) (with % showing the proportion of the NCA affected). Negative effects during construction likely as excavation will be required for the transfer pipeline. Construction will also result in permanent loss of woodland, with impacts on landscape character. Above ground infrastructure may permanently change the landscape character of the area and affect visual amenity.	Re-routing of the pipeline to minimise damage and disruption to woodland or utilise directional drilling or other trenchless techniques to reduce construction effects. Best practice measures to be implemented to minimise effects during construction including although temporary effects during construction may remain. Land reinstated upon completion where possible.	0	-	0	0
Historic Environment	To conserve/protect and enhance historic environment and heritage assets, and their setting, including archaeologically important sites.	0	-	0	0	The option is within proximity of a number of listed buildings. Construction may affect the setting of these heritage assets, however this is likely to be temporary as the pipeline will be buried. There is potential for the excavation of the pipeline to impact buried archaeology if present. The new effluent reuse plant will be located southeast of the Whitehall Road Industrial estate.	Best practice measures to be implemented to minimise setting effects for other historic heritage during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	0
Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	-	0	0	The pipeline is within 500m of University of Essex, a primary school, playing fields, religious grounds and allotments. There is no direct land take from these areas. There is likely to be temporary disturbance to users of these sites and the local community during construction. This option may contribute to the local economy through employment opportunities during the construction phase. During operation, it is unlikely to contribute to the local economy. IMD deciles along the pipeline route vary from two to seven.	Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur during construction.	+	-	0	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	0	0	The option is within 5km of the Fambridge Shellfish classification zone. There are no bathing waters monitoring sites within 500m of the option. All potable water transfers have been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	N/A	0	0	0	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	-	0	0	There may be temporary disturbance to users of walking, cycling and other public rights of way during the construction phase. This option does not propose any opportunities of associated environmental and recreational benefits.	N/A	0	-	0	0
	Maintain and enhance tourism and recreation	0	-	0	0	The option is within 500m of University of Essex, a primary school, playing fields, religious grounds and allotments and crosses watercourses and habitat areas/ woodland that could be used for recreations. Therefore there may be some temporary effects on recreation, angling and other water based activities during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0
Material Assets	Minimise resource use and waste production	0	-	0	0	New infrastructure required for option which will use materials and generate waste. Laying pipeline will involve excavated material.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	0
	Avoid negative effects on built assets and infrastructure	0	-	0	0	The option crosses minor roads. Likely to be temporary impacts during construction due to disruption for users. It is assumed that trenchless techniques will be used for pipelines which cross roads. During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-EFR-004
Option Name	Tilbury water reuse
Water company	Essex & Suffolk Water
Option Description	Effluent Reuse Plant (28.9 Ml/d DO (maximum)). Intake from Tilbury WRC (Anglian Water owned asset), discharge to Hanningfield Service Reservoir. Two transfers required: Tilbury WRC to new water reuse plant (Transfer 1, length approximately 300-600 m), new water reuse plant to Hanningfield reservoir (Transfer 2, length approximately 32 km).
WRZ	Essex & Suffolk Water

Option rejected. Further information can be found in Section 2.2.6 of the Supply Option Development Technical Report.

SEA Topic	SEA Objective	Construction Effects +	Construction Effects -	Operational Effects +	Operational Effects -	Comment	Mitigation	Residual +	Residual -	Residual Operational +	Residual Operational -
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	---	0	0	Hanningfield Reservoir SSSI (100% favourable) is potentially directly impacted by the option. Langdon Ridge SSSI (19.5% favourable, 80.5% unfavourable - recovering) within 500m of the option. No direct effects but there may be disturbance effects during the construction phase. The option is within 500m of an important bird area (RSPB) Thames estuary and marshes located at the southern extent. The option is entirely located within SSSI Impact Risk Zones. There are no MCZ/MPAs within 500m of the option. The HRA ToLS identified five Natura 2000 sites that could be affected Thames Estuary & Marshes Ramsar (UK11069) (~2.2km), Thames Estuary & Marshes SPA (UK9012021) (~2.2km), Crouch & Roach Estuaries (Mid-Essex Coast Phase 3) Ramsar (UK11058) (~4.7km), Crouch & Roach Estuaries (Mid-Essex Coast Phase 3) SPA (UK9009244) (~4.7km), Essex Estuaries SAC (UK001690) (~4.7km). LSE concluded only for Thames Estuary & Marshes SPA (UK9012021) due to operational effects on water quality from effluent discharge.	Refining pipeline alignment or use trenchless techniques to avoid SSSI. Best practice methods to be implemented to minimise disturbance effects. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual effects are lessened. However, some residual effects are likely to remain and this wouldn't negate the need for a potential appropriate assessment.	0	--	0	0
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	--	0	0	The pipeline passes adjacent to and through small parcels of Ancient Woodland and BAP Priority Habitat (mainly deciduous woodland). Potential permanent loss of Ancient Woodland and deciduous woodland BAP Priority Habitat. No direct effects on other Priority Habitats but there may be disturbance effects during the construction phase and potential effects on protected species. Hanningfield Reservoir (SSSI) Groundwater Dependent Terrestrial Ecosystem (GWDTE) is directly within the option and Mill Meadows, Billericay (SSSI) GWDTE is within 2km of the option. The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. The percentage change is -17.87%. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost.	Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid woodland habitat, in particular Ancient Woodland and BAP Priority Habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual effects are lessened. However, some residual effects are likely to remain.	0	-	0	0
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	Very low risk of transfer of INNS as the treated source water is likely to be entirely free of INNS. Physical transfer of treated water (between two locations assumed currently unconnected) (no INNS risk as treated water will be free from INNS). Construction phase risk of INNS is also considered to be very low.	During construction best practice will be implemented to prevent the spread of INNS.	0	0	0	0

	To meet WFD objectives relating to biodiversity.	0	-	0	0	The WFD Phase 1 assessment results show there would be a low risks for ecology during construction due to installation and repairs to tunnels, conduits and other below ground structures, additionally low impacts are anticipated during operation due to the draining of pipelines into local watercourses for maintenance.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	---	0	0	The option crosses grade 2 and 3 agricultural land with disturbance to these soils during construction. During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any loss of land quality from the transfer pipeline. The location of the pumping station is currently unknown. However, it is likely that this land, if agricultural, will not be reinstated as it is a permanent structure, therefore this land would be permanently lost. The option is within 500m of historic landfill sites and authorised landfill sites with potential to disturb contaminated material during construction.	Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land permanently taken or temporarily disturbed. Ground will be reinstated therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. There will be permanent loss as a result of the pumping station although this is a relatively small area so neutral effects identified. Best practice techniques to prevent disturbance of contaminated material during construction.	0	--	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	-	0	0	The majority of the option is within Flood Zone 1 however, sections of the option passes through Flood Zones 2 and 3, flood risk/warning areas and flood defences, and may have an impact on construction. Impacts on operation unlikely given the pipeline is buried. The pipeline is unlikely to increase the risk of flooding.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	--	The transfer pipeline crosses watercourses therefore potential for impacts on water quality during the construction phase. Potential for changes in water levels and flows in Hanningfield Reservoir during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction.	0	0	0	-
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option is located within groundwater SPZs 3 with potential for impacts on water quality during the construction phase.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	0	The WFD Phase 1 assessment determined that the option would have a low level of effect on all identified in the vicinity during the construction phase and no effects during operation.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	The option involves reuse of water reducing demand, which may help to build resilience during potential future drought scenarios.	N/A	0	0	+	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA although there are three AQMAs within 2 km. 1- AQMA 24 Tilbury Dock Road, Calcutta Road part of St Chads Road, Tilbury, 2- Northfleet Industrial Area AQMA and 3- Gravesham A226 One-way system AQMA. Construction likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0

Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	Effects during construction of the option due to resource use and emissions, and effects during the operational phase as the option requires a pumping station.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	+	--	Effects on water levels will depend where the effluent is being diverted from and whether this would affect water levels in that waterbody. Effluent will be discharged into the Hanningfield Reservoir providing additional flows.	N/A	0	0	+	--
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	--	0	0	Option overlaps two NCA(s) (with % proportion of NCA affected):Greater Thames Estuary (0.01%); Northern Thames Basin (0.02%). Negative effects during construction likely as excavation will be required for the transfer pipeline. Construction will also result in permanent loss of woodland, including Ancient Woodland, with impacts on landscape character. There will be minimal new above ground infrastructure. The pumping station is a relatively small-scale structure and is therefore unlikely to change the landscape character of the area or affect visual amenity during operation.	Re-routing of the pipeline to minimise damage and disruption to woodland, including Ancient Woodland, or utilise directional drilling or other trenchless techniques to reduce construction effects. Best practice measures to be implemented to minimise effects during construction including although temporary effects during construction may remain. Land reinstated upon completion so with mitigation, no residual effects are likely to remain during operation.	0	-	0	0
Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	0	---	0	0	The option passes through West Tilbury Conservation Area and within 500m of two further conservation areas, it also passes within 500m of four scheduled monuments and is within proximity of a number of listed buildings. The option intersects Chelmsford council - for which conservation area data has not been made available. Construction may affect the setting of these historic assets, however this is likely to be temporary as the pipeline will be buried. There is potential for the excavation of the pipeline to impact buried archaeology if present. The new effluent reuse plant will be located near the existing Tilbury STW with exact location to be determined.	Preferred mitigation for conservation area is to re-route the pipeline; however, if this is not possible then careful construction and reinstatement to its original condition with no detrimental effect on the character, appearance, or design of the RPG or conservation area should be implemented. Best practice measures to be implemented to minimise setting effects for other heritage assets during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	0

Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	---	0	0	The pipeline crosses two Noise Action Planning Important Areas, and is within 500m of three others. The option crosses Commons and is within 500m of open access areas, primary schools, religious buildings and grounds, golf courses, playing fields, one country park/garden, an airport and a docks. There is no direct land take from these areas. There is likely to be temporary disturbance to users of these sites and the local community during construction. This option may contribute to the local economy through employment opportunities during the construction phase. During operation, it is unlikely to contribute to the local economy. IMD deciles along the pipeline route vary from four to nine.	Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur during construction. OR Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction and land will be reinstated. However, temporary effects are likely to still occur during construction. OR Route alignment to be amended or trenchless techniques to be used to avoid direct impacts on property and community assets. Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction and land will be reinstated. However, temporary effects are likely to still occur during construction.	+	-	0	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	0	0	There are no shellfish waters or bathing waters within 500m of the option location. The movement of water from one point to another increases the risks of disease transmission. All potable water transfers have been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	N/A	0	0	0	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	-	0	0	There may be temporary disturbance to users of walking, cycling and other public rights of way during the construction phase. This option does not propose any opportunities of associated environmental and recreational benefits.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. There could be potential to enhance the cycleways as part of the works (e.g. during re-instatement).	0	-	0	0
	Maintain and enhance tourism and recreation	0	--	0	0	The pipeline route crosses Commons and is within 500m of open access areas, primary schools, religious buildings and grounds, golf courses, playing fields, one country park/garden, an airport and a dock, and crosses open spaces, watercourses and habitat areas/woodland that could be used for recreation. Therefore there may be some temporary effects on recreation, angling and other water based activities during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0
Material Assets	Minimise resource use and waste production	0	-	0	0	New infrastructure required for option which will use materials and generate waste and excavated material.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	0
	Avoid negative effects on built assets and infrastructure	0	--	0	0	The option crosses railway lines and major roads. Likely to be temporary impacts during construction due to disruption for users. It is assumed that trenchless techniques will be used for pipelines which cross railway lines and major roads. During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-EFR-010
Option Name	Langford Water Reuse - WRC Improvement
Water company	Essex & Suffolk Water
Option Description	New balance tank (180 Ml) to incorporate additional flows and maintain consistently high outputs at Langford Recycling Plant (LRP). Existing intake from Chelmsford WRC and a new intake from Basildon WRC (both Anglian Water owned assets). Existing discharge from LRP to River Chelmer. Two new transfers required: Basildon WRC to LRP inlet works (Transfer 1, length approx. 29 km), LRP inlet works to new balance tank (Transfer 2, length approx. 30 m).
WRZ	Essex & Suffolk Water

Option rejected. Further information can be found in Section 2.2.6 of the Supply Option Development Technical Report.

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
Biodiversity, flora and	To protect designated sites and their qualifying features.	0	---	0	--	The option does not overlap any sites, however the following designated sites are within 2km with potential indirect impacts during the construction phase: Hanningfield Reservoir SSSI (100% favourable), Norsey Wood SSSI/LNR (100% favourable), Crouch and Roach Estuaries SPA/Ramsar/MCZ/MPA/SSSI (28% favourable, 71% unfavourable-recovering, 1% unfavourable- no change), Blackwater Estuary SPA/Ramsar/NNR/SSSI (GWDTE) (23% favourable, 75% unfavourable-recovering, 2% unfavourable- declining), Essex Estuaries SAC. No direct effects but there may be disturbance effects during the construction phase. The option is entirely located within SSSI Impact Risk Zones. There is one MCZ (Blackwater, Crouch, Roach and Colne Estuaries) within 500m of the option. The HRA ToLS identified nine Natura 2000 sites that could be affected Crouch & Roach Estuaries (Mid-Essex Coast Phase 3) Ramsar (UK11058) (~0.7km), Crouch & Roach Estuaries (Mid-Essex Coast Phase 3) SPA (UK9009244) (~0.7km), Essex Estuaries SAC (UK0013690) (~0.7km), Blackwater Estuary (Mid-Essex Coast Phase 4) Ramsar (UK11007) (~1.8km), Blackwater Estuary (Mid-Essex Coast Phase 4) SPA (UK9009245) (~1.8km), Benfleet and Southend Marshes Ramsar (UK11006) (~7km), Benfleet and Southend Marshes SPA (UK9009171) (~7km), Thames Estuary & Marshes Ramsar (UK11069) (~9.8km), Thames Estuary & Marshes SPA (UK9012021) (~9.8km). Likely significant effects are anticipated to five of the aforementioned sites (Crouch and Roach Estuaries (Mid-Essex Coast Phase 3) Ramsar (UK11058) and SPA (UK9009244)) and Essex Estuaries SAC (UK0013690) (~0.7km), Blackwater Estuary (Mid-Essex Coast Phase 4) Ramsar (UK11007) (~1.8km), Blackwater Estuary (Mid-Essex Coast Phase 4) SPA (UK9009245) due to construction and operational impacts to flows with the potential to impact toxic contamination, the water table and cause biological disturbances, and to Blackwater Estuary (Mid-Essex Coast	Best practice methods to be implemented to minimise disturbance effects. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual effects are lessened. However, some residual effects are likely to remain and this wouldn't negate the need for a potential appropriate assessment HRA AA required to assess effects on Crouch and Roach Estuaries (Mid-Essex Coast Phase 3) Ramsar (UK11058) and SPA (UK9009244), Blackwater Estuary (Mid-Essex Coast Phase 4) Ramsar (UK11007) and SPA (UK9009245).	0	--	0	-

fauna	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	---	0	0	The pipeline passes adjacent to and through Priority Habitat (mainly coastal and floodplain grazing marsh, deciduous woodland and good quality semi-improved grassland). Potential permanent loss of Priority Habitats. No direct effects on other Priority Habitats but there may be disturbance effects during the construction phase and potential effects on protected species. No direct overlap with Ancient Woodland but there are eight ancient woodlands within 500m with potential for indirect impact. Blanningfield Reservoir (SSSI) Groundwater Dependent Terrestrial Ecosystems (GWDTE) and Crouch and Roach Estuaries (SSSI) GWDTE are within 2km of the option. The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. The percentage change is -32.33%. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost.	Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid woodland habitat, in particular Ancient Woodland and BAP Priority Habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual effects are lessened. However, some residual effects are likely to remain.	0	--	0	0
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	-	0	0	Low risk of transfer of INNS as transfer is within same catchment and crosses three rivers. There are no additional connections to other waterbodies. Three internationally designated sites and three SSSI's are present within 1km of this option. As water is treated at source there is negligible INNS risk.	During construction best proactice will be implemented to prevent the spread of INNS.	0	0	0	0
	To meet WFD objectives relating to biodiversity.	0	-	0	0	The WFD Phase 1 assessment results show there would be low risks for ecology during construction due to the installation and repair of below ground structures, in some instances crossing watercourses, and low risks for ecology during operation due to the draining of pipe lines for maintenance into local watercourses.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	-	0	0	Maldon Cutting geological SSSI (100% unfavourable-declining) is within 2km. The option crosses grade 2,3 and 4 agricultural land with disturbance to these soils during construction. During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any loss of land quality from the transfer pipeline. Building on existing Langford treatment works with one existing intake and an existing outfall. The location of the new balance tanks are to be located near to existing Langford Recycling Plant within Grade 4 agricultural land, it is likely that this land, will not be reinstated as it is a permanent structure, therefore this land would be permanently lost. The option is within 500m of 2 historic landfill sites with potential to disturb contaminated material during construction.	The majoority of the ground impacted will be reinstated therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. There will be permanent loss as a result of the balance tanks, however this is a relatively small area so neutral effects are anticipated. Best practice techniques to prevent disturbance of contaminated material during construction.	0	0	0	0
	To reduce or manage flood risk, taking climate change into account.	0	-	0	0	The majority of the option is within Flood Zone 1 however, sections of the option passes through Flood Zones 2 and 3, flood risk/warning areas and flood defences, and may have an impact on construction. Impacts on operation unlikely given the pipeline is buried. The pipeline is unlikely to increase the risk of flooding.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	--	The transfer pipeline crosses watercourses therefore potential for impacts on water quality during the construction phase. Potential for small scale changes in water levels and flows in River Chelmer during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction.	0	0	0	-

Water	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option overlies the Essex Gravels groundwater unit (62.22%) with some potential for temporary impacts on water quality during the construction phase. Discharged water during operation will be treated, therefore preventing operational degradation of water quality.	Best practice construction methods and pollution prevention measures to be implemented, which should prevent adverse impacts during construction. Therefore residual construction impacts lessened to neutral.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	--	0	-	The WFD Phase 1 assessment determined that the option would have a medium level of effect on one watercourse (Crouch A129 - Wickford) during construction due to a reduction of existing discharge into the watercourse. Low levels of impacts are anticipated to all other watercourses during construction and operation, due to construction and repairs to below ground structures and the draining of pipelines for maintenance.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of operation. Further WFD assessment is required for Crouch (A129-Wickford) (GB105037028540) due to medium impacts during construction.	0	-	0	0
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	The option involves reuse of water reducing demand, which may help to build resilience during potential future drought scenarios.	N/A	0	0	+	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA although MDC Air Quality Management Area number 1 is within 2 km. Construction likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	Effects during construction of the option due to resource use and emissions, and effects during the operational phase as the option requires a pumping station.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	+	--	Effects on water levels will depend where the effluent is being diverted from and whether this would affect water levels in that waterbody. Effluent will be discharged into River Chelmer providing additional flows. Reusing water instead of increasing abstraction may increase climate resilience through relieving or preventing additional pressure on the water system.	N/A	0	0	+	--
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	-	0	-	Option overlaps one NCA (with % proportion of NCA affected): Northern Thames Basin (0.03%). The option also crosses through areas of Green Belt Land. Negative effects during construction likely as excavation will be required for the transfer pipeline. Construction will also result in permanent loss of woodland, with impacts on landscape character. Above ground infrastructure may permanently change the landscape character of the area and affect visual amenity.	Re-routing of the pipeline to minimise damage and disruption to woodland, or utilise directional drilling or other trenchless techniques to reduce construction effects. Best practice measures to be implemented to minimise effects during construction including although temporary effects during construction may remain. Land reinstated upon completion where possible.	0	-	0	0
Historic Environment	To conserve/protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	0	---	0	0	The option passes through Stow Maries World War One Aerodrome Conservation Area and Chelmer and Blackwater Navigation and one area for Heritage at Risk. The option is within 500m of two further conservation areas, it also passes within 500m of two scheduled monuments and is within proximity of a number of listed buildings. The option intersects Chelmsford council - for which conservation area data has not been made available. There are three Country Parks within 2km. Construction may affect the setting of these historic assets, however this is likely to be temporary as the pipeline will be buried. There is potential for the excavation of the pipeline to impact buried archaeology if present. The new balancing tanks will be located near the existing Langford Recycling Plant.	Preferred mitigation for conservation area is to re-route the pipeline; however, if this is not possible then careful construction and reinstatement to its original condition with no detrimental effect on the character, appearance, or design of the RPG or conservation area should be implemented. Best practice measures to be implemented to minimise setting effects for other heritage assets during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	0

Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	--	0	0	The pipeline is within 500m of three Noise Action Planning Important Areas. The option is within 500m of sport facility, primary schools, religious buildings and grounds, museum, cemeteries, playing fields, play spaces one country park/garden, an airfield and a services. There is no direct land take from these areas. There is likely to be temporary disturbance to users of these sites and the local community during construction. This option may contribute to the local economy through employment opportunities during the construction phase. During operation, it is unlikely to contribute to the local economy. IMD deciles along the pipeline route vary from three, four, five, six, seven, eight, and ten.	Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur during construction.	+	-	0	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	0	0	There are no bathing waters or Shellfish Classification Zones within 500m of the option location. The movement of water from one point to another increases the risks of disease transmission. All potable water transfers have been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	N/A	0	0	0	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	-	0	0	The proposed pipeline route will cross one National Cycle Network routes. There may be temporary disturbance on users of these, as well as other walking and cycling routes, and other public rights of way during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. There could be potential to enhance the cycleways as part of the works (e.g. during re-instatement).	0	-	+	0
	Maintain and enhance tourism and recreation	0	--	0	0	The option is within 500m of sports facility, primary schools, religious buildings and grounds, museum, cemeteries, playing fields, play spaces one country park/garden, an airfield and a services, and crosses open spaces, watercourses and habitat areas/woodland that could be used for recreation. Therefore there may be some temporary effects on recreation, angling and other water based activities during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0
Material Assets	Minimise resource use and waste production	0	-	0	0	New infrastructure required for option which will use materials and generate waste and excavated material.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	0
	Avoid negative effects on built assets and infrastructure	0	--	0	0	The option crosses railway lines and major roads. Likely to be temporary impacts during construction due to disruption for users. It is assumed that trenchless techniques will be used for pipelines which cross railway lines and major roads. During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-NIT-001
Option Name	Barsham nitrate treatment
Water company	Essex & Suffolk Water
Option Description	Nitrate Treatment (4 Ml/d capacity). Nitrate treatment extension on Barsham WTW's existing site. Intake from existing WTW's granular activated carbon (GAC), outfall to existing WTW's chlorine contact tanks.
WRZ	Essex & Suffolk Water

Option rejected. Further information can be found in Section 2.2.6 of the Supply Option Development Technical Report.

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	-	0	0	There are no designated sites within 2km which may be indirectly affected. The option is entirely located within SSSI Impact Risk Zones. There are no MCZ/MPAs within 500m of the option. The HRA ToLS identified three Natura 2000 sites that could be affected: Broadland SPA (UK9009253) (~2.3km) which supports multiple species during breeding seasons, Broadland Ramsar (UK110100) (~2.3km) and The Broads SAC (UK0013577) (~2.3km). Potential LSE concluded for Broadland SPA. No LSE concluded for the other sites.	Ecology surveys will be required at future design stages to determine effects and mitigation required although this wouldn't negate the need for a potential appropriate assessment.	0	-	0	0
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	-	0	0	The option passes adjacent to and partially through one parcel of BAP Priority Habitat (deciduous woodland). Potential permanent loss of deciduous woodland BAP Priority Habitat, however it is expected as works are to take place within the existing WTW the impacts would be minimal. No direct effects on other Priority Habitats but there may be disturbance effects during the construction phase and potential effects on protected species. There are no Groundwater Dependent Terrestrial Ecosystems (GWDTE) or chalk rivers within 2km of the option. The option is not expected to cause the loss of BNG units due to works taking place within the existing WTW site.	Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining option alignment or using trenchless techniques to avoid woodland habitat, in particular BAP Priority Habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required.	0	-	0	0
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	No risk of transfer/movement of invasive or non-native species with this option type due to the extension of the WTW not crossing any water bodies. Transferred water does not leave the boundary of WTW therefore there is no risk INNS will be introduced of transferred.	N/A	0	0	0	0

	To meet WFD objectives relating to biodiversity.	0	-	0	0	The WFD Phase 1 assessment results show there would be a no risks for ecology during construction but low levels of effects during operation, due to the drainage of pipelines for maintenance.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	0	0	0	No works are taking place outside of the existing WTW therefore negligible impacts to agricultural land and soil quality are anticipated in the area during construction and operation.	N/A	0	0	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	-	0	-	The majority of the option is within Flood Zone One , however, the option does pass adjacent to Flood Zones Two and Three, flood defences, and flood alert/warning areas, and may have an impact on construction. During operation there is the potential for minor changes to water flow in the area of this option.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	0	The option is adjacent to watercourses therefore potential for impacts on water quality during the construction phase. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option is located within a number of groundwater SPZs (Zones 1, 2 and 3) with potential for impacts on water quality during the construction phase.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	0	The WFD Phase 1 assessment determined that the option would have a low level of effect on waterbodies identified in the vicinity during the operation phase, no effects are anticipated during construction.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	The option will improve water quality and the reuse of water, therefore supports the quality and resilience of water supplies during potential future drought scenarios.	N/A	0	0	+	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA nor are there any within 2km. Construction likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	Effects during construction and operation of the option due to resource use and emissions.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	0	0	Water levels not predicted to be significantly affected therefore unlikely to affect resilience of the local environment to climate change.	N/A	0	0	0	0
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	--	0	0	The option is located in one NCAs The Broads (0.01%). It falls within 500m of a National Park (The Broads). Negative effects during construction likely as excavation will be required for the transfer option. Construction will also result in permanent loss of woodland, with impacts on landscape character. There will be new above ground infrastructure.	Best practice measures to be implemented to minimise effects during construction including although temporary effects during construction may remain. Land reinstated upon completion so with mitigation, no residual effects are likely to remain during operation.	0	-	0	0

Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	0	-	0	0	There are no Historic Environment records within 500m of the option. There is potential for the excavation of the option to impact buried archaeology if present, however this is expected to be unlikely as works are taking place within the existing WTW. There will be new above ground infrastructure, but due to distance from any heritage assets it is unlikely to have effects on the setting of heritage assets during operation.	Best practice measures to be implemented to minimise setting effects for other historic heritage during construction.	0	0	0	0
Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	-	0	0	The option is within 500m of The Broads National Park. There is no direct land take from this area. This option may contribute to the local economy through employment opportunities during the construction phase. During operation, it is unlikely to contribute to the local economy. IMD decile overlapping the option is 5.	Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur during construction.	+	-	0	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	0	0	There are no shellfish waters or bathing waters within 500m of the option location. All potable water has been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	N/A	0	0	0	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	--	0	0	This option does not propose any opportunities of associated environmental and recreational benefits.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction.	0	0	+	0
	Maintain and enhance tourism and recreation	0	-	0	0	The option is within 500m of a national park, however all works are taking place within the existing WTW. There is the potential for temporary disturbance due to increased noise during construction, there are no impacts anticipated during operation.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. However, temporary effects are likely to still occur during construction.	0	-	0	0
Material Assets	Minimise resource use and waste production	0	-	0	0	New infrastructure required for option which will use materials and generate waste.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	0
	Avoid negative effects on built assets and infrastructure	0	-	0	0	During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the option. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-NIT-002
Option Name	Langford nitrate treatment
Water company	Essex & Suffolk Water
Option Description	Nitrate Treatment (19.2 Ml/d capacity). Nitrate treatment extension on Langford WTW's existing site. Intake from existing WTW's granular activated carbon (GAC), outfall to existing WTW's chlorine contact tanks.
WRZ	Essex & Suffolk Water

Option rejected. Further information can be found in Section 2.2.6 of the Supply Option Development Technical Report.

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	-	0	0	Blackwater, Crouch Roach and Colne Estuaries MAC within 2km which may be indirectly affected. The option is entirely located within SSSI Impact Risk Zones. There are no MCZ/MPAs within 500m of the option. The HRA ToLS identified three Natura 2000 sites that could be affected Blackwater Estuary (Mid-Essex Coast Phase 4) Ramsar (UK11007) (~2.3km), Blackwater Estuary (Mid-Essex Coast Phase 4) SPA (UK9009245) (~2.3km), Essex Estuaries SAC (UK00136900) (~2.3km). No LSE concluded for any of the aforementioned sites.	Ecology surveys will be required at future design stages to determine effects and mitigation required.	0	-	0	0
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	-	0	0	The option is within 500m of BAP Priority Habitat (coastal and floodplain grazing marsh and deciduous woodland). No direct effects on other Priority Habitats but there may be disturbance effects during the construction phase and potential effects on protected species. There so LSE across the sites. There are no Groundwater Dependent Terrestrial Ecosystems (GWDTE) or chalk rivers within 2km of the option. The option is not expected to cause the loss of BNG units due to works taking place within the existing WTW site.	Best practice methods are assumed to be implemented to minimise disturbance effects. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required.	0	-	0	0
	To meet WFD objectives relating to biodiversity.	0	0	0	-	The WFD Phase One assessment results show no risks for ecology during construction but low level of effects during operation due to the drainage of pipelines for maintenance.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To reduce or manage flood risk, taking climate change into account.	0	-	0	0	The majority of the option is within Flood Zone 1 , however, the option does pass adjacent to Flood Zones 2 and 3, flood defences, and flood alert/warning areas, and may have an impact on construction.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required.	0	-	0	0

Water	To enhance or maintain surface water quality, flows and quantity.	0	-	0	0	The option is adjacent to watercourses therefore potential for impacts on water quality during the construction phase. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option is located within a number of groundwater SPZs (Zones 1, 2 and 3) with potential for impacts on water quality during the construction phase.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	0	The WFD Phase 1 assessment determined that the option would have no impact on waterbodies identified in the vicinity of the option during the construction phase, and low levels of impact anticipated during operation, due to drainage of pipelines for maintainance.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	The option will transfer water from an area of surplus to one of deficit and does not require further abstraction therefore supports resilience of water supplies during potential future drought scenarios.	N/A	0	0	+	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA nor are there any within 2km. Construction likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	Effects during construction and operation of the option due to resource use and emissions.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	0	0	Water levels not predicted to be significantly affected therefore unlikely to affect resilience of the local environment to climate change.	N/A	0	0	0	0
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	--	0	0	The option is located in one NCAs, Northern Thames Basin (0.01%). Negative effects during construction likely as excavation will be required for the option. Construction will also result in permanent loss of woodland, with impacts on landscape character. There will be new above ground infrastructure.	Best practice measures to be implemented to minimise effects during construction including although temporary effects during construction may remain. Land reinstated upon completion so with mitigation, no residual effects are likely to remain during operation.	0	-	0	0
Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	0	---	0	0	The option is directly within Chelmer and Blackwater Navigation conservation area and within 500m of Langford conservation area. 1 scheduled monument is within 500m of the option. Construction may affect the setting of these heritage assets. There is potential for the excavation of the option to impact buried archaeology if present. There will be new above ground infrastructure.	Preferred mitigation for a conservation area is to re-route the pipeline; however, if this is not possible then careful construction and reinstatement to its original condition with no detrimental effect on the character, appearance, or design of the conservation area should be implemented. Best practice measures to be implemented to minimise setting effects for other heritage assets during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	0

Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	-	0	0	The option is within 500m of religious grounds, museum and a cemetery. There is no direct land take from this area. There is likely to be temporary disturbance to users of these sites and the local community during construction. This option may contribute to the local economy through employment opportunities during the construction phase. During operation, it is unlikely to contribute to the local economy. IMD decile overlapping the option is 7.	Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur during construction.	+	-	0	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	0	0	There are no shellfish waters or bathing waters within 500m of the option location. All potable water has been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	N/A	0	0	0	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	--	0	0	This option does not propose any opportunities of associated environmental and recreational benefits.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction.	0	0	+	0
	Maintain and enhance tourism and recreation	0	-	0	0	The option is within 500m of a museum, however all works are taking place within the existing WTW, therefore impacts are anticipated to be small in scale and temporary.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Temporary effects are likely to still occur during construction.	0	-	0	0
Material Assets	Minimise resource use and waste production	0	-	0	0	New infrastructure required for option which will use materials and generate waste.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	0
	Avoid negative effects on built assets and infrastructure	0	-	0	0	During the construction phase, there is likely to be some disruption to the	Best practice measures including a Traffic Management Plan to be implemented to	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-NIT-003
Option Name	Langham nitrate treatment
Water company	Essex & Suffolk Water
Option Description	Nitrate Treatment (20 Ml/d capacity). Nitrate treatment extension on Langham WTW's existing site.
WRZ	Essex & Suffolk Water

Option rejected. Further information can be found in Section 2.2.6 of the Supply Option Development Technical Report.

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	-	0	0	There are no designated sites within 2km which may be indirectly affected. The option is entirely located within SSSI Impact Risk Zones. There are no MCZ/MPAs within 500m of the option. The HRA ToLS identified two Natura 2000 sites that could be affected Stour and Orwell Estuaries Ramsar (UK11067) (~6km), and Stour and Orwell Estuaries SPA (UK9009121) (~6km). No LSE concluded for any of the two sites.	Ecology surveys will be required at future design stages to determine effects and mitigation required although this wouldn't negate the need for a potential appropriate assessment.	0	-	0	0
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	-	0	0	The option is within 500m of BAP Priority Habitat (coastal and floodplain grazing marsh and deciduous woodland). No direct effects on Priority Habitats are anticipated but there may be disturbance effects during the construction phase and potential effects on protected species. There are no Groundwater Dependent Terrestrial Ecosystems (GWDTE) or chalk rivers within 2km of the option. The option is not expected to cause the loss of BNG units due to works taking place within the existing WTW site.	Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining option alignment or using trenchless techniques to avoid woodland habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required.	0	0	0	0
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	Very low risk of transfer of INNS as Extension of WTW does not cross any water bodies. Transferred water does not leave boundary of WTW therefore there is no risk INNS will be introduced or transferred.	N/A	0	0	0	0
	To meet WFD objectives relating to biodiversity.	0	0	0	-	The WFD Phase One assessment results show no risks for ecology during construction but low level of effects during operation due to the drainage of pipelines for maintenance.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0

Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	0	0	0	The option crosses grade four agricultural land with disturbance to these soils during construction. The works are taking place within the existing WTW therefore the impact the agricultural land and soil quality is anticipated to be minimal. The precise location of the option is currently unknown. However, it is likely that this land, if agricultural, will not be reinstated as it is a permanent structure, therefore this land would be permanently lost.	There will be permanent loss as a result of the works although this is a relatively small area so neutral effects identified.	0	0	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	-	0	0	The majority of the option is within Flood Zone One , however, the option is adjacent to Flood Zones Two and Three, flood defences, and flood alert/warning areas, and may have an impact on construction. As works will be taking place within the existing WTW site the option is unlikely to increase the risk of flooding.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	0	The option is adjacent to watercourses therefore potential for impacts on water quality during the construction phase. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option is located within a number of groundwater SPZs (Zones 1, 2 and 3 with potential for impacts on water quality during the construction phase.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	0	The WFD Phase 1 assessment determined that the option would have a low level of effect on waterbodies identified in the vicinity during the operation phase, no effects are anticipated during construction.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	The option will transfer water from an area of surplus to one of deficit and does not require further abstraction therefore supports resilience of water supplies during potential future drought scenarios.	N/A	0	0	+	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA nor are there any within 2km. Construction likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	Effects during construction and operation of the option due to resource use and emissions.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	0	0	Water levels not predicted to be significantly affected therefore unlikely to affect resilience of the local environment to climate change.	N/A	0	0	0	0
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	--	0	0	The option is located in one NCAs, Dedham Vale (0.03%). It falls within Dedham Vale AONB. Negative effects during construction likely as excavation will be required for the option. Construction will also result in permanent loss of woodland, with impacts on landscape character. There will be new above ground infrastructure.	Best practice measures to be implemented to minimise effects during construction including although temporary effects during construction may remain. Land reinstated upon completion so with mitigation, no residual effects are likely to remain during operation.	0	-	0	0

Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	0	-	0	0	There are no Historic Environment records within 500m of the option. There is potential for the excavation of the option to impact buried archaeology if present. however this risk is expected to be minimal as works are taking place within the existing WTW. There will be new above ground infrastructure, but due to distance from any heritage assets it is unlikely to have effects on the setting of heritage assets during operation.	Best practice measures to be implemented to minimise setting effects for other historic heritage during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	0
Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	0	0	0	This option may contribute to the local economy through employment opportunities during the construction phase. During operation, it is unlikely to contribute to the local economy. IMD deciles overlapping the option is 6 and 7.	Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur during construction.	+	0	0	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	0	0	There are no shellfish waters or bathing waters within 500m of the option location. All potable water has been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	N/A	0	0	0	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	--	0	0	This option does not propose any opportunities of associated environmental and recreational benefits.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction.	0	0	+	0
	Maintain and enhance tourism and recreation	0	-	0	0	The option is entirely within the existing WTW therefore negligible impacts are anticipated to recreation and tourism in the area. There is the potential for temporary disturbance due to increased noise during construction, there are no impacts anticipated during operation.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. However, temporary effects are likely to still occur during construction.	0	-	0	0
Material Assets	Minimise resource use and waste production	0	-	0	0	New infrastructure required for option which will use materials and generate waste.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	0
	Avoid negative effects on built assets and infrastructure	0	-	0	0	During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the option. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
Option ID	ESW-NIT-004
Option Name	Barsham EDR Nitrate Removal + Pipeline
Water company	Essex & Suffolk Water
Option Description	The EDR treatment will be positioned within the existing Barsham WTW site boundary. Option includes a waste stream discharge (brine) pipeline to Anglian Water's Beccles STW (ESW-NIT-004-TRA). The pipeline is approx. 5.4km long with a Nominal Diameter of 150mm. The majority of the pipeline is to be laid in road, with approx. 1.1km laid in fields. Barsham River WTW source water has high nitrate concentrations at certain times of the year, particularly during the winter months, which can if too high stop water production. This option would allow the WTW to continue to operate throughout the year. This option will provide nitrate treatment via electrodialysis reversal (EDR) for a proportion of the 28Ml/d river works WTW capacity, when blended with borehole water.
WRZ	ESWEssex

Option selected in the following plans:

- Central Preferred
- Least Cost
- Best Value
- Best Environment
- High PCC
- North Suffolk Reservoir
- Habs Regs SR

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
	To protect designated sites and their qualifying features.	0	--	0	0	There are no designated sites within 2km which may be indirectly affected during construction. A small section of The Broads SAC, Broadland Ramsar, Broadland SPA, Barnby Broad & Marshes SSSI, and Broadland Important Bird Area (RSPB) fall just within 2km of the option, however no indirect effects to these designated sites are anticipated given the distance between them and the option (subject to further environmental assessment). The option is almost entirely located within SSSI Impact Risk Zones (Refined). There are no MCZ/MPAs within 500m of the option. No effects to designated sites and their qualifying features are anticipated during operation. The HRA ToLS identified seven Natura 2000 sites that could be affected; Broadland SPA (UK9009253) (approx. 2km east), Broadland Ramsar (UK110100 (approx. 2km east), The Broads SAC (UK0013577) (approx. 2km east), Benacre to Easton Bavents Lagoons SAC (UK0013104) (approx. 9km south-east), Benacre to Easton Bavents Lagoons SAC (UK0013104) (approx. 9km south-east), Outer Thames Estuary SPA (UK9020309) (approx. 9km east) and Southern North Sea SAC (UK0030395) (approx. 9km east). Potential LSEs were concluded for Broadland SPA, Broadland Ramsar and The Broads SAC during construction due to the sites supporting a variety of wetland bird species, and the potential for the surrounding landscape to be used as functionally-linked habitat supporting these bird species. No effects during operation are anticipated.	Best practice methods to be implemented to minimise disturbance effects. Trenchless techniques to be used where appropriate. Ecology surveys may be required at future design stages to determine effects and mitigation.	0	-	0	0

Biodiversity, flora and fauna	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	-	0	0	The option passes adjacent to and through BAP Priority Habitat (Deciduous woodland - 7210.73m2, and No main habitat but additional habitats present - 355.37 m2), potentially resulting in permanent loss as a result of pipeline construction. Where works are to take place within the existing WTW, the impacts are expected to be minimal. No direct effects are anticipated to other priority habitats, but there may be disturbance effects during the construction phase, resulting in potential effects on protected species. There are numerous parcels of deciduous woodland, coastal and floodplain grazing marsh, and areas of no main habitat but additional habitats present, within 500m of the option. Additionally, there are numerous parcels of woodland within 500m of the option (15313.18 m2 - total area intersecting with study area) that may be indirectly affected through disturbance from construction activities. A small area of Groundwater Dependent Terrestrial Ecosystems (GWDTE) falls within 2km of the option, however no indirect effects are anticipated. There are no chalk rivers within 2km of the option. The option is expected to cause the loss of BNG units predominately due to habitat clearance associated with construction. The percentage change is -51.57%. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost. The Natural Capital Assessment concluded the option would result in -£572.43.	Best practice methods are assumed to be implemented to minimise disturbance effects and any habitat loss, including refining pipeline alignment or using trenchless techniques to avoid priority habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required.	0	-	0	0
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	There is a very low risk of transfer/movement of invasive or non-native species as the option is transfer of waste water/brine, which is assumed to be free of INNS. Additionally, transfer of waste water/brine is within a closed system (i.e., between WTWs) rather than to a watercourse.	Best practice methods to be implemented.	0	0	0	0
	To meet WFD objectives relating to biodiversity.	0	0	0	0	Two WFD waterbodies identified. The WFD Phase 1 assessment results show there would be no effects for ecology during construction or operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0

Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	-	0	0	The option crosses grade 3 and 4 agricultural land, resulting in potential disturbance to these soils during construction. During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes following reinstatement, therefore there is unlikely to be any permanent loss of land, or a reduction in quality, from construction of the pipeline. The pipeline is approx. 5.4km long, the majority of which is to be laid in road, with approx. 1.1km to be laid in fields. There are no authorised and/or historic landfill sites within 500m of the option. There are several historic landfill sites within 2km, however there is considered to be no risk of disturbance to contaminated materials during construction or operation.	Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land temporarily disturbed. Ground will be reinstated, therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. Best practice techniques to prevent disturbance of any potentially contaminated material during construction.	0	-	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	-	0	-	The option passes adjacent to several areas of Flood Zone 2 and 3, as well as to areas of flood alert/warning also within 500m of the option. This could have an impact on construction, as for example, significant earth works will be required, in which excavated material will have to be temporarily stored, and thus this could be at risk during a flood event. In addition, any construction machinery and other stored materials could also be at risk during a flood event. During operation, there is potential for minor changes to water flow in the area of this option, however it is considered unlikely that this will have an effect on flood risk.	Appropriate measures to be put in place to reduce the impact of flooding during the construction phase. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. FRA to be undertaken and any above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required. With mitigation, flood risk will be minimised/reduced.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	0	The option runs adjacent to and/or crosses several waterbodies. Therefore, there is potential for impacts on water quality and flows during the construction phase. Any impacts on water quality will be temporary. No effects are anticipated during operation, however there is potential for minor changes to water flow in the area.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option is located within a number of groundwater SPZs (Zones 1, 2 and 3) with potential for impacts on water quality and resources during the construction phase through contamination/pollution. Any impacts are likely to be minor and temporary. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented, With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	--	Two waterbodies were considered during the WFD Phase 1 assessment: Broadland Rivers Chalk & Crag and Waveney (Ellingham Mill - Burgh St. Peter). The assessment determined that the option would have a low level of effect during construction on both waterbodies, due to construction of below ground structures and crossing a railway line. A medium level of effect during operation was determined for Waveney (Ellingham Mill - Burgh St. Peter) during operation, due to discharge of brine to Beccles STW.	Best practice construction methods and pollution prevention measures to be implemented. However, some residual effects may still remain.	0	-	0	-

	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	The option will provide nitrate treatment through Electrodialysis Reversal (EDR) to water sourced from the Barsham River, which has high nitrate concentrations at certain times of the year, particularly during the winter months, which can stop water production if too high. As a result, this option will allow the WTW to continue to operate throughout the year, thus reducing the pressure placed on other areas of the natural system during times of high nitrate concentrations. This will help to increase water efficiency and resilience of water supplies. In addition, the option also includes a waste stream discharge pipeline to Anglian Water's Beccles STW, thus enabling the reuse of water, further improving water efficiency and increasing the resilience of water supplies and natural systems to droughts.	N/A	0	0	+	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA nor are there any within 2km, however it does intersect with the urban areas of Beccles and Worlingham. Construction activities, specifically where the pipeline is to be laid in road, could pose moderate effects on local air quality. In addition, there may be changes to local traffic volumes as a result of road closures and/or diversions. No significant effects are anticipated during operation, however minor effects may arise where localised maintenance works could be required.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	---	0	-	Given the scale of the option, a large quantity of materials will be required to construct the pipeline and other proposed infrastructure, and construction activities will also generate emissions through significant machinery movements associated with required earthworks, HGV movements from transporting materials, as well as other plant emissions resulting from construction. During operation, energy will be required to provide nitrate treatment through electrodialysis within the existing Barsham WTW, and energy will be needed to pump waste water through the pipeline. Any maintenance and/or replacement works will also produce operational carbon emissions.	Investigate use of renewables during construction and operation for energy supply, and use of materials with lower embodied carbon. Carbon assessment could help identify areas for carbon savings or alternative materials. As the electricity grid is decarbonised, greener energy will be more available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	--	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	0	0	Water levels not predicted to be significantly affected, therefore the option is unlikely to affect the resilience of the local environment to climate change.	N/A	0	0	0	0
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	--			The option is entirely located within The Broads NCA, and is also within 500m of both the Suffolk Coast and Heaths NCA and the South Norfolk and High Suffolk Claylands NCA. Additionally, the option is within 500m of The Broads National Park. Temporary disruption effects to these sites and their landscape character and visual amenity are likely as a result of construction activities. Construction will involve excavation and generate noise, vibration, and dust, as well as likely causing increases in traffic and congestion, and having a temporary impact on local air quality. The options runs adjacent to and/or intersects with numerous areas of woodland, in which permanent loss may result, however this is anticipated to be minimal. There will be some new above ground infrastructure, but this will be positioned within the existing Barsham WTW site boundary, and so is unlikely to have an effect on landscape character and visual amenity in the area. No effects to landscape are anticipated during operation.	Best practice measures to be implemented to minimise effects during construction, however temporary effects may remain. Land should be reinstated upon completion. With mitigation, minor negative effects are likely to remain during construction.	0	-	0	0

Historic Environment	To conserve/protect and enhance historic environment and heritage assets, and their setting, including archaeologically important sites.	0	-	0	0	The option intersects with Beccles Conservation Area, and runs within varying levels of proximity to numerous listed buildings. Within 500m of the option there are 5 Grade I Listed Buildings (Church of St Michael; Detached Tower of Church of St Michael; Leman House; Roos Hall; Worlingham Hall), 3 Grade II* Listed Buildings (Ashmans Hall; Church of All Saints; Minster Church of St Benet, Beccles), and 103 Grade II Listed Buildings. There is potential for indirect effects to these buildings during construction, as construction activities could temporarily affect their setting through disturbance. There is potential for excavation works to impact buried archaeology if present, however this is expected to be unlikely. Although there will be some new above ground infrastructure, this will be positioned within the existing Barsham WTW site boundary, and given the distance from any heritage assets, the option is unlikely to have effects on the setting of heritage assets during operation. No other effects during operation are anticipated.	Best practice measures to be implemented to minimise setting effects for other heritage assets during construction. Further work likely to be required to determine significance of effects. Any loss of archaeological remains could cause residual effects to remain.	0	-	0	0
Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	-	0	0	The option is within 500m of The Broads National Park. Whilst there is no direct land take from this area, the option may pose indirect effects to the setting of this park and its users during construction. The option also intersects with part of the National Cycle Network where the pipeline is to be laid along Ringsfield Road. Construction will pose direct temporary effects to this cycle route, as well as potentially effecting other cycle/recreational routes within the local area. The option is also within 500m of 6 playing fields, 3 religious grounds, 9 play spaces, 2 bowling greens, 3 other sports facilities, 3 allotments, 1 cemetery, and 1 park or garden. Construction could pose direct temporary effects to these assets. The option may contribute to the local economy through employment opportunities during the construction phase. During operation it is unlikely that there will be any negative effects, however localised and temporary effects could occur where maintenance works are required.	Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. Any disturbed land should be reinstated, and route alignment to be amended or trenchless techniques to be used to avoid direct impacts on property and community assets. However, temporary effects are likely to still occur.	+	-	0	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	+	0	There are no shellfish waters or bathing waters within 500m of the option location. All potable water will be treated before being released for consumption, thus it is highly unlikely that this option will affect disease transmission during operation. Additionally, the option will provide nitrate treatment to water sourced from the Barsham River, which has high nitrate concentrations at certain times of the year, particularly during the winter months, which can stop water production if too high. As a result, this option will allow the WTW to continue to operate throughout the year, thus helping to secure resilient water supplies for the health and wellbeing of customers.	N/A	0	0	+	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	--	0	0	The option does not propose any opportunities of associated environmental and recreational benefits. It will also likely reduce access and negatively affect users of the local environment during construction.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. There could be potential to enhance the cycleways as part of the works (e.g. during re-instatement).	0	-	0	0

	Maintain and enhance tourism and recreation	0	-	0	0	The option is within 500m of The Broads National Park, as well as other recreation sites, such as playing fields, play spaces, allotments, and other sports facilities. There is potential for temporary disturbance effects to users of these recreational sites due to increased noise, vibration, and other possible negative effects arising from construction activities. Part of the route intersects with the National Cycle Network where the pipeline is to be laid along Ringsfield Road. In addition, there are also numerous Listed Buildings within 500m of the option, and the option also intersects with Beccles Conservation Area. These historical sites could attract tourism to the area, however construction will likely effect the setting of these buildings and the wider area, thus potentially having a temporary negative effect. No effects are anticipated during operation apart from those which may arise during localised and temporary maintenance works.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0
Material Assets	Minimise resource use and waste production	0	---	0	-	New infrastructure will be required for the option. Construction will use a significant amount of materials and also generate waste. In addition, resources will be needed for periodic maintenance works and also in operation to treat and pump water from the facility.	Seek opportunities to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	--	0	-
	Avoid negative effects on built assets and infrastructure	0	-	0	0	The pipeline is approximately 5.4km long. The majority of this length is to be laid in road, with only 1.1km laid in fields. As a result, there will be temporary negative effects on the local road network. Not only will there be likely access issues, but there will also be an increase in the volume of traffic and congestion associated with any road closures and/or diversions. Additionally, traffic will also increase as a result of deliveries of construction materials for the option. The option also crosses a level crossing (rail) as it follows Ingate road, thus construction will likely have a temporary effect on rail transport in the area. During the operational phase there is unlikely to be any disturbance to the transport network. Any maintenance works are likely to be localised and temporary.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-NIT-005
Option Name	Langford EDR Nitrate Removal + Pipeline
Water company	Essex & Suffolk Water
Option Description	The EDR treatment will be positioned within existing Langford WTW site boundary. Option includes a waste stream discharge (brine) pipeline to Anglian Water's Maldon STW (ESW-NIT-005-TRA). The pipeline is approx. 6.7km long with a Nominal Diameter of 200mm. The pipe is to be laid in road for the entirety of the route.
WRZ	ESWEssex

Option selected in the following plans:

- Central Preferred
- Least Cost
- Best Value
- High PCC
- North Suffolk Reservoir
- Habs Regs SR

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
	To protect designated sites and their qualifying features.	0	--	0	-	The option is entirely located within SSSI Impact Risk Zones. The HRA ToLS identified five Natura 2000 sites that could be affected; Blackwater Estuary Ramsar (UK11007) (approx. 0.08km), Essex Estuaries SAC (UK0013690) (approx. 0.08km), Blackwater Estuary SPA (UK9009245) (approx. 0.08km), Croach & Roach Estuaries SPA (UK9009244) (approx. 10km) and Croach & Roach Estuaries Ramsar (UK11058) (approx. 10km). LSE identified for Blackwater Estuary Ramsar, Essex Estuaries SAC and Blackwater Estuary SPA due to potential dust and pollution impacts during construction and the option crossing several rivers which feed directly into all three sites. No LSE identified for the other two sites. Whilst there is potential for minor negative effects during operation as a result of periodic maintenance and replacement works that could cause disturbances to nearby designated sites and their qualifying features, any such works are likely to be localised and temporary, and with appropriate mitigation in place, any effects will be minimised.	Best practice methods to be implemented to minimise disturbance effects. Trenchless techniques to be used where appropriate. Ecology surveys may be required at future design stages to determine effects and mitigation.	0	-	0	0

Biodiversity, flora and fauna	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	--	0	0	The option intersects areas of BAP Priority Habitat (coastal and floodplain grazing marsh 772.33m2, deciduous woodland 1878.89m2, good quality semi-improved grassland 516.59m2, and areas of no main habitat but additional habitats present 69.79m2.) The pipeline is to be laid in roads for the entirety of its 6.7km long route and the waste stream pump station will be located inside existing infrastructure, therefore no direct effects, and no loss of Priority Habitat, are anticipated. However, these habitats may be indirectly affected during construction as a result of disturbances, such as noise, vibration and dust, generated by construction activities. Whilst these effects will be temporary, biodiversity and priority species (if present) within these surrounding habitats could be affected. There is no Ancient Woodland within 500m of the option, however there are several parcels within 2km that could be indirectly affected. There are also numerous parcels of Woodland within 500m of the option that could be indirectly affected. There are no Chalk Rivers. No operational effects are anticipated. The option is expected to cause the loss of BNG units predominately due to habitat clearance associated with construction. The percentage change is -49.21%, however total habitat units lost is relatively small at -4.58. The Natural Capital Assessment concluded the option would result in -£688.71.	Best practice methods are assumed to be implemented to minimise disturbance effects and any habitat loss, including refining pipeline alignment or using trenchless techniques to avoid priority habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required.	0	-	0	0
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	-	0	0	There is a low risk of transfer/movement of invasive or non-native species during option construction as the proposed pipeline runs adjacent to and/or crosses several waterbodies. During operation, water transferred for treatment will not leave the boundary of Langford WTW, and any waste water will be transported to Anglian Water's Maldon STW through a waste stream discharge pipeline where the water will be treated and discharged as trade flow, therefore there is no risk INNS will be introduced or transferred.	Best practice methods to be implemented.	0	0	0	0
	To meet WFD objectives relating to biodiversity.	0	0	0	0	Four WFD waterbodies identified. The WFD Phase 1 assessment results show there would be no effects for ecology during construction or operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0

Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	-	0	0	The pipeline is to be laid in roads for the entirety of its route and the waste stream pump station will be located inside existing infrastructure, therefore no direct land take of agricultural land is expected. Although the pipeline runs adjacent and/or near to areas of Grade 2 ,3 and 4 agricultural land, indirect effects are considered unlikely to the functionality and quality of soils. There are no authorised landfill sites within 500m of the option, however there are three historical landfill sites within 500m (Maldon Causeway, Salcote Hall and Chigborough Farm, and Chigborough Quarry), of which the pipeline runs next to the later two. There is a risk that excavation works during construction of the pipeline could unearth contaminated materials, however with appropriate mitigation this risk is considered minimal. No effects are anticipated during operation.	Best practice techniques to prevent disturbance of any potentially contaminated material during construction.	0	0	0	0
	To reduce or manage flood risk, taking climate change into account.	0	-	0	0	The majority of the option is located within Flood Zone 2 and Flood Zone 3, with flood alert/warning areas and flood defences. The option runs adjacent to and/or crosses numerous main rivers and other smaller waterbodies. This flood risk could have an impact on construction, as for example, significant earth works will be required, in which excavated material will have to be temporarily stored, and thus this could be at risk during a flood event, as well as any construction machinery and other stored materials. During operation, it is considered unlikely that the option will have a significant effect on flood risk in the area.	Appropriate measures to be put in place to reduce the impact of flooding during the construction phase. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. FRA to be undertaken and any above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required. With mitigation, flood risk will be minimised/reduced.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	0	The option runs adjacent to and/or crosses numerous main rivers (Blackwater River, Langford Cut, Spickets Brook) and other smaller waterbodies. Therefore, there is potential for impacts on water quality and flows during the construction phase. No significant effects are anticipated during operation, however there is potential for minor water quality improvements as a result of the treatment works reducing the river's nitrate levels.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction.	0	0	+	0
	To enhance or maintain groundwater quality and resources.	0	-	0	0	A majority of the option is located within SPZ 3. The western extent, including new waste stream pump station, is predominately located within SPZ 2, with a small area located within SPZ 1. There is potential for impacts on water quality during the construction phase. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented, With mitigation, no effects are predicted as a result of construction.	0	0	0	0

Water	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	--	0	--	Four waterbodies were considered during the WFD Phase 1 assessment: Chelmer (d/s confluence with Can), Blackwater (Combined Essex), BLACKWATER and Essex Gravels. The assessment determined that the option would have a low level of effects during construction on all waterbodies, due to crossing main rivers. The assessment determined that the option would have a medium level of effect during operation on Chelmer (d/s confluence with Can) and Blackwater (Combined Essex) due to changes in abstraction patterns, increased abstraction in winter, and on BLACKWATER due to discharge of high nitrate brine via Maldon STW.	During construction, risk assessments will be undertaken for excavation works and dewatering to ensure no adverse impact on watercourses, wetland habitats or abstractions. If impact likely, appropriate mitigation to be put in place Dewatering discharge will be also be treated before discharge. During operation, land drainage will be provided on the upgradient side of the scheme such that they will not cause an increase in groundwater flooding risk. This drainage will be discharged into local watercourses to maintain flow. Whilst best practice mitigation is to be put in place, minor residual negative effects during construction and operation cannot be ruled out.	0	-	0	-
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	The option will provide nitrate treatment to water sourced from Langford WTW's existing granular activated treatment, which has high nitrate concentrations at certain times of the year, particularly during the winter months, which can stop water production if too high. As a result, this option will allow the WTW to continue to operate throughout the year, thus reducing the pressure placed on other areas of the natural system during times of high nitrate concentrations. This will help to increase water efficiency and resilience of water supplies. In addition, the option also includes a waste stream discharge pipeline to Anglian Water's Maldon STW, thus enabling the reuse of water, further improving water efficiency and increasing the resilience of water supplies and natural systems to droughts in the area.	N/A	0	0	+	0
Air	To reduce and minimise air emissions during construction and operation.	0	--	0	-	The option is not within an AQMA, however there is one (MDC Air Quality Management Area number 1) in the town of Maldon within 2km of the option. The option also intersects with the urban area of Heybridge. Construction activities, specifically where the pipeline is to be laid in road, could pose effects on local air quality. In addition, there may be changes to local traffic volumes as a result of road closures and/or diversions. No significant effects are anticipated during operation, however minor effects may arise where localised maintenance works could be required.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	---	0	-	Given the scale of the option, a large quantity of materials will be required to construct the pipeline, and construction activities will also generate emissions through significant machinery movements associated with required earthworks, HGV movements transporting materials, as well as other plant emissions from construction of the pipeline itself. During operation, energy will be required to provide nitrate treatment through electrodialysis within the existing Langford WTW, energy will be needed to pump water through the pipeline and to operate the waste stream pump station. Any maintenance and/or replacement works will also produce operational carbon emissions.	Investigate use of renewables during construction and operation for energy supply and use of materials with lower embodied carbon. Carbon assessment could help identify areas for carbon savings or alternative materials. As the electricity grid is decarbonised, greener energy will be more available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	--	0	-

	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	0	0	Water levels not predicted to be significantly affected, therefore the option is unlikely to affect the resilience of the local environment to climate change.	N/A	0	0	0	0
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	--	0	0	The option is located in two NCAs (Northern Thames Basin, and Greater Thames Estuary). Although the pipeline is to be laid in roads for the entirety of its 6.7km long route, indirect negative effects to landscape during construction are likely. Temporary disruption effects to these areas and their landscape character and visual amenity are likely as a result of construction activities. Construction will involve excavation and generate noise, vibration, and dust, as well as causing other construction related effects, such as increases in traffic and congestion, and having a temporary impact on local air quality. There are numerous areas of woodland within 500m of the option, no direct loss is expected, and if any loss is necessary then this is anticipated to be minimal. Any new above ground infrastructure will be positioned within the existing Langford WTW site boundary, and so is unlikely to have an effect on landscape character and visual amenity in the area. No effects on landscape are anticipated during operation.	Best practice measures to be implemented to minimise effects during construction, however temporary effects may remain. Land should be reinstated upon completion. With mitigation, minor negative effects are likely to remain during construction.	0	-	0	0
Historic Environment	To conserve/protect and enhance historic environment and heritage assets, and their setting, including archaeologically important sites.	0	--	0	0	The option is directly within Chelmer and Blackwater Navigation conservation area and Langford conservation area. Additionally, Maldon conservation area is within 2km of the option. There are two Scheduled Monuments within 500m: Pumping Station, and Mound E of Basin Road. The option interacts with four Grade II Listed Buildings. There are numerous Listed Buildings at varying levels of proximity within 500m of the option: one Grade 1 (Church of St Andrew), one Grade II* (Church of St Giles), and 52 Grade II. Construction may affect the setting of these heritage assets. There is potential for the excavation of the option to impact buried archaeology if present. No significant effects are anticipated during operation. Minor effects may arise during temporary and periodic maintenance works.	Best practice measures to be implemented to minimise setting effects for heritage assets during construction. Further work likely to be required to determine significance of effects. Any loss of archaeological remains could cause residual effects to remain.	0	-	0	0
	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	-	0	0	The option is within 500m of two religious grounds, one religious building, four playing fields, three play spaces, two parks or gardens, one golf course and two cemeteries. There is no direct land take from these areas, however there is likely to be temporary disturbance to users of these sites and the local community during construction. The option interacts with the National Cycle Network at three locations, thus there could be disruption to access caused during construction. The A414 is located within 500m of the option. As the pipeline is to be laid in road for the entirety of its 6.7km route, road closures and/or diversions will likely be in place during construction, potentially resulting in increased traffic volumes and congestion within the local area. The option may contribute to the local economy through employment opportunities during the construction phase. During operation, it is unlikely to contribute to the local economy.	Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. Any disturbed land should be reinstated, and route alignment to be amended or trenchless techniques to be used to avoid direct impacts on property and community assets. However, temporary effects are likely to still occur.	+	-	0	0

Population and Human Health	To secure resilient water supplies for the health and wellbeing of customers.	0	0	+	0	There is one shellfish classification zone (Goldhanger) within 500m of the option. There are no bathing waters within 500m. All potable water will be treated before being released for consumption, thus it is highly unlikely that this option will affect disease transmission during operation. Additionally, the option will provide nitrate treatment to water within Langford WTW, which has high nitrate concentrations at certain times of the year, particularly during the winter months, which can stop water production if too high. As a result, this option will allow the WTW to continue to operate throughout the year, thus helping to secure resilient water supplies for the health and wellbeing of customers.	N/A	0	0	+	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	--	0	0	The option does not propose any opportunities of associated environmental and recreational benefits. It will also likely reduce access and negatively effect users of the local environment during construction. For the entire length of its route the pipeline is to be laid in road. In three instances this route will interact with the National Cycle Network, one of which is where the cycle route follows a section of the proposed pipeline route along the B1026. No effects are anticipated during operation.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. There could be potential to enhance the cycleways as part of the works (e.g. during re-instatement).	0	-	0	0
	Maintain and enhance tourism and recreation	0	-	0	0	The option is directly within Chelmer and Blackwater Navigation conservation area and Langford conservation area. Additionally, Maldon conservation area is within 2km of the option. There are numerous Listed Buildings at varying levels of proximity within 500m of the option. These sites could attract tourism to the area, however there is potential for temporary disturbance effects during construction to the setting of these buildings and the wider area, as well as to any nearby recreation facilities, such as the National Cycle Network, or any trails in surrounding woodland. This disturbance could have a negative effect on tourism and recreation in the area. No effects are anticipated during operation apart from those which may arise during localised and temporary maintenance works.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0
Material Assets	Minimise resource use and waste production	0	---	0	-	New infrastructure will be required for the option. Construction will use a significant amount of materials and also generate waste. In addition, resources will be needed for periodic maintenance works, and during operation to treat and pump water from the facility, and power the waste stream pump station.	Seek opportunities to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	--	0	-
	Avoid negative effects on built assets and infrastructure	0	-	0	0	The pipeline is approximately 6.7km long, and is to be laid in road for the entirety of its length. As a result, there will be temporary negative effects on the local road network. Not only will there be likely access issues, but there will also be an increase in the volume of traffic and congestion associated with any road closures and/or diversions. Additionally, traffic will also increase as a result of deliveries of construction materials for the option, including for construction of the waste stream pump station. This increase in traffic volume and congestion could place extra pressure on other transport infrastructure within the area. During the operational phase there is unlikely to be any disturbance to the transport network. Any maintenance works are likely to be localised and temporary.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-NIT-006
Option Name	Langham EDR Nitrate Removal + Pipeline
Water company	Essex & Suffolk Water
Option Description	The EDR treatment will be positioned within existing Langham WTW site boundary. Option includes a waste stream discharge pipeline to Anglian Water's Colchester STW (ESW-NIT-006-TRA). The pipeline is approx. 14.523km long with a Nominal Diameter of 200mm and is laid in road for the entirety of the route.
WRZ	ESWEssex

Option selected in the following plans:

- Central Preferred
- Least Cost
- Best Value
- High PCC
- North Suffolk Reservoir
- Habs Regs SR

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
	To protect designated sites and their qualifying features.	0	--	0	--	The option intersects the Blackwater, Crough, Roach and Colne Estuaries Marine Conservation Zone. The entire option is located within SSSI Impact Risk Zones. There are two SSSIs within 500m of the option: Bullock Wood and Upper Colne Marshes. The HRA ToLS identified nine Natura 2000 sites that could be affected; Colne Estuary Ramsar (UK11015) (approx. 3.5km), Colne Estuary SPA (UK9009243) (approx. 3.5km), Essex Estuaries SAC (UK013690) (approx. 3.5km), Stour and Orwell Estuaries Ramsar (UK11067) (approx. 5.8km), Stour and Orwell Estuaries SPA (UK9009121) (approx. 5.8km), Abberton Reservoir Ramsar (UK11001) (approx. 5km), Abberton Reservoir SPA (UK9009141) (approx. 5km), Blackwater Estuary SPA (UK9009245) (approx. 7.5km) and Blackwater Estuary Ramsar (UK11007) (approx. 7.5km). LSE identified for Colne Estuary Ramsar, Colne Estuary SPA, Essex Estuaries SAC, due to construction effects from functionally-linked habitat and operation effects due to potential reduction in river's nitrate levels. No LSE identified for the other six sites.	Best practice methods to be implemented to minimise disturbance effects. Trenchless techniques to be used where appropriate. Ecology surveys may be required at future design stages to determine effects and mitigation.	0	-	0	-

Biodiversity, flora and fauna	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	-	0	0	The option interacts BAP Priority Habitat (deciduous woodland 2082.19m2, mudflats 599.42m2, no main habitat but additional habitats present 218.82m2.) The pipeline is to be laid in roads for the majority of its route, therefore no direct effects, and no loss of Priority Habitat, is anticipated. However, these habitats may be indirectly affected during construction as a result of disturbances, such as noise, vibration and dust, generated by construction activities. Whilst these effects will be temporary, biodiversity and priority species (if present) within these surrounding habitats could be affected. Additionally, there are three parcels of Ancient Woodland, as well as numerous parcels of Woodland, that may be indirectly affected within 500m of the option. There are no chalk rivers within 2km of the option, however part of the Upper Colne Marshes (SSSI) groundwater dependent terrestrial ecosystem (GDTE) falls within 500m of the option. Indirect effects are possible, however any effects are likely to be minor. No operational effects are anticipated. The option is expected to cause the loss of BNG units predominately due to habitat clearance associated with construction. The percentage change is -18.33%. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost. The Natural Capital Assessment concluded the option would result in -£898.64.	Best practice methods are assumed to be implemented to minimise disturbance effects and any habitat loss, including refining pipeline alignment or using trenchless techniques to avoid priority habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required.	0	-	0	0
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	-	0	0	There is a low risk of transfer/movement of invasive or non-native species during option construction as the proposed pipeline runs adjacent to and/or crosses several waterbodies. During operation, however, water transferred for treatment will not leave the boundary of Langham WTW, and any waste water will be transported to Anglian Water's Colchester STW through a waste stream discharge pipeline where the water will be treated and discharged as trade flow. Therefore, there is no risk INNS will be introduced or transferred during operation.	Best practice methods to be implemented.	0	0	0	0
	To meet WFD objectives relating to biodiversity.	0	0	0	0	Six WFD waterbodies identified. The WFD Phase 1 assessment results show there would be no effects for ecology during construction or operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0

Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	-	0	0	The pipeline is to be laid in roads for the majority of its route, therefore no direct land take of agricultural land is expected as a result of the pipeline. Land take is anticipated for the addition of road access. The option is located adjacent and/or near to areas of Grade 1, 2, 3, and 4 agricultural land. Indirect effects to the functionality and quality of soils may be caused as a result of the addition of road access. There are five historic landfill sites within 500m (Wilson Marriage School, Molar Works, Whitehall Close, Haven Quay, and Place Farm). The option does not intersect with these sites, and so the risk of unearthing contaminated materials is considered minimal. There are no authorised landfill sites within 2km of the option. No effects are anticipated during operation.	Best practice techniques to prevent disturbance of any potentially contaminated material during construction.	0	-	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	-	0	0	The majority of the option is within Flood Zone 1, and it intersects with Flood Zone 2 and 3 along some sections of its route, particularly at the southern end. The option also runs adjacent to Flood Zone 2 and 3 in areas where these zones are within 500m. Additionally, parts of the option fall within flood alert/warning areas. The option runs adjacent to and/or crosses several main rivers and other smaller waterbodies. This flood risk could have an impact on construction, as for example, significant earth works will be required, in which excavated material will have to be temporarily stored, and thus this could be at risk during a flood event, as well as any construction machinery and other stored materials. During operation, it is considered unlikely that the option will have a significant effect on flood risk in the area.	Appropriate measures to be put in place to reduce the impact of flooding during the construction phase. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. FRA to be undertaken and any above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required. With mitigation, flood risk will be minimised/reduced.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	0	The option runs adjacent to and/or crosses several main rivers and other smaller waterbodies. Therefore, there is potential for impacts on water quality and flows during the construction phase. No significant effects are anticipated during operation, however there is potential for minor water quality improvements as a result of the treatment works reducing the river's nitrate levels.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction.	0	0	+	0
	To enhance or maintain groundwater quality and resources.	0	-	0	0	A majority of the option is located within SPZ 3. The northern extents of the option are located within SPZ 2 and SPZ 1. There is potential for impacts on water quality during the construction phase. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented, With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	--	Six waterbodies were considered during the WFD Phase 1 assessment: Colne (d/s Doe's Corner), Salary Brook, Stour (d/s R. Brett), Stour (Lamarsh - R. Brett), COLNE and Essex Gravels. The assessment determined that the option would have a low level of effects during construction on all waterbodies. The assessment determined that the option would have a medium level of effect during operation on Stour (Lamarsh - R. Brett) and Essex Gravels due to potential river abstraction during winter months and on COLNE due to discharge of brine via Colchester STW.	Best practice construction methods and pollution prevention measures to be implemented. However, some residual effects may still remain.	0	-	0	-

	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	The option will provide nitrate treatment to water sourced from Langford WTW's existing granular activated carbon treatment, which has high nitrate concentrations at certain times of the year, particularly during the winter months, which can stop water production if too high. As a result, this option will allow the WTW to continue to operate throughout the year, thus reducing the pressure placed on other areas of the natural system during times of high nitrate concentrations. This will help to increase water efficiency and resilience of water supplies. In addition, the option also includes a waste stream discharge pipeline to Anglian Water's Colchester STW, thus enabling the reuse of water, further improving water efficiency and increasing the resilience of water supplies and natural systems to droughts in the area.	N/A	0	0	+	0
Air	To reduce and minimise air emissions during construction and operation.	0	--	0	-	The option is within two AQMA's: Area 2 - East Street and the adjoining lower end of Ipswich Road, and Area 1 - Central Corridors. The option also intersects with large urban areas within Colchester. Construction activities, specifically where the pipeline is to be laid in road, could pose effects on local air quality. In addition, there may be changes to local traffic volumes as a result of road closures and/or diversions. This could have a significant effect on air quality within the AQMA's, however with appropriate mitigation any effects should be reduced. That said, the option is likely to pose effects on local air quality during construction. No significant effects are anticipated during operation, however minor effects may arise where localised maintenance works could be required.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	---	0	-	Given the scale of the option, a large quantity of materials will be required to construct the pipeline, and construction activities will also generate emissions through significant machinery movements associated with required earthworks, HGV movements transporting materials, as well as other plant emissions from construction of the pipeline itself. During operation, energy will be required to provide nitrate treatment through electrodialysis within the existing Langford WTW, and energy will be needed to pump water through the pipeline. Any maintenance and/or replacement works will also produce operational carbon emissions.	Investigate use of renewables during construction and operation for energy supply and use of materials with lower embodied carbon. Carbon assessment could help identify areas for carbon savings or alternative materials. As the electricity grid is decarbonised, greener energy will be more available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	--	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	0	0	Water levels not predicted to be significantly affected, therefore the option is unlikely to affect the resilience of the local environment to climate change.	N/A	0	0	0	0

Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	--	0	-	The option intersects with two NCAs (Northern Thames Basin, and South Suffolk and North Essex Clayland) and Dedham Vale AONB (0.06%). Additionally, there are numerous parcels of woodland and High Woods Country Park within 500m of the option. The pipeline is to be laid in roads for the entirety of its route, however new the addition of road access will likely result in negative effects to landscape during construction. Temporary disruption effects to these areas and their landscape character and visual amenity are likely as a result of construction activities. Construction will involve excavation and generate noise, vibration, and dust, as well as causing other construction related effects, such as increases in traffic and congestion, and having a temporary impact on local air quality. There are numerous areas of woodland within 500m of the option, no direct loss is expected, and if any loss is necessary then this is anticipated to be minimal. Effects on landscape are anticipated during operation, as a result of the addition of road access.	Best practice measures to be implemented to minimise effects during construction, however temporary effects may remain. Land should be reinstated upon completion. With mitigation, minor negative effects are likely to remain during construction and operation.	0	-	0	-
Historic Environment	To conserve/protect and enhance historic environment and heritage assets, and their setting, including archaeologically important sites.	0	--	0	0	The option is directly within two conservation areas (Colchester Area 1; and Colchester, Hythe). There are five additional conservation areas within 500m of the option (New Town; Garrison; Colchester, Hythe; Colchester, Distillery Pond; Colchester Area 1). High Woods Country Park is within close proximity to the option, running adjacent to the west along a section of the pipeline. There are also five Scheduled Monuments within 500m of the option (Town ditch; Town wall; SE corner of Roman town in Easthill House Gardens; Colchester Castle and the Temple of Claudius; and Group of barrows at Annan Road). There are three registered parks or gardens within 2km of the option (Tendering Hall Park; Colchester Castle Park; and Wivenhoe Park). The option intersects six Grade II Listed buildings (11 and 12, East Street; 133 (Tudor Cottage), 133A and 133B Hythe Hill; 21-23, East Street; 60 and 61, East Street; 62-65, East Street; K6 Telephone Kiosk). Construction activities may temporarily affect the setting of these heritage assets, through disturbances such as noise, vibration, and dust. There are numerous listed buildings at varying levels of proximity within 500m of the option: 2 Grade I (East Hill House; and Winnock Almshouses), 8 Grade II* (9 and 10, East Hill; Church of St James and St Paul; Former Church of St Leonard at the Hythe; Garrison Church; Grey Friars; Rear Wing of the Old Siege House; The Siege House; Valley House), and 113 Grade II Listed Buildings. Given the heritage within the area, there is potential for excavation works to impact buried archaeology, however with appropriate mitigation this risk is considered minimal. No significant effects are anticipated during operation. Minor effects may arise during temporary and periodic maintenance works.	Best practice measures to be implemented to minimise setting effects for heritage assets during construction. Further work likely to be required to determine significance of effects. Any loss of archaeological remains could cause residual effects to remain.	0	-	0	0

Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	--	0	0	The option interact and follows the alignment of one Noise Action Planning Important Area, with multiple other areas within 500m. The option is within 500m of three allotments, two cemeteries, one Country Park (High Woods), five other sports facilities, 14 play spaces, three playing fields, three public park or gardens, two registered common land, one religious building and four religious grounds. The option crosses three major roads, one railway track and four National Cycle network routes. The cycle route follows parts of the proposed pipeline route along several sections. No land take is anticipated for the pipeline, however land take is anticipated for the addition of road access. Additionally, there is likely to be temporary disturbance to users of these sites and to the wider local community during construction. Additionally, road closures and/or diversions will likely be in place during construction, potentially resulting in access issues, increased traffic volumes and congestion within the local area, and reduced air quality. The option may contribute to the local economy through employment opportunities during the construction phase. During operation, it is unlikely to contribute to the local economy.	Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. Any disturbed land should be reinstated, and route alignment to be amended or trenchless techniques to be used to avoid direct impacts on property and community assets. However, temporary effects are likely to still occur.	+	-	0	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	+	0	There are no shellfish classification zones or bathing waters within 2000m of the option. All potable water will be treated before being released for consumption, thus it is highly unlikely that this option will affect disease transmission during operation. Additionally, the option will provide nitrate treatment to water within Langham WTW, which has high nitrate concentrations at certain times of the year, particularly during the winter months, which can stop water production if too high. As a result, this option will allow the WTW to continue to operate throughout the year, thus helping to secure resilient water supplies for the health and wellbeing of customers.	N/A	0	0	+	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	--	0	0	The option does not propose any opportunities of associated environmental and recreational benefits. It will also likely reduce access and negatively effect users of the local environment during construction. The option is likely to result in likely road closures and/or diversions during construction, potentially causing access issues. At several locations, this option will also interact with the National Cycle Network, specifically where the cycle route follows sections of the proposed pipeline route. No effects are anticipated during operation.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. There could be potential to enhance the cycleways as part of the works (e.g. during re-instatement).	0	-	0	0
	Maintain and enhance tourism and recreation	0	-	0	0	The option is directly within two conservation areas. There are 1 country park, 3 public parks or gardens as well as 5 scheduled monuments and five additional conservation areas within 500m of the option. The option intersects six Grade II Listed Buildings with numerous Listed Buildings at varying levels of proximity within 500m. These sites could attract tourism to the area, however there is potential for temporary disturbance effects during construction to the setting of these sites/buildings and the wider area, as well as to any nearby recreation facilities, such as the National Cycle Network. Additionally, it is likely that road closures and/or diversions will be required during construction of the pipeline and addition of road access, thus likely causing increased traffic volumes and congestion in the local area, as well as access issues. This disturbance could have a negative effect on tourism and recreation in the area. No effects are anticipated during operation apart from those which may arise during localised and temporary maintenance works.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0

Material Assets	Minimise resource use and waste production	0	---	0	0	New infrastructure will be required for the option. Construction will use a significant amount of materials and also generate waste. In addition, resources will be needed for periodic maintenance works and also in operation to treat and pump water from the facility.	Seek opportunities to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	--	0	-
	Avoid negative effects on built assets and infrastructure	0	-	0	0	There will be temporary negative effects on the local road network, as a result of the pipeline being laid in the road and the addition of the road access. Not only will there be likely access issues, but there will also be an increase in the volume of traffic and congestion associated with any road closures and/or diversions. Additionally, traffic will also increase as a result of deliveries of construction materials for the option. This increase in traffic volume and congestion could place extra pressure on other transport infrastructure within the area. During the operational phase there is unlikely to be any disturbance to the transport network. Any maintenance works are likely to be localised and temporary.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-PMP-001A
Option Name	Abberton Raw Water Pumping Station (RWPS)
Water company	Essex and Suffolk Water
Option Description	The option has two distinct elements: Replacement, and enhanced pumping capacity of two existing pumps, motors, and controls at Abberton Reservoir Raw Water Pumping Station; and upgrades to treatment infrastructure at Langford WTW to accommodate the introduction of source water for Abberton raw water reservoir.
WRZ	ESWEssex

Option selected in the following plans:

- Central Preferred
- Least Cost
- Best Value
- Best Environment
- High PCC
- North Suffolk Reservoir
- Habs Regs SR

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
	To protect designated sites and their qualifying features.	0	--	0	--	The Abberton Reservoir RWPS element of the option is located within Abberton Reservoir SSSI, SPA and Ramsar. The RWPS is within an SSSI Impact Risk Zone. Part of the Roman River SSSI falls within 2km of the RWMPS. . Potential indirect effects through construction disturbance are anticipated to surrounding areas of habitat and designated sites. Although the option involves the replacement of two existing pumps, motors, and controls, it is considered that negative effects during construction will be temporary and moderate. During operation, pumping capacity will not exceed the reservoir's available DO of 265 Ml/d, and so negative effects are anticipated to be minor. The HRA ToLS identified nine Natura 2000 site that could be affected; Abberton Reservoir SPA (UK9002561) 0km, Abberton Reservoir Ramsar (UK11001) 0km, Essex Estuaries SAC (UK0013690) approx. 2.2km east, Blackwater Estuary (Mid-Essex Coast Phase 4) SPA (UK9009245) approx. 2.2km south-east, Blackwater Estuary (Mid-Essex Coast Phase 4) Ramsar (UK11007) approx. 2.2km south-east, Colne Estuary (Mid-Essex Coast Phase 2) Ramsar (UK11015) approx. 3km south-east, Colne Estuary (Mid-Essex Coast Phase 2) SPA (UK9009243) approx. 3km south-east, Dengie (Mid-Essex Coast Phase 1) Ramsar (UK11018) approx. 9.5km south and Dengie (Mid-Essex Coast Phase 1) SPA (UK9009242) approx. 9.5km south. LSE identified for Abberton Reservoir SPA, Abberton Reservoir Ramsar, Essex Estuaries SAC, Blackwater Estuary (Mid-Essex Coast Phase 4) SPA, Blackwater Estuary (Mid-Essex Coast Phase 4) Ramsar, Colne Estuary (Mid-Essex Coast Phase 2) Ramsar and Colne Estuary (Mid-Essex Coast Phase 2) SPA due to the potential for sites to be functionally linked to habitat for the qualifying features of the sites, which may result in construction impacts. LSE identified for Abberton Reservoir SPA, Abberton Reservoir Ramsar, Essex Estuaries SAC, Colne Estuary (Mid-Essex Coast Phase 2) Ramsar and Colne Estuary (Mid-Essex Coast Phase 2) SPA, due to physical damage, non-toxic contamination, water table availability and biological disturbances during operation. No LSE identified for the other two sites.	Best practice methods to be implemented to minimise disturbance effects. Ecology surveys might be required at future design stages to determine effects and mitigation required.	0	-	0	-

Biodiversity, flora and fauna	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	-	+	0	Within 500m there is no main habitat, but additional habitat present, and within 2km there are several areas of Deciduous Woodland and a few parcels of Good Quality Semi-improved Grassland. Apart from one parcel of Ancient Woodland, there are no designated sites within 2km of the Langford WTW element of the option. Within 500m there are several areas of Deciduous Woodland and Coastal and Floodplain Grazing Marsh Priority Habitat. The works associated with both elements of the option will not lead to the loss of any woodland or Priority Habitat, therefore no direct effects are anticipated to biodiversity and priority species. However, construction activities could pose disturbance effects such as noise, vibrations and dust, which could have indirect effects on biodiversity and wildlife in surrounding areas of woodland and habitat. Any effects are considered likely to be minor and temporary. Pollutants and/or construction waste should be dealt with properly to avoid potential contamination, as this could have negative effects on any freshwater biodiversity and priority species that may be present. During operation no negative effects to biodiversity and priority species are anticipated. The option is expected to cause the loss of BNG units predominately due to habitat clearance associated with construction. The percentage change is -26.44%. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost. The Natural Capital Assessment concluded the option would result in -£423.56.	Best practice methods are assumed to be implemented to minimise disturbance effects. Ecology surveys might be required at future design stages to determine effects and mitigation required.	0	-	+	0
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	Whilst it is possible for INNS to be present in Abberton Reservoir and Langford WTW, any pumped water will be kept isolated and subsequently treated, and so should be entirely free of INNS upon release from the system. As a result, the risk of transfer is considered very low. During the construction phase risks of INNS is considered low, however appropriate mitigation should be implemented to avoid any potential spreading, whether it be boot spraying, wheel and equipment washing, or other best practice methods.	Best practice methods to be implemented.	0	0	0	0
	To meet WFD objectives relating to biodiversity.	0	0	0	0	Two WFD waterbodies identified. The WFD Phase 1 assessment results show there would be no effects for ecology during construction or operation.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	0	0	0	The Abberton Reservoir RWPS element of the option is not considered to pose any negative effects to soil. There are also no authorised and/or historical landfill sites within 2km of the option. The Langford WTW element of the option is also not considered to pose any negative effects to soil. All works will be undertaken within the existing WTW site, and so no agricultural land will be effected. There are no authorised landfill sites within 2km, but there are three historic landfill sites, however given the distance between these and the option the risk of unearthing potentially contaminated material is considered minimal.	N/A	0	0	0	0

	To reduce or manage flood risk, taking climate change into account.	0	-	+	0	The Abberton Reservoir RWPS element of the option is entirely located within Flood Zones 2 and 3. There is no flood alert, flood risk, or flood warning area within 2km of the option. The option is located within Abberton Reservoir, and involves the replacement of two existing pumps, providing additional pumping capacity during operation, thus potentially helping to reduce and/or manage flood risk in combination with other mechanisms currently available at the reservoir. However, pumping capacity will be decreased during the construction phase, meaning that the option could have a temporary negative effect on the reservoirs ability to reduce and/or manage flood risk. Most of the Langford WTW element of the option intersects with Flood Zone 2, and the option runs right next to Flood Zone 3. The option also falls partly within and adjacent to areas of Flood Alert and Flood Warning, and is within 500m of areas benefiting from flood defences. The option is not expected to influence flood risk during both construction and operation.	Appropriate measures to be put in place to reduce the impact of flooding during the construction phase. FRA might need to be undertaken, and above ground infrastructure to be designed to be flood resilient. With mitigation, flood risk will be minimised/reduced.	0	0	+	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	0	Whilst the Abberton RWPS element of the option involves the replacement of two existing pumps to provide additional pumping capacity, the option is located within a reservoir, meaning that surface water quality, flows and quantity are already influenced and controlled by existing water infrastructure. Therefore, it is considered unlikely that the option will have any effects on surface water quality, flows, and quantity during operation. Minor and temporary effects are possible during construction. The Langford WTW upgrade element of the option provides greater treatment capacity to allow for water that will come from the Abberton Raw Water Transfer. As a result, this element of the option is not expected to have any effect on surface water quality, flows and quantity during operation. Minor and temporary effects could arise during the construction phase.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
Water	To enhance or maintain groundwater quality and resources.	0	0	0	0	Although the Abberton RWPS element of the option is located within SPZ3 and is within 500m of the Essex Gravels Groundwater Body, it is also located within a reservoir, meaning that groundwater quality, flows and quantity are already likely to be effected to some extent by existing water infrastructure. Therefore, it is considered unlikely that the option will have any effects on groundwater quality and resources. The Langford WTW upgrade element of the option provides greater treatment capacity to allow for water that will come from the Abberton Raw Water Transfer, and thus is not expected to have any effect on groundwater quality and resources during operation. Construction could have a minor effect as the option is located within SPZ1 and 2, as well as the Essex Gravels Groundwater Body.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	-	Two waterbodies were considered during the WFD Phase 1 assessment: Layer Brook and Abberton Reservoir. The assessment determined that the option would have a low level of effects during construction for both waterbodies, due to modification of existing PS, potential for below ground structures and pumping station modification. Low level of effects during operation for both waterbodies were determined due to modification of a new pumping station.	Best practice construction methods and pollution prevention measures to be implemented. However, some residual effects may still remain.	0	-	0	-

	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	++	0	The Abberton RWPS element of the option involves the replacement of two existing pumps, as well as motors and some controls, providing additional pumping capacity, in which the Abberton Raw Water Transfer will pump water to Langford WTW for treatment. The pumping station currently has a restricted capacity to 220 Ml/d (at reservoir bottom water level). During a 1 in 500 year drought the current pumps would be insufficient to maximise abstraction from Abberton during a dry year. The additional pumping capacity is based upon 265-220 Ml/d. Therefore, it is anticipated that the option will provide moderate positive effects during operation, as it will help to increase resilience of water supplies and natural systems to droughts. Langford WTW abstracts raw water from the River Waveney. Raw water is stored in bankside storage prior to treatment. Under certain conditions however, Langford WTW struggles to achieve its peak deployable output. As a result, the proposed option is to upgrade the sites treatment infrastructure and to introduce raw water from Abberton Reservoir so that the WTW can operate at its maximum output capacity. Therefore, this element of the option will also help to increase resilience of water supplies and natural systems to droughts during operation.	N/A	0	0	++	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The Abberton RWPS element of the option is not within an AQMA, nor are there any within 5km of the site. Given the location of the scheme, construction is unlikely to have an effect on air quality. No effects are anticipated during operation either. The Langford WTW element of the option is also not within an AQMA, nor are there any within 2km. There is one AQMA just outside the 2km buffer, however given the distance from this to the scheme no negative effects are anticipated during construction and operation. Construction could pose temporary effects on local air quality as a result of increased road traffic movements associated with deliveries of construction materials, as well as from air emissions arising from construction activities, however these effects will likely be minor.	N/A	0	0	0	0
	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	There will be some effects during construction of both elements of the option through resource use and through emissions resulting from construction activities such as from delivery of materials and parts. During operation both elements of the option will also require energy to pump and treat water.	Investigate use of renewables during construction and operation for energy supply and use of materials with lower embodied carbon. Carbon assessment could help identify areas for carbon savings or alternative materials. As the electricity grid is decarbonised, greener energy will be more available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-

Climatic Factors	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	+	0	The Abberton RWPS element of the option involves the replacement of two existing pumps, as well as motors and some controls, providing additional pumping capacity. The pumping station currently has a restricted capacity to 220 Ml/d (at reservoir bottom water level). During a 1 in 500 year drought the current pumps would be insufficient to maximise abstraction from Abberton during a dry year. The additional pumping capacity is based upon 265-220 Ml/d. Therefore, it is anticipated that the option will improve the climate resilience of the asset, and reduced the pressure placed on the natural system during drought conditions. The Langford WTW element of the option will also help to improve climate resilience of assets and natural systems by increasing the maximum deployable output of the site through construction of a raw water transfer from Abberton Reservoir, thus reducing the need for abstractions from River Blackwater and River Chelmer during dry periods.	N/A	0	0	+	0
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	-	0	0	Both elements of the option are not within an AONB, nor are there any within 5km of the sites. Both elements are within the Northern Thames Basin National Character Area (NCA). The Greater Thames Estuary NCA sits just outside the 2km buffer around both sites. The South Suffolk and North Essex Clayland NCA is within 5km of the Langford WTW element of the option. Construction is not expected to result in any loss of woodland, or additional habitat present in both sites. Potential negative effects are anticipated during construction to the scenic setting of these sites, and any trails or other outdoors amenities that may be within the vicinity. Construction activities may cause disturbance and/or disruption to users of these. Therefore, minor and temporary negative effects to landscape character and visual amenity are possible. During operation both elements of the option are unlikely to change the landscape character of the area or affect visual amenity. Any new above ground infrastructure will be located within the existing Langford WTW site.	Best practice measures to be implemented to minimise effects during construction, however temporary effects may remain. With mitigation, minor negative effects are likely to remain during construction.	0	-	0	0
Historic Environment	To conserve/protect and enhance historic environment and heritage assets, and their setting, including archaeologically important sites.	0	-	0	0	There are no historic environment constraints within 2km of the Abberton RWPS element of the option apart from Listed Buildings. The Langford WTW element of the option is located within the Chelmer and Blackwater Navigation Conservation Area, and within 500m of the Langford Conservation Area. It is also within 2km of two Scheduled Monument (Pumping Station; and Complex of cropmarks including barrows E of Hoemil Barns). Within 500m of both elements of the option there is one GRADE II* Listed Buildings (Church of St Giles), and 10 Grade II Listed Buildings. Both elements of the option are not anticipated to have any permanent negative effects to the historic environment and heritage assets, and their setting. Minor and temporary disturbance effects could arise during construction, but with appropriate mitigation any effects will be reduced and/or minimised.	N/A	0	0	0	0

Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	0	-	0	0	Both elements of the option are located within the Northern Thames Basin National Character Area. Several sections of the National Cycle Network fall within 2km of the Langford WTW site, and within 5km of the Abberton RWPS site. There are no Noise Action Planning Important Areas within 5km of both sites. Apart from 1 Religious Building and 1 Religious Grounds, there are no other community buildings or outdoor play spaces within 500m of both sites. There may be some unofficial trails and cycle routes and other outdoor activity spots within 500m of both sites. Construction activities could have temporary disturbance effects, such as noise, vibration, and dust. In addition, there could be increased road traffic associated with construction deliveries. Effects are likely to be minor, unless there are any restrictions to access. Therefore, both elements of the option could have minor and temporary negative effects to the health and wellbeing of the local community. The option may contribute to the local economy through employment opportunities during the construction phase. No effects are anticipated during operation.	Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	+	0	There are no shellfish waters or official bathing waters within 500m of both sites. There are several Shellfish Classification Zones within 5km of the Abbertown RWPS site, however it is considered unlikely that there will be any hydrological connections between these and the reservoir. The movement of water from one point to another increases the risks of disease transmission. The option will provide additional pumping capacity at Abberton Reservoir, with a raw water transfer to Langford WTW for treatment. As a result, all pumped water will be treated before being released, thus minimising the risk of spreading disease. The Abbeton element of the option will help to secure resilient water supplies for the health and wellbeing of customers, as it will provide additional pumping capacity. The pumping station currently has a restricted capacity to 220 Ml/d (at reservoir bottom water level). During a 1 in 500 year drought the current pumps would be insufficient to maximise abstraction from Abberton during a dry year. The additional pumping capacity is based upon 265-220 Ml/d. The Langford WTW element of the option will also help to secure resilient water supplies for the health and wellbeing of customers through helping the site to sustain its maximum output capacity (57Ml/d).	N/A	0	0	+	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	+	-	0	0	Both elements of the option are unlikely to increase access and connect customers to the natural environment. During construction, both elements of the option could cause temporary disturbance to users of the natural environment. Construction activities may generate noise, vibration, and dust which could affect any nearby trails or other outdoor activities such as fishing. In addition, any temporary road closures required for the works will effect access. No effects anticipated during operation.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Impacts to recreational sites to be avoided where possible. However, temporary effects are likely to still occur during construction.	0	-	0	0

	Maintain and enhance tourism and recreation	0	-	0	0	Both elements of the option are unlikely to have any effects on tourism, but could have temporary negative effects to recreation during the construction phase. No effects anticipated during operation.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Impacts to recreational sites to be avoided where possible. However, temporary effects are likely to still occur during construction.	0	-	0	0
Material Assets	Minimise resource use and waste production	0	-	0	-	There will be some effects during construction of both elements of the option through resource use and materials required for construction. There may also be some waste production, however the option(s) should be designed to use as much of the existing infrastructure as possible, only replacing aspects where necessary. In addition, any generated waste should be dealt with appropriately. During operation, energy will be required to pump and treat, and additional resources may be needed for any maintenance and/or replacement works.	Seek opportunities to implement sustainable design measures (design to reduce footprint, selection of materials). However it is likely that negative effects will remain.	0	-	0	-
	Avoid negative effects on built assets and infrastructure	0	-	0	0	Both elements of the option do not intersect within any railway lines or National Trails. The Langford WTW element of the option is within 2km of a Major Road (A414). Several sections of the National Cycle Network fall within 2km of the Langford WTW site, and within 5km of the Abberton RWPS site. Any negative effects on built assets and infrastructure are anticipated to be temporary and minor. There could be increased traffic volumes within the local area as a result of construction activities, as well any potential road closures and/or diversions. There are anticipated to be no negative effects during operation.	Best practice measures to be included. A Traffic Management Plan might be required to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-RES-002C1
Option Name	Barsham River Works Upgrade (New reservoir and treatment extension)
Water company	Essex and Suffolk
Option Description	New winter storage reservoir to be built. Intake comes from the River Waveney when there's no spare capacity at Barsham WTW. When supplies are short at Barsham WTW, water is taken from the reservoir and transferred to the WTW. Two transfer pipelines are required: River Waveney to reservoir (2.32km), reservoir to Barsham WTW (3.52 km). There are three potential flow rates for both transfer pipelines: 16.2 Ml/d, 18.5 Ml/d, 19.9 Ml/d. Option also includes additional treatment capacity provided by an 16Ml/d extension at the existing Barsham WTW. The additional treatment capacity can easily be located within the existing site boundary.
WRZ	Northern Central

Option selected in the following plans:

- Least Cost
- Best Value

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
	To protect designated sites and their qualifying features.	0	---	0	--	There are no designated sites within 500m of the option footprint. Within 2km, there is the Broadland Ramsar, and SPA, and The Broads SAC. Geldeston Meadows SSSI is also located within 2km of the option. This designated site is a water dependent SSSI Groundwater Dependent Terrestrial Ecosystems (GWDTE) along the River Waveney which may be affected by increases in abstraction to supply the reservoir. Therefore, this SSSI is likely to be sensitive to any changes in water levels and so is likely to be affected by the operation of the option. The option is entirely located within SSSI Impact Risk Zones. There are no MCZ/MPAs within 500m of the option. The HRA ToLS identified seven Natura 2000 sites that could be affected; Broadland SPA (UK9009253) (approx. 1.1km), Broadland Ramsar (UK11010) (approx. 1.1km), The Broads SAC (UK0013577) (approx. 1.1km), Breydon Water Ramsar (UK11008) (approx. 12.5km), Breydon Water SPA (UK9009181) (approx. 12.5km), Outer Thames Estuary SPA (UK9020309) (approx. 12.7km), Southern North Sea SAC (UK0030395) (approx. 12.7km). LSE identified for all seven sites during construction due to potential for non-physical disturbance, biological disturbance, toxic contamination, and non-toxic contamination, and during operation due to potential for physical damage, non-toxic contamination, water table availability and biological disturbance.	Best practice methods to be implemented to minimise disturbance effects. Trenchless techniques to be used where appropriate. Ecology surveys required at future design stages to determine effects and mitigation required.	0	---	0	-

Biodiversity, flora and fauna	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	+++	--	+	0	The option passes through and/or runs adjacent to some small sections of BAP Priority Habitat (Deciduous Woodland, and Coastal and Floodplain Grazing Marsh). Additionally, there are a few small sections of habitats designated as having no main habitat but where additional habitats present within 500m of the option. The option will result in the direct land-take and potential permanent loss of Coastal and Floodplain Grazing Marsh Priority Habitat at its northern end. This will have a direct negative effect on any present biodiversity and priority species. There will also be potential indirect effects to surrounding parcels of Priority Habitat and biodiversity through construction associated disturbances. There is one GWDTE within 2km of the option, as well as numerous parcels of woodland. Operational effects are likely for the GWDTE. The option is expected to cause the a gain of BNG units predominately due to habitat creation associated with the new reservoir. The percentage change is +89.52%. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost. The Natural Capital Assessment concluded the option would result in -£50,538.57.	Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid woodland habitat, in particular Ancient Woodland and BAP Priority Habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required.	+++	-	+	0
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	---	0	--	The magnitude, severity and risk of INNS are all high for this option due to the physical transfer of untreated water (between two locations assumed to currently be unconnected). This potential transfer of new invasive species to the reservoir from the River Waveney along the two new pipeline routes is likely to occur through pipeline washouts, pipe bursts, wash water discharge, emergency overflows, sludge disposal, natural and recreational uses, and reservoir overflows. INNS transported to new waterbodies could be spread further by equipment or animals entering the water. There is also a risk of INNS during construction as significant earthworks will be required to lay the pipelines, and so they could be mass movement of earth/soil potentially containing INNS. In some instances, construction activities may disturb small waterbodies that could be hydrologically linked to more major rivers and watercourses.	During construction best practice will be implemented to prevent the spread of INNS. To ensure that the option operation does not lead to a transfer of invasive species, appropriate filtration systems must be in place. Treatment at the upgraded WTW would prevent any non-native species being transferred further. However, there may still be residual risk.	0	--	0	-
	To meet WFD objectives relating to biodiversity.	0	-	0	0	The Phase 1 WFD assessment identifies three waterbodies with potential deterioration risks. The results show there would be no effects for ecology during construction or operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0

Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	--	0	-	The transfer pipelines cross grade 2, 3 and 4 agricultural land, resulting in disturbance to these soils during construction. During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any permanent loss of land or reduction in quality from implementation of the pipelines. The reservoir itself may lead to loss of land during operation. There are no authorised and/or historic landfill sites within 500m of the option. The option also includes additional treatment capacity provided by an extension at the existing Barsham WTW. This can be located within the existing site boundary, and so there should be no further use of agricultural land, however as permanent structures are to be built this land would be permanently lost. No negative effects to soils are anticipated during operation apart from where localised and temporary maintenance and/or replacement works are required, however with appropriate mitigation in place effects are likely to be minimal.	Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land permanently taken or temporarily disturbed. Ground required for the pipelines will be reinstated therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. There may be residual operational effects associated with the reservoir. Best practice techniques to prevent disturbance of contaminated material during construction.	0	-	0	-
Water	To reduce or manage flood risk, taking climate change into account.	0	-	0	0	The options interacts with Flood Zones 2 and 3. These interactions occur at the northern end of the option near the River Waveney, and where the option crosses a Main River towards its eastern end. Pipelines are located underground and are unlikely to be affected by any flooding in the area during operation, or to contribute to increased flood risk. There is a risk of works being affected by flood risk during construction.	The magnitude, severity and risk of INNS are all high for this option due to the physical transfer of untreated water (between two locations assumed to currently be unconnected). This potential transfer of new invasive species to the reservoir from the River Waveney along the two new pipeline routes is likely to occur through pipeline washouts, pipe bursts, wash water discharge, emergency overflows, sludge disposal, natural and	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	-	The transfer pipeline crosses watercourses therefore there are potential for impacts on water quality during the construction phase. There are also potential operational impacts on water flow in River Waveney due to abstraction for the service reservoir. Additionally, there is also potential transfer of INNS during operation with impacts on water quality.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless technique where the pipeline crosses watercourses. With mitigation, residual construction effects are considered negligible. Operational impacts on river flow from abstraction and potential transfer of INNS will remain.	0	-	0	-
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option is located within Groundwater Source Protection Zones 1 and 2, with potential for impacts on water quality during the construction phase.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	-	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	---	Three waterbodies were considered during the WFD Phase 1 assessment: Waveney (Ellingham Mill - Burgh St. Peter), Waveney (Starston Brook - Ellingham Mill) and Broadland Rivers Chalk & Crag. The assessment determined that the option would have a low level of effects during construction for all three waterbodies, due to the option crossing two main rivers and intake from River Waveney. High level of effects are considered likely during operation for all three waterbodies, due to the creation of a new winter storage reservoir. High impacts are also anticipated specifically for Waveney (Ellingham Mill - Burgh St. Peter) due to new or increased surface water extraction. For other WFD objectives, low level effects are anticipated during operation, due to the option crossing two main rivers and maintenance of new intake from River Waveney.	Best practice construction methods and pollution prevention measures to be implemented. However, some residual effects may still remain.	0	-	0	---

	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	++	-	This option will support the building of a new winter storage reservoir. This reservoir will take water from River Waveney when there's no spare capacity at Barsham WTW. When supplies are short at Barsham WTW, water will then be transferred from the reservoir to the WTW. To facilitate this, two new transfer pipelines will be built with three potential flows rates (16.2 Ml/d, 18.5 Ml/d, 19.9 Ml/d). The option also includes additional treatment capacity provided by an 16 Ml/d extension at the existing Barsham WTW. During normal operation, this option could combat the effect of extreme temperatures and drought on water resilience by providing an additional reservoir to supply drinking water, where water has been taken from the River Waveney prior to drought conditions. Positive effects are identified. The reservoir may be vulnerable to longer drought situations where lower flows in the intake rivers mean the reservoir cannot be filled/topped up. The reservoir would be exposed to evaporation due to heat (especially extreme temperatures)/wind exposure and lose water that could not be replaced. Therefore negative effects are also identified. The option is unlikely to affect the local environment's resilience to hazards such as flood risk, temperatures extremes, storms, and gales, but may assist in managing resilience of surrounding flora and fauna to drought.	N/A	0	0	++	-
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA nor are there any within 2km. However, construction is likely to have a temporary negative effect on local air quality through construction activities, as well as from increased traffic volumes associated with deliveries of materials and any road closures and/or diversions. Effects may be reduced by appropriate mitigation, but minor effects are likely to remain. No effects are anticipated during operation.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	--	0	--	There will be some effects during construction of the option through resource use and through emissions resulting from construction activities such as from delivery of materials and parts. During operation the option will also require energy to pump and treat water.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	+	0	The option is unlikely to affect the local environment's resilience to hazards such as flood risk, temperatures extremes, storms, and gales, but may assist in managing resilience of surrounding flora and fauna to drought.	N/A	0	0	+	0

Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	-	0	0	The option is not within an AONB, nor are there any within 5km of the option footprint. The option is, however, located in The Broads, and the South Norfolk and High Suffolk Claylands NCA's, as well as The Broads National Park. Therefore, negative effects during construction are likely as excavation and other construction activities will be required for the transfer pipelines. The creation of a reservoir and its embankment is likely to disturb the views and landscape character of the area and therefore change the character of the NCA during construction and operation. Additionally, there will also be temporary disturbance effects resulting from construction activities that will also negatively effect landscape character and visual amenity. No effects are anticipated during operation apart from where localised and temporary maintenance and/or replacement works are required.	Best practice measures to be implemented to minimise effects during construction including although temporary effects during construction may remain. Land affected by transfer pipelines will be reinstated upon completion so with mitigation, no residual effects are likely to remain during operation. Scheme design can look to incorporate measures to reduce landscape and visual impact during operation, such as tree planting.	0	-	0	0
Historic Environment	To conserve/protect and enhance historic environment and heritage assets, and their setting, including archaeologically important sites.	0	-	0	0	The option does not intersect directly with any heritage sites, but is within 2km of two conservation areas (Geldeston, and Beccles), three Scheduled Monument (Mettingham Castle, Motte and bailey castle known as The Mount, and Moated site of Barsham Hall and remains of associated buildings), as well as numerous Listed Buildings. Within 500m of the option there is the 1 Grade I Listed Building (Holy Trinity Church). There are also 3 Grade II* Listed Buildings (Ashmans Hall, Church of All Saints, and Church of St Bartholomew), and 11 Grade II Listed Buildings. Construction may affect the setting of these historic assets, however this is likely to be temporary as the pipelines will be buried. The creation of a reservoir and its embankment is likely to impact the setting of these heritage assets during construction and operation. There is potential for the excavation of the pipeline and construction of the new reservoir to impact buried archaeology if present. There are not anticipated to be effects during the operational phase.	Best practice measures to be implemented to minimise setting effects for other heritage assets during construction. Incorporate measures to reduce setting impact e.g. planting of trees as screening. However, although design features will likely reduce the setting impact, there may be residual effects. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	0
	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	0	-	+	0	The option is within 500m of The Broads National Park, religious buildings and religious grounds, common lands and parks/gardens. There is no direct land take from these areas. There is likely to be temporary disturbance to users of these sites and the local community during construction. This option has the potential to provide jobs in the construction phase of the project. Workers will be required for construction of new pipelines and construction of the reservoir. Development of the site as a tourism/recreational asset may provide jobs in the long term.	Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur during construction.	0	-	+	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	+	0	There are no shellfish waters or bathing waters within 500m of the option location. The Barsham WTW is likely to ensure, through treatment works, that disease is not transmitted from any water sources to customers drinking water supplies. It is unlikely therefore that this option would affect disease transmission during its operation. The option is likely to improve the resilience of the water supply during operation as it will provide additional capacity for water storage during periods of drought.	N/A	0	0	+	0

Population and Human Health	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	-	+	-	The option is unlikely to increase access and connect customers to the natural environment during construction. It could provide education or information resources for the public through signage, or other mechanisms used to inform the public about the works, its need, and its benefits. During construction, the option could cause temporary disturbance to users of the natural environment. Construction activities may generate noise, vibration, and dust which could affect any nearby trails or other outdoor activities such as fishing. In addition, any temporary road closures required for the works will effect access. During operation, there is potential that the site could be used by the public for recreational purposes and that signage can provide information and education on the site.	Best practice mitigation to minimise disturbance to users during construction, however some impacts likely to remain. Enhance operational benefits by incorporating education and information resources within the reservoir design e.g. trails, information boards etc.	0	-	+	0
	Maintain and enhance tourism and recreation	0	-	+	0	The option is within 500m of a national park, religious buildings and religious grounds, common lands and parks/gardens, and crosses over and within proximity of watercourses and habitat areas/woodland that could be used for recreation. Therefore there may be some temporary effects on recreation, angling and other water based activities during the construction phase. The proposed pipeline route runs within close proximity to two sections of the National Cycle Network routes. There may be temporary disturbance on users of these, as well as other walking and cycling routes, and other public rights of way during the construction phase. The creation of a reservoir may provide an informal recreational opportunity, therefore a minor positive effect during operation is anticipated.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction. Enhance operational benefits by incorporating recreational activities such as fishing, sailing, and canoeing into reservoir design.	0	-	+	0
	Minimise resource use and waste production	0	--	0	--	There will be some effects during construction of the option through resource use and materials required for construction. There may also be some waste production, however the option should be designed to use as much of the existing infrastructure as possible, only replacing aspects where necessary. In addition, any generated waste should be dealt with appropriately. During operation, energy will be required to pump and treat, and additional resources may be needed for any maintenance and/or replacement works.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	-
Material Assets	Avoid negative effects on built assets and infrastructure	0	-	0	0	The option footprint comes into close proximity with several sections of the National Cycle Network. The option does not interact with any major roads or rail infrastructure. During the construction phase, there is likely to be disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipelines and new reservoir, as well as from any resulting road closures and/or diversions. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
Option ID	ESW-RES-002
Option Name	North Suffolk winter storage reservoir
Water company	Essex & Suffolk Water
Option Description	The option is located in Barsham and consists of the creation of a new 6120 ML winter storage reservoir (903,000 m2 footprint), that may require embankments, cut-off wall and spillway. Intake comes from the River Waveney/River Hundred when there's no spare capacity at Barsham WTW. When supplies are short at Barsham WTW, water is taken from the reservoir and transferred to the WTW. 3 transfer pipelines required: River Waveney to reservoir (2.32 km), River Hundred to reservoir (15.0 km), reservoir to Barsham WTW (3.52 km). These pipelines will require a pumping station along each route, the locations of which are not currently known.
WRZ	Essex & Suffolk Water

Option selected in the following plans:

- North Suffolk Reservoir

SEA Topic	SEA Objective	Construction Effects +	Construction Effects -	Operational Effects +	Operational Effects -	Comment	Mitigation	Residual Construction Effects +	Residual Construction Effects -	Residual Operational Effects +	Residual Operational Effects -
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	---	0	---	The option footprint does not directly overlap any designated sites. Sotterley Park SSSI (100% favourable) is within 500m of the option, and a further 2 SSSI are within 2km of the option (Geldeston Meadows; and Titsal Wood, Shadingfield). No direct land-take but there may be disturbance effects during the construction phase. There are a number of water dependent SSSI Groundwater Dependent Terrestrial Ecosystems (GWDTE) along the River Waveney which may be affected by increases in abstraction to supply the reservoir. These are: Geldeston Meadows (~1.7 km); Stanley & Alder Carrs, Aldeby (~7 km); Barnby Broad & Marshes (~12.5 km); Sprat's Water & Marshes, Carlton Colville (~20 km) (with approx. distance downstream from abstraction point). These SSSIs are therefore likely to be sensitive to any changes in water levels and are likely to be affected by the operation of the option rather than by the construction. The option is entirely located within SSSI Impact Risk Zones. There are no MCZ/MPAs within 500m of the option. The HRA ToLS identified nine Natura 2000 sites that could be affected; Broadland SPA and Ramsar (~2.1km); The Broads SAC (~2.1km); Benacre to Easton Bavents Lagoons SAC (~2.5km); Benacre to Easton Bavents SPA (~2.5km); Southern North Sea SAC (~3.8km); Outer Thames Estuary SPA (~3.8km); Minsmere-Walberswick SPA and Ramsar (~8.5km); potential LSE concluded for Broadland SPA and Ramsar (~2.1km); The Broads SAC (~2.1km); Benacre to Easton Bavents Lagoons SAC (~2.5km); Benacre to Easton Bavents SPA (~2.5km); Southern North Sea SAC (~3.8km); Outer Thames Estuary SPA (~3.8km) due to potential pollution effects during construction and potential toxic contamination during operation. No LSE concluded for the other two sites. Following this HRA AA, it is considered that with aderence to the proposed mitigation, the proposed works associated with this option are not expected to have adverse effects on the overall integrity of the following sites and their qualifying features: Southern North SEA SAC and Outer Thames Estuary SPA . For the remaining sites, averse effects cannot be ruled out, and thus further investigation is recommended to assess potential effects in more detail on the qualifying features and determine more targeted mitigation measures as well as to reduce uncertainty: Broadland SPA and Ramsar, The Broads SAC, and Benacre to Easton Bavents Lagoons SPA. It is anticipated that there will be residual operation effects for te following sites: Broadland SPA, Broadland Ramsar, The Broads SAC, and Benacre to Easton Bavents Lagoons SAC and SPA.	Best practice methods to be implemented to minimise disturbance effects. For the following Designated Sites it is anticipated that with adherence to proposed mitigation, adverse impacts on the Designated Sites will be alleviated during the construction and operation phases of this option: Southern North Sea SAC, and Outer Thames Estuary SPA. For the remaining sites, low and localised effects may still be possible during both the construction an operation phases. These effects cannot be ruled out due to uncertainty, thus further studies to better understand how the qualifying species use the linked habitats are required and to determine more targeted mitigation measures. This option will need to be included in the in-combination assessment. These Designated Sites are: Broadland SPA and Ramsar (During operation, no mitigation was identified to account for impacts relating to the change in flow due to the new abstraction (such as toxic and non-toxic contamination). As a result, a likely significant effect cannot be ruled out), The Broads SAC, and Benacre to Easton Bavents Lagoons SAC and SPA. It is assumed that any mitigation recommended by further ecology surveys will be implemented and therefore residual operational effects are lessened. Ensure abstraction from the rivers are taken at appropriate times to mitigate against effects on water dependant designated sites.	0	--	0	--
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	+++	--	+	-	The pipeline passes adjacent to and through small parcels of Priority Habitat (mainly deciduous woodland and Coastal and floodplain grazing marsh). Potential permanent loss of Priority Habitat. No direct effects on other Priority Habitats but there may be disturbance effects during the construction phase and potential effects on protected species. There is one GWDTE within 2km of the option, and three others in direct hydrological connection with the proposed abstraction point. No chalk rivers within 2km. The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. However, there will be a significant gain due to the creation of new open water habitat. The percentage change is +67.01%. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost.	Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid woodland habitat, in particular Ancient Woodland and BAP Priority Habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required. A new reservoir has significant opportunities for benefits for ecology.	+++	-	+	-
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	---	The magnitude, severity and risk of INNS are all high for this option due to the physical transfer of untreated water (between two locations assumed currently unconnected). This potential transfer of new invasive species to the reservoir or waterbodies along the new pipeline route is likely to occur through new pipeline washouts, pipe bursts, wash water discharge, emergency overflows, sludge disposal, natural and recreational uses, and reservoir overflows. INNS transported to new waterbody could be spread further by equipment or animals entering the water. Two internationally designated sites and two SSSIs are present within 1km of the transfer route. Several washout points occur along route.	During construction best practice will be implemented to prevent the spread of INNS. To ensure that the option operation does not lead to a transfer of invasive species, appropriate filtration systems must be in place. Treatment at the upgraded WTW would prevent any non-native species being transferred further. However, there may still be residual risk.	0	0	0	-

	To meet WFD objectives relating to biodiversity.	0	-	0	---	Four WFD waterbodies identified. The WFD Phase 1 assessment results show there would be high risks for ecology during operation due to new/increased surface water abstraction (for two waterbodies), and otherwise low impacts from both operation and construction activities. Two waterbodies were identified as requiring further assessment. Level 2 WFD assessment for the Waveney waterbody identified minor localised risks to biological elements and physico-cemical quality elements, due to changes in flow velocity, flow volume, and sedmentation resulting from the installation of a new river intake. No biodiversity compliance risk or risks to achieving water body objectives were identified as a result of this option. For the Lothingland Hundred waterbody a potential deterioration risk was identified to fish due to the new river intake. Assuming appropriate fish screens are in place, then this risk is reduced to a minor localised effect. Minor effects were also identified to biological elements, hydrological regime and physico-chemical elements due to the new intake and abstraction. With appropriate mitigation put in place, it is assumed that there will be no biodiversity compliance risk or risks to achieving water body objectives as a result of this option. With mitigation, no effects are predicted as a result of construction. For operational impact, further WFD L2 assessment required for Waveney (Ellingham Mill - Burgh St. Peter) and Lothingland Hundred to determine best mitigation approach. Operational residual impacts lessened assuming implementation of adequate mitigation. Level 2 results assumed that with appropriate mitigation put in place there will be no biodiversity compliance risk or risks to achieving water body objectives as a result of this option.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless technique where the pipeline crosses watercourses. In the short term there is potential for effects.	0	-	0	-
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	---	0	0	The transfer pipelines cross grade 2, 3 and 4 agricultural land with disturbance to these soils during construction. During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any loss of land quality from the transfer pipeline. The new reservoir is likely to be located within Grade 3 agricultural land. The construction of the new reservoir is likely to reduce the area of agricultural land (by 903,000 m2), leading to the permanent loss of land. The locations of new pumping stations are currently unknown. However, it is likely that this land, if agricultural, will not be reinstated as they are permanent structures, therefore this land would be permanently lost. The transfer pipelines are within 500m of three historic landfill sites with potential to disturb contaminated material during construction.	Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land permanently taken or temporarily disturbed. Ground will be reinstated therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. There will be permanent loss as a result of the new reservoir and pump ing stations therefore residual effects identified. Best practice techniques to prevent disturbance of contaminated material during construction.		---	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	-	0	0	The transfers pipelines will be partially located in Flood Zone 3. Pipelines are located underground and are unlikely to be affected by any flooding in the area during operation, or to contribute to increased flood risk. There is a risk of works being affected by flood risk during construction. The reservoir and remaining areas of transfer options are located in Flood Zone 1, which forms the lowest flood risk, and therefore are unlikely to be affected during construction or operation.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	--	The transfer pipeline crosses watercourses therefore potential for impacts on water quality during the construction phase. Potential operational impacts on water flow in River Waveney due to abstraction for the service reservoir. Potential transfer of INNS during operational phase with impacts on water quality.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless technique where the pipeline crosses watercourses. With mitigation, residual construction effects are considered negligible. Operational impacts on river flow from abstraction and potential transfer of INNS will remain.	0	0	0	--
	To enhance or maintain groundwater quality and resources.	0	--	0	0	The option is located within a number of groundwater SPZs (Zones 1, 2 and 3) with potential for impacts on water quality during the construction phase.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	---	Four WFD waterbodies identified. The WFD Phase 1 assessment results show there would be high risks to two waterbodies (Waveney (Ellingham Mill - Burgh St. Peter) and Lothingland Hundred) during operation due to new/increased surface water abstraction, and otherwise low or neutral impacts from both operation and construction activities. Two waterbodies were identified as requiring further assessment. Level 2 WFD assessment for the Waveney waterbody identified minor localised risks to biological elements and physico-cemical quality elements, due to changes in flow velocity, flow volume, and sedmentation resulting from the installation of a new river intake. No biodiversity compliance risk or risks to achieving water body objectives were identified as a result of this option. For the Lothingland Hundred waterbody a potential deterioration risk was identified to fish due to the new river intake. Assuming appropriate fish screens are in place, then this risk is reduced to a minor localised effect. Minor effects were also identified to biological elements, hydrological regime and physico-chemical elements due to the new intake and abstraction. With appropriate mitigation put in place, it is assumed that there will be no biodiversity compliance risk or risks to achieving water body objectives as a result of this option.	Best practice construction methods and pollution prevention measures to be implemented. If this option were to be selected, further assessment of the effects under the WFD would be required for those waterbodies detrimentally affected. Operational residual impacts lessened assuming implementation of adequate mitigation. WFD Level 2 results concluded that : For Waveney, no compliance risk or risks to achieving water body objectives were identified. For Lothingland Hundred, with appropriate mitigation put in place, it is assumed that there will be no compliance risks or risks to achieving water body objectives.	0	-	0	-

	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	-	During normal operation, this option could combat the effect of extreme temperatures and drought on water resilience by providing an additional reservoir to supply drinking water, where water has been taken from the River Waveney prior to drought conditions. Positive effects are identified. The reservoir may be vulnerable to longer drought situations where lower flows in the intake rivers mean the reservoir cannot be filled/topped up. The reservoir would be exposed to evaporation due to heat (especially extreme temperatures)/wind exposure and lose water that could not be replaced. Therefore negative effects are also identified. The option is unlikely to affect the local environment's resilience to hazards such as flood risk, temperatures extremes, storms, and gales, but may assist in managing resilience of surrounding flora and fauna to drought.	N/A	0	0	+	-
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA nor are there any within 2km. Construction likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	Effects during construction of the option due to resource use and emissions, and effects during the operational phase as the option requires pumping.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	+	0	The option is unlikely to affect the local environment's resilience to hazards such as flood risk, temperatures extremes, storms, and gales, but may assist in managing resilience of surrounding flora and fauna to drought.	N/A	0	0	+	0
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	--	0	--	The option is located in the Suffolk Coast and Heaths; South Norfolk and High Suffolk Claylands; The Broads NCAs. Negative effects during construction likely as excavation will be required for the transfer pipelines. The creation of a reservoir and its embankment is likely to disturb the views and landscape character of the area and therefore change the character of the NCA during construction and operation. The pumping stations are relatively small-scale structures and are therefore unlikely to change the landscape character of the area or affect visual amenity during operation.	Best practice measures to be implemented to minimise effects during construction including although temporary effects during construction may remain. Land affected by transfer pipelines will be reinstated upon completion so with mitigation, no residual effects are likely to remain during operation. Incorporate measures to reduce landscape and visual impact of the reservoir and embankment e.g. planting of trees as screening and reducing the height of any embankment. However, although design features will likely improve the aesthetics, the landscape will remain changed.	0	--	0	--
Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	0	--	0	-	The transfer pipelines do intersect directly with any heritage sites, but are within proximity of a number of listed buildings and a scheduled monument. Construction may affect the setting of these historic assets, however this is likely to be temporary as the pipelines will be buried. The reservoir is within 500m of seven listed buildings and a scheduled monument. The creation of a reservoir and its embankment is likely to impact the setting of these heritage assets during construction and operation. There is potential for the excavation of the pipeline and construction of the new reservoir to impact buried archaeology if present. The pumping stations are relatively small-scale structures and are therefore unlikely to have effects on the setting of historic assets during operation.	Best practice measures to be implemented to minimise setting effects for other heritage assets during construction. Incorporate measures to reduce setting impact of the reservoir and embankment e.g. planting of trees as screening and reducing the height of any embankment. However, although design features will likely reduce the setting impact, there may be residual effects. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	-
	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	-	+	0	The option is within 500m of a national park, religious buildings and religious grounds, common lands and parks/gardens. There is no direct land take from these areas. There is likely to be temporary disturbance to users of these sites and the local community during construction. This option has the potential to provide jobs in the construction phase of the project. Workers will be required for construction of new pipelines and construction of the reservoir. Development of the site as a tourism/recreational asset may provide jobs in the long term. IMD deciles along the pipeline route vary from four to five. The reservoir is located within IMD decile five.	Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur during construction.	+	-	+	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	0	0	There are no shellfish waters or bathing waters within 500m of the option location. The Barsham WTW is likely to ensure, with the use of cleaning agents, that disease is not transmitted from any water sources to customers drinking water supplies. It is unlikely therefore that this option would affect disease transmission during its operation.	N/A	0	0	0	0

Population and Human Health	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	-	+	0	Construction of the reservoir will have no benefits in the short term. However, once completed, the reservoir has the potential to have a positive effect in the medium to long term during operation.	Best practice mitigation to minimise disturbance to users during construction, however some impacts likely to remain. There could be potential to enhance the cycleways as part of the works (e.g. during re-instatement). Enhance operational benefits by incorporating education and information resources within the reservoir design e.g. trails, information boards etc.	0	-	++	0
	Maintain and enhance tourism and recreation	0	-	+	0	The option is within 500m of a national park, religious buildings and religious grounds, common lands and parks/gardens, and crosses over- and within proximity of watercourses and habitat areas/woodland that could be used for recreation. Therefore there may be some temporary effects on recreation, angling and other water based activities during the construction phase. The proposed pipeline route will cross National Cycle Network routes. There may be temporary disturbance on users of these, as well as other walking and cycling routes, and other public rights of way during the construction phase. The creation of a reservoir may provide an informal recreational opportunity.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction. Enhance operational benefits by incorporating recreational activities such as fishing, sailing, and canoeing into reservoir design.	0	-	++	0
Material Assets	Minimise resource use and waste production	0	--	0	0	New infrastructure required for option which will use materials and generate waste. Significant materials required for reservoir embankment.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	0
	Avoid negative effects on built assets and infrastructure	0	--	0	0	The option footprint overlaps a National Cycle Network Route, and crosses a major road. Likely to be temporary impacts during construction due to disruption for users. It is assumed that trenchless techniques will be used where pipelines cross roads. During the construction phase, there is likely to be disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipelines and new reservoir. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-TRA-001
Option Name	Barsham to Blyth Transfer Main
Water company	Essex & Suffolk Water
Option Description	8 Ml/d transfer from Barsham WTW to Saxmundham Tower. Consists of multiple sections: A - Barsham WTW to Shadingfield Tower (length 5.6 km); B - Shadingfield Tower to Holton WTW (length 7.4 km); C - Holton WTW to Saxmundham Tower (length 19.2 km); D - connects new pipelines to Walpole WTW (length 1.4 km).
WRZ	Essex & Suffolk Water

Option selected in the following plans:

- Central Preferred
- Least Cost
- Best Value
- Best Environment
- High PCC
- North Suffolk Reservoir
- Habs Regs SR

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	---	0	-	There are no designated sites within the footprint of this option. There is one biological Site of Special Scientific Interest (SSSIs) within 500 metres, Titsal Wood designated for biological interest (100% unfavourable - declining), approximately 40 metres to the south. Other designated sites within 2km which may be indirectly affected include Dews Ponds Special Area of Conservation (SAC) (UK0030133) (0.5km). The option is entirely located within SSSI Impact Risk Zones. There are no MCZ/MPAs within 500m of the option. The HRA ToLS identified 15 Natura 2000 sites that could be affected, Dew's Ponds SAC (UK0030133) (~0.5km), Broadland Special Protection Area (SPA) (UK9009243) and Ramsar (UK11010) (~2.1km), The Broads SAC (UK0013577) (~2.1km), Minsmere to Walberswick SPA (UK9009101) (~3.5km), SAC (UK0012809) (~3.5km) and Ramsar (UK11044) (~4km), Alde-Ore & Butley Estuaries SAC (UK0030076) (~5.5km), Alde-Ore SPA (UK9009112) (~5.5km), and Alde-Ore Estuary Ramsar (UK11002) (~5.5km), Sandlings SPA (UK902086) (~5.5km), Benachre to Easton Bavents SPA (UK9009291) (~7km), Benachre to Eastern Bavents Lagoons SAC (UK0013104) (~8km), Outer Thames Estuary SPA (UK9020309) (~8km), and Southern North Sea SAC (UK0030395) (~8km). Potential LSEs were concluded for 12 sites; the construction phase of Dew's Ponds SAC will result in physical damage, non-physical disturbance (noise and light pollution), non/-toxic contamination and biological disturbances. The Broads SAC, Broadland Ramsar and SPA will have biological and non-physical disturbances during the construction phase. Minsmere to Walberswick SPA and SPA will result in toxic and non-toxic contamination and biological and non-physical disturbances. There are no anticipated effects to these sites during the operational phase. Minsmere to Walberswick Ramsar, Alde-Ore & Butley Estuaries SAC, Alde-Ore Estuary Ramsar and SPA, Outer Thames Estuary SPA and Southern North Sea SAC sites will likely have toxic and non-tocix contamination and biological disturbances during contrustion phases. No operational effects are expected. No LSE concluded for the remaining three sites. Following HRA AA, it is considered that with aderence to the proposed mitigation, the proposed works associated with this option are not expected to have adverse effects on the overall integrity of the following sites and their qualifying features: Dew's Pond SAC, Minsmere to Walberswick Heaths & Marshes SAC, Alde-Ore & Butley Estuaries SAC, Outer Thames Estuary SPA, Southern North Sea SAC, Alde-Ore Estuary Ramsar, and the Alde-Ore SPA. For the remaining sites, averse effects cannot be ruled out, and thus further investigation is recommended to assess potential effects in more detail on the qualifying features and determine more targeted mitigation measures as well as reduce uncertainty: The Broads SAC (in relation to otter populations), Broadland Ramsar (in relation to tter and bird populations), Broadland SPA (in relation to bird populatins), and Minsmere to Walberswick SPA and Ramsar (both in relation to bird populations).	Best practice methods to be implemented to minimise disturbance effects. For the following Designated Sites it is anticipated that with adherence to proposed mitigation, adverse impacts on the Designated Sites will be alleviated during the construction and operation phases of this option: Dew's Ponds SAC, Minsmere to Walberswick Heaths & Marshes SAC, Alde-Ore & Butley Estuaries SAC, Alde-Ore Estuary Ramsar, Alde-Ore SPA, Outer Thames Estuary SPA and Southern North Sea SAC. For the remaining sites, low and localised effects may still be possible during both the construction an operation phases. These effects cannot be ruled out due to uncertainty, thus further studies to better understand how the qualifying species use the linked habitats are required and to determine more targeted mitigation measures. This option will need to be included in the in-combination assessment. These Designated Sites are: The Broads SAC, Broadland Ramsar and SPA, and Minsmere to Walberswick SPA and Ramsar.	0	-	0	-
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	--	0	0	The pipeline passes adjacent to and through small parcels of woodland and BAP Priority Habitat (deciduous woodland and costal/ floodplain grazing marsh). Potential permanent loss of woodland, coastal/floodplain grazing marsh and deciduous woodland BAP Priority Habitat. No direct effects on other Priority Habitats but there may be disturbance effects during the construction phase and potential effects on protected species. There are no Groundwater Dependent Terrestrial Ecosystems (GWDTE) or chalk rivers within 2km of the option. The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. The percentage change is -14.13%. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost. There are not anticipated to be any ongoing effects during the construction phase.	Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid woodland habitat, in particular Ancient Woodland and BAP Priority Habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required.	0	-	0	0
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	Very low risk of transfer of INNS as the treated source water is likely to be entirely free of INNS. Construction phase risk of INNS is also considered to be very low.	During construction best practice will be implemented to prevent the spread of INNS.	0	0	0	0
	To meet WFD objectives relating to biodiversity.	0	-	0	-	The WFD Phase 1 assessment results show there would be a low risk for ecology during construction due to the repairs to, and construction of tunnels. A low risk of impacts to ecology during operation due to drainage of pipelines into local watercourses for maintenance.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction. Best practice mitigation should also be applied during operational maintenance activities to avoid impacts.	0	0	0	0

Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	---	0	0	Holton Pit SSSI designated for geological interest is within 500 metres (100% unfavourable - declining). The option crosses grade 2, 3 and 4 agricultural land with disturbance to these soils during construction. During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any loss of land quality from the transfer pipeline. The location of the pumping station is currently unknown. However, it is likely that this land, if agricultural, will not be reinstated as it is a permanent structure, therefore this land would be permanently lost. The option is within 500m of a two historic landfill sites (Grove Farm and Holton Pit) with potential to disturb contaminated material during construction.	Pipeline realignment or trenchless techniques to avoid geological SSSI. No residual effect if avoided. Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land permanently taken or temporarily disturbed. Ground will be reinstated therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. There will be permanent loss as a result of the pumping station although this is a relatively small area so neutral effects identified. Pipeline realignment or trenchless techniques to avoid historic landfill. Best practice techniques to prevent disturbance of contaminated material during construction.	0	-	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	-	0	0	The majority of the option is within Flood Zone 1 with areas of Flood Zones 2 and 3 which may have an impact on construction. Impacts on operation unlikely given the pipeline is buried. The pipeline is unlikely to increase the risk of flooding. The pumping station will increase the hardstanding in the area which may have a potential effect on flood risk however this is likely to be minimal.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	0	The transfer pipeline crosses watercourses therefore potential for impacts on water quality during the construction phase. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. However there is potential for minor residual effects during the construction phase.	0	-	0	0
	To enhance or maintain groundwater quality and resources.	0	--	0	0	The option is located within Broadland Rivers Chalk and Crag and Waveney and East Suffolk Chalk and Crag Groundwater units with potential for temporary impacts on water quality during the construction phase. The option is located within a number of groundwater SPZs 1 and 2 with potential for impacts on water quality during the construction phase.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	0	The WFD Phase 1 assessment determined that the option would have a low level of impacts to all waterbodies during the construction phase and operational phase. No further WFD assessments required.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	The option will transfer water from an area of surplus to one of deficit and does not require further abstraction therefore supports resilience of water supplies during potential future drought scenarios.	N/A	0	0	+	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA nor are there any within 2km. Construction likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	Effects during construction of the option due to resource use and emissions, and effects during the operational phase as the option requires a pumping station.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	0	0	Water levels not predicted to be significantly affected therefore unlikely to affect resilience of the local environment to climate change.	N/A	0	0	0	0
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	--	0	0	Option overlaps 3 NCA(s) (with 0.04% proportion of NCA affected): South Norfolk and High Suffolk Claylands (0.03%); Suffolk Coast and Heaths (0.01%) and The Broads (0.01%). Negative effects during construction likely as excavation will be required for the transfer pipeline. Construction will also result in permanent loss of woodland, with impacts on landscape character. There will be minimal new above ground infrastructure. The pumping station is a relatively small-scale structure and is therefore unlikely to change the landscape character of the area or affect visual amenity during operation.	Re-routing of the pipeline to minimise damage and disruption to woodland, including Ancient Woodland, or utilise directional drilling or other trenchless techniques to reduce construction effects. Best practice measures to be implemented to minimise effects during construction including although temporary effects during construction may remain. Land reinstated upon completion so with mitigation, no residual effects are likely to remain during operation.	0		0	0

Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	0	--	0	0	The option is within proximity of a number of listed buildings. There are also two Scheduled Monuments within 500 metres (Moated site at Moat Farm; Moated site and associated earthworks at Westend Farm). Construction may affect the setting of these historic assets, however this is likely to be temporary as the pipeline will be buried. There is potential for the excavation of the pipeline to impact buried archaeology if present. There will be minimal new above ground infrastructure, which is unlikely to have effects on the setting of heritage assets during operation.	Best practice measures to be implemented to minimise setting effects for other heritage assets during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	0
Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	--	0	0	The the option intersects a playing field (Saxmundham War Memorial Playing Field), and three national cycle routes. Additionally within 500m there are two cemeteries, a country park, a golf course, playing fields, The Broads National Park, Wenhaston Commons, four play spaces and three playing fields, Mill Heath registered common land, three places of worship and four national cycle routes. There is likely to be temporary disturbance to users of these sites and the local community during construction. This option may contribute to the local economy through employment opportunities during the construction phase. During operation, it is unlikely to contribute to the local economy. IMD deciles along the pipeline route vary from 4 to 6.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction and land will be reinstated. However, temporary effects are likely to still occur during construction.	+	-	0	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	0	0	There are no shellfish waters or bathing waters within 500m of the option location. The movement of water from one point to another increases the risks of disease transmission. All potable water transfers have been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	N/A	0	0	0	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	--	0	0	The proposed pipeline route will cross three National Cycle Network routes. There may be temporary disturbance on users of these, as well as other walking and cycling routes, and other public rights of way during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. There could be potential to enhance the cycleways as part of the works (e.g. during re-instatement).	0	0	0	0
	Maintain and enhance tourism and recreation	0	--	0	0	The option directly intersects a playing field and three national cycle routes. The pipeline route is within 500m of a country park, a golf course, playing fields, The Broads National Park, Wenhaston Commons, four play spaces and three playing fields, Mill Heath registered common land, watercourses and habitat areas/woodland that could be used for recreation. Therefore there may be some temporary effects on recreation, angling and other water based activities during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0
Material Assets	Minimise resource use and waste production	0	-	0	0	New infrastructure required for option which will use materials and generate waste and excavated material.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	0
	Avoid negative effects on built assets and infrastructure	0	--	0	0	The option crosses two railway lines, two major roads and three National Cycle Network routes. Likely to be temporary impacts during construction due to disruption for users. It is assumed that trenchless techniques will be used for pipelines which cross railway lines and major roads. During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-TRA-003
Option Name	Anglian Water Treated Water Import (Little Whelnetham to Eye transfer)
Water company	Essex & Suffolk Water
Option Description	9.75 Ml/d transfer of treated water from Little Whelnetham Service Reservoir to New Eye Airfield Service Reservoir. Transfer length approximately 31.5 km.
WRZ	Essex & Suffolk Water

Option rejected. Further information can be found in Section 2.2.6 of the Supply Option Development Technical Report.

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	-	0	0	Major Farm, Braiseworth SSSI (100% favorable), The Gardens, Great Ashfield SSSI (100% favourable) and Norton wood SSSI (100% favorable) are within 500m of the option. No direct effects but there may be disturbance effects during the construction phase. Other designated sites within 2km which may be indirectly affected. The option is entirely located within SSSI Impact Risk Zones. There are no MCZ/MPAs within 500m of the option. The HRA ToLS identified seven Natura 2000 sites that could be affected, Waveney & Little Ouse Valley Fens SAC (approx. 7.8km), Redgrave & South Lopham Fens Ramsar (approx. 7.8km), Breckland SAC (approx. 17km), Breckland SPA (approx. 11km), The Broads SAC (approx. 30km), Broadland SPA (approx. 30km) and Broadland Ramsar (approx. 30km). No LSE concluded for the sites.	Refining pipeline alignment or use trenchless techniques to avoid SSSI. Best practice methods to be implemented to minimise disturbance effects. Ecology surveys will be required at future design stages to determine effects and mitigation required, although this would not negate the need for a potential appropriate assessment.	0	-	0	0
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	---	0	0	The pipeline passes adjacent to and through small parcels of Ancient Woodland and BAP Priority Habitat (mainly deciduous woodland). Potential permanent loss of Ancient Woodland and deciduous woodland BAP Priority Habitat. No direct effects on other Priority Habitats but there may be disturbance effects during the construction phase and potential effects on protected species. There are two Groundwater Dependent Territorial Ecosystems (GWDTE) within 500m, Major Farm, Braiseworth (SSSI), and The Gardens, Great Ashfield (SSSI). The chalk river Sapiston is within 2km of the option. The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. The percentage change is -90.29%. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost.	Consider minor rerouting to avoid most high value habitats. Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid woodland habitat, in particular Ancient Woodland and BAP Priority Habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened.	0	--	0	0

	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	Risk of INNS very low. Transfer of treated effluent between service reservoirs with no other connections to waterbodies, therefore negligible risk of INNS transfer.	N/A	0	0	0	0
	To meet WFD objectives relating to biodiversity.	0	-	0	0	The WFD Phase 1 assessment results show there would be moderate risks for ecology during construction but no effects during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	--	0	0	The option crosses grade two and three agricultural land with disturbance to these soils during construction. During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any loss of land quality from the transfer pipeline. The location of the pumping station is currently unknown. However, it is likely that this land, if agricultural, will not be reinstated as it is a permanent structure, therefore this land would be permanently lost.	Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land permanently taken or temporarily disturbed. Ground will be reinstated therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. There will be permanent loss as a result of the pumping station although this is a relatively small area so neutral effects identified. Best practice techniques to prevent disturbance of contaminated material during construction.	0	0	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	-	0	0	The majority of the option is within Flood Zone 1, however the option does pass through Flood Zones 2 and 3 and flood defences, and may have an impact on construction. Impacts on operation unlikely given the pipeline is buried. The pipeline is unlikely to increase the risk of flooding.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	0	The transfer pipeline crosses watercourses therefore potential for impacts on water quality during the construction phase. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option is located within a number of groundwater SPZs with potential for impacts on water quality during the construction phase.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	0	The WFD Phase 1 assessment determined that the option would have a medium level of effect on one or more waterbodies during the construction phase and no effects during operation.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0

	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	The option will transfer water from an area of surplus to one of deficit and does not require further abstraction therefore supports resilience of water supplies during potential future drought scenarios.	N/A	0	0	+	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA nor are there any within 2km. Construction likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	Effects during construction of the option due to resource use and emissions, and effects during the operational phase as the option requires a pumping station.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	0	0	Water levels not predicted to be significantly affected therefore unlikely to affect resilience of the local environment to climate change.	N/A	0	0	0	0
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	--	0	0	This option overlaps two NCAs (with % proportion of NCA affected): South Suffolk and North Essex Clayland (0.03%), and South Norfolk and High Suffolk Claylands (0.1%). Negative effects during construction likely as excavation will be required for the transfer pipeline. Construction will also result in permanent loss of woodland, including Ancient Woodland, with impacts on landscape character. There will be minimal new above ground infrastructure. The pumping station is a relatively small-scale structure and is therefore unlikely to change the landscape character of the area or affect visual amenity during operation.	Re-routing of the pipeline to minimise damage and disruption to woodland, including Ancient Woodland, or utilise directional drilling or other trenchless techniques to reduce construction effects. Best practice measures to be implemented to minimise effects during construction including although temporary effects during construction may remain. Land reinstated upon completion so with mitigation, no residual effects are likely to remain during operation.	0	-	0	0
Historic Environment	To conserve/protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	0	--	0	0	The option is within 500m of Beyton Conservation Area, seven scheduled monuments and is within proximity of a number of listed buildings. Construction may affect the setting of these historic assets, however this is likely to be temporary as the pipeline will be buried. There is potential for the excavation of the pipeline to impact buried archaeology if present. There will be minimal new above ground infrastructure, which is unlikely to have effects on the setting of heritage assets during operation.	Best practice measures to be implemented to minimise setting effects for other heritage assets during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	0

Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	-	0	0	The pipeline is within 500m of ten greenspaces, five churches/places of worship, one public park, two primary schools, one secondary school and one medical care building. There is no direct land take from these areas. There is likely to be temporary disturbance to users of these sites and the local community during construction. This option may contribute to the local economy through employment opportunities during the construction phase. During operation, it is unlikely to contribute to the local economy. IMD deciles along the pipeline route vary from five to ten.	Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur during construction.	+	-	0	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	0	0	There are no shellfish waters or bathing waters within 500m of the option location. The movement of water from one point to another increases the risks of disease transmission. All potable water transfers have been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	N/A	0	0	0	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	-	0	0	The proposed pipeline route will cross two National Cycle Network routes. There may be temporary disturbance on users of these, as well as other walking and cycling routes, and other public rights of way during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. There could be potential to enhance the cycleways as part of the works (e.g. during re-instatement).	0	0	+	0
	Maintain and enhance tourism and recreation	0	-	0	0	The pipeline route crosses open spaces, watercourses and habitat areas/woodland that could be used for recreation and is within 500m of playing fields, religious grounds, public parks and gardens and allotments. Therefore there may be some temporary effects on recreation, angling and other water based activities during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0
Material Assets	Minimise resource use and waste production	0	-	0	0	New infrastructure required for option which will use materials and generate waste and excavated material.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	0
	Avoid negative effects on built assets and infrastructure	0	--	0	0	The option crosses major roads and National Cycle Network routes. Likely to be temporary impacts during construction due to disruption for users. It is assumed that trenchless techniques will be used for pipelines which cross major roads. During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-TRA-004
Option Name	Essex to Hartismere Transfer (Langham WTW to Eye Airfield)
Water company	Essex & Suffolk Water
Option Description	Transfer from Langham WTW to New Eye Airfield Service Reservoir. Transfer length approximately 47.5 km AT 10Ml/d maximum capacity. Tunnelling (micro-tunnelling/horizontal directional drilling) required as route crosses one railways, five major roads, three minor roads, four rivers (including River Stour, River Brett, River Gipping), seven drainage channels. Major crossing near Badley consists of road crossing followed by railway line followed by River Gipping – all in space of approximately 270m – assumed to be two separate crossings: road (trenched); river and railway (trenchless).
WRZ	Essex & Suffolk Water

Option rejected. Further information can be found in Section 2.2.6 of the Supply Option Development Technical Report.

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	--	0	0	Major Farm, Braiseworth SSSI (100% favourable) and Fen Alder Carr LNR are within 500m of the option. No direct effects likely but there may be disturbance effects during the construction phase. The HRA ToLS identified four Natura 2000 sites that could be affected: Stour and Orwell Estuaries SPA and Ramsar (5.1km), Redgrave & South Lopham Fens Ramsar (9.6km), Waveney & Little Ouse Valley Fens SAC (9.6km). Potential for significant effects concluded for Stour and Orwell Estuaries SPA and Ramsar due to construction effects from hydrological links of rivers the pipeline crosses to the designated sites, and close proximity of the pipeline construction activities. Habitat damage may lead to habitat fragmentation, and noise and vibration can also cause disturbance. No LSE concluded for the other two sites.	Best practice methods to be implemented to minimise disturbance effects to the SSSI. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened, although this would not negate the need for a potential appropriate assessment. HRA AA required to assess uncertain effects on Stour and Orwell Estuaries SPA and Ramsar.	0	-	0	0
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	---	0	0	The pipeline passes through areas of the following BAP priority habitats; coastal and floodplain grazing marsh; deciduous woodland and good quality-semi improved grassland. Potential permanent loss of these BAP priority habitats. The option passes within 500m of ancient woodland. No direct effects on ancient woodland but there may be disturbance effects during the construction phase and potential effects on protected species. There is one Groundwater Dependent Terrestrial Ecosystems (GWDTE), Major Farm Braiseworth within 500m of the option. The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. The percentage change is -91.47%. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost.	Consider minor rerouting to avoid most high value habitats. Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid woodland habitat, in particular Ancient Woodland and BAP Priority Habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened.	0	--	0	0
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	Very low risk of transfer of INNS as the treated source water is likely to be entirely free of INNS. Construction phase risk of INNS is also considered to be very low.	N/A	0	0	0	0

	To meet WFD objectives relating to biodiversity.	0	-	0	-	The WFD Phase 1 assessment results showed that there would be moderate risks for ecology during construction and medium effects on one or more waterbodies during operation. The WFD Phase 2 assessment results identified possible deterioration risks to biological status elements as a result of dewatering due to construction of below ground elements.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. Assuming that appropriate mitigation measures are put in place, no effects are predicted as a result of construction, and WFD Level 2 results indicate that the option will have no compliance risk and will not compromise achievement of water body objectives for any of the four waterbodies.	0	0	0	0
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	--	0	0	The option is within 500m of the Hascot Hill Pit Geological SSSI (100% unfavourable - no change). The option crosses grade two and three agricultural land with disturbance to these soils during construction. During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any loss of land quality from the transfer pipeline. The location of the pumping station is currently unknown. However, it is likely that this land, if agricultural, will not be reinstated as it is a permanent structure, therefore this land would be permanently lost. This option is within 500m of the Layham Quarry authorised landfill site.	Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land permanently taken or temporarily disturbed. Ground will be reinstated therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. There will be permanent loss as a result of the pumping station although this is a relatively small area so neutral effects identified. Best practice techniques to prevent disturbance of contaminated material during construction.	0	0	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	-	0	0	The majority of the option is within Flood Zone 1, however the option does pass through Flood Zones 2 and 3 and flood defences, and may have an impact on construction. Impacts on operation unlikely given the pipeline is buried. The pipeline is unlikely to increase the risk of flooding.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	0	The transfer pipeline crosses watercourses therefore potential for impacts on water quality during the construction phase. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option is located within a number of groundwater SPZs with potential for impacts on water quality during the construction phase.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	--	0	-	The WFD Phase 1 assessment determined that the option would have a medium level of effect on one or more waterbodies during the operation phase and medium effects on one or more waterbodies during construction, these waterbodies will require further assessment.	Best practice construction methods and pollution prevention measures to be implemented, with these in place no residual effects during operation are expected. Results from WFD Level 2 assessment indicate that the option does not compromise achievement of water body objectives for any of the four waterbodies assuming that appropriate mitigation measures are put in place.	0	0	0	0
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	The option will transfer water from an area of surplus to one of deficit and does not require further abstraction therefore supports resilience of water supplies during potential future drought scenarios.	N/A	0	0	+	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA. Construction likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0

Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	Effects during construction of the option due to resource use and emissions, and effects during the operational phase as the option requires a pumping station.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	0	0	Water levels not predicted to be significantly affected therefore unlikely to affect resilience of the local environment to climate change.	N/A	0	0	0	0
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	--	0	0	This option overlaps the Dedham Vale AONB and two NCA(s) (with % proportion of NCA affected): South Norfolk and High Suffolk Claylands (0.02%) and South Suffolk and North Essex Claylands (0.02%). Negative effects during construction likely as excavation will be required for the transfer pipeline. Construction will also result in permanent loss of woodland, with impacts on landscape character. There will be minimal new above ground infrastructure. The pumping station is a relatively small-scale structure and is therefore unlikely to change the landscape character of the area or affect visual amenity during operation.	Re-routing of the pipeline to minimise damage and disruption to woodland, or utilise directional drilling or other trenchless techniques to reduce construction effects. Best practice measures to be implemented to minimise effects to the AONB during construction including although temporary effects during construction may remain. Land reinstated upon completion so with mitigation, no residual effects are likely to remain during operation.	0	-	0	0
Historic Environment	To conserve/protect and enhance the historic environment including the significance of designated and non-designted cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting	0	-	0	0	The option is within 500m of Badley and Higham Conservation Areas and one scheduled monument, and is within proximity of a number of listed buildings. Construction may affect the setting of these historic assets, however this is likely to be temporary as the pipeline will be buried. There is potential for the excavation of the pipeline to impact buried archaeology if present. There will be minimal new above ground infrastructure, which is unlikely to have effects on the setting of heritage assets during operation.	Best practice measures to be implemented to minimise setting effects for other heritage assets during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	0
Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	-	0	0	The pipeline is within 500m of three primary schools, one secondary school, a nursing home, playing fields, public park or garden, allotments and religious grounds. There is likely to be temporary disturbance to users of these sites and the local community during construction. This option may contribute to the local economy through employment opportunities during the construction phase. During operation, it is unlikely to contribute to the local economy. IMD deciles along the pipeline route vary from five to ten.	Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur during construction.	+	-	0	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	0	0	There are no shellfish waters or bathing waters within 500m of the option location. The movement of water from one point to another increases the risks of disease transmission. All potable water transfers have been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	N/A	0	0	0	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	-	0	0	The proposed pipeline route will cross a National Cycle Network route. There may be temporary disturbance on users of these, as well as other walking and cycling routes, and other public rights of way during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. There could be potential to enhance the cycleways as part of the works (e.g. during re-instatement).	0	0	+	0
	Maintain and enhance tourism and recreation	0	-	0	0	The pipeline route crosses open spaces, watercourses and habitat areas/woodland that could be used for recreation and is within 500m of playing fields, religious grounds, public parks and gardens and allotments. Therefore there may be some temporary effects on recreation, angling and other water based activities during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0

Material Assets	Minimise resource use and waste production	0	-	0	0	New infrastructure required for option which will use materials and generate waste and excavated material.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	0
	Avoid negative effects on built assets and infrastructure	0	--	0	0	The option crosses a railway line, major roads and a National Cycle Network route. Likely to be temporary impacts during construction due to disruption for users. It is assumed that trenchless techniques will be used for pipelines which cross railway lines and major roads. During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-TRA-007
Option Name	Anglian Water Treated Water Import (Norwich to Barsham WTW transfer)
Water company	Essex & Suffolk Water
Option Description	Intake from Mousehold WTW, Norwich (Anglian owned asset), discharge to Barsham WTW. Transfer length approximately 28.6 km and 44Ml/d capacity. Route realigned so that it takes off from an Anglian Water transfer outside of Norwich ring road (A47). This has reduced the length of the transfer and reduced the number of critical crossings. Tunnelling (micro-tunnelling/horizontal directional drilling) required as route crosses three major roads, one minor road, and a large river crossing. The route crosses three other rivers (The Beck, River Chet, River Waveney (twice)) and one drainage channel.
WRZ	Essex & Suffolk Water

Option rejected. Further information can be found in Section 2.2.6 of the Supply Option Development Technical Report.

SEA Topic	SEA Objective	Construction Effects +	Construction Effects -	Operational Effects +	Operational Effects -	Comment	Mitigation	Residual +	Residual -	Residual Operational +	Residual Operational -
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	--	0	0	The option overlaps the Lion Wood LNR and has the potential for direct impacts. The Broadland Ramsar, SAC and SPA are within 500m of the Option. Geldeston Meadows SSSI (97.2% unfavourable - no change, 2.8% unfavourable declining) is within 500m of the option. The option is within 500m of Whitlingham Marsh and Whitlingham LNR. No direct effects likely but there may be disturbance effects during the construction phase. The option is entirely located within SSSI Impact Risk Zones. The HRA ToLS identified six Natura 2000 sites that could be affected; The Broads SAC (0.1km), Broadland SPA and Ramsar (0.1km), Outer Thames Estuary SPA (12km), and Breydon Water SPA and Ramsar (16km). Likely significant effects concluded for The Broads SAC, and Broadland SPA and Ramsar due to construction effects from hydrological links of rivers the pipeline crosses to the designated sites. No LSE concluded for the other three sites.	Best practice methods to be implemented to minimise disturbance effects to the Ramsar, SAC, SPA and SSSI. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened. HRA AA required to assess uncertain effects on The Broads SAC and Broadland Ramsar and SPA.	0	-	0	0
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	---	0	0	The pipeline passes through areas of the following BAP priority habitats; coastal and floodplain grazing marsh; deciduous woodland; good quality-semi improved grassland and lowland fens. Potential permanent loss of these BAP priority habitats. The option passes within 500m of ancient woodland. No direct effects on ancient woodland but there may be disturbance effects during the construction phase and potential effects on protected species. There are two Groundwater Dependent Terrestrial Ecosystems (GWDTE) within 2km of the option, Yare Broads and Marshes and Geldston Meadows. The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. The percentage change is -73.85%. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost.	Consider minor rerouting to avoid most high value habitats. Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid woodland habitat, in particular Ancient Woodland and BAP Priority Habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened.	0	--	0	0

	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	Very low risk of transfer of INNS as the treated source water is likely to be entirely free of INNS. Construction phase risk of INNS is also considered to be very low.	N/A	0	0	0	0
	To meet WFD objectives relating to biodiversity.	0	-	0	-	The WFD Phase 1 assessment results show there would be a medium risk during construction and operation due to construction/presence of new underground feature within 500m of sensitive groundwater feature (Geldeston Meadows SSSI). Construction risk due to associated dewatering and operational risk from potential impact on groundwater flooding.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. Ecological risk assessments will be undertaken for excavation works, and dewatering discharge will be treated. Gradient land drainage provided to prevent operational groundwater flood risk. In the short term there is potential for effects. With mitigation, lasting effects as a result of construction or operation are predicted to be negligible.	0	0	0	0
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	--	0	0	The option crosses grade 2, 3 and 4 agricultural land with disturbance to these soils during construction. During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any loss of land quality from the transfer pipeline. The location of the pumping station is currently unknown. However, it is likely that this land, if agricultural, will not be reinstated as it is a permanent structure, therefore this land would be permanently lost. The option is within 500m of Postwick Waste Site authorised landfill site.	Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land permanently taken or temporarily disturbed. Ground will be reinstated therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. There will be permanent loss as a result of the pumping station although this is a relatively small area so neutral effects identified. Best practice techniques to prevent disturbance of contaminated material during construction.	0	0	0	0
	To reduce or manage flood risk, taking climate change into account.	0	-	0	0	The majority of the option is within Flood Zone 1, however the option does pass through Flood Zones 2 and 3 and flood defences, and may have an impact on construction. Impacts on operation unlikely given the pipeline is buried. The pipeline is unlikely to increase the risk of flooding.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	0	The transfer pipeline crosses watercourses therefore potential for impacts on water quality during the construction phase. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction.	0	0	0	0

Water	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option is located within a number of groundwater SPZs with potential for impacts on water quality during the construction phase.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	--	0	--	The WFD Phase 1 assessment determined that the option would have a medium effect construction phase and during operation.	Best practice construction methods and pollution prevention measures to be implemented. Further assessment (level 2 WFD assessment) is needed to understand the construction and operation impacts on the waterbodies.	0	-	0	-
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	The option will transfer water from an area of surplus to one of deficit and does not require further abstraction therefore supporting resilience of water supplies during potential future drought scenarios.	N/A	0	0	+	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA although the Central Norwich AQMA is within 500m. Construction is likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	Effects during construction of the option due to resource use and emissions, and effects during the operational phase as the option requires a pumping station.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	0	0	Water levels not predicted to be significantly affected therefore unlikely to affect resilience of the local environment to climate change.	N/A	0	0	0	0

Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	--	0	0	Option overlaps 3 NCA(s) (with % proportion of NCA affected): Central North Norfolk (0.01%), The Broads (0.03%) and South Norfolk and High Suffolk Claylands (0.02%). Negative effects during construction likely as excavation will be required for the transfer pipeline. Construction will also result in permanent loss of woodland, with impacts on landscape character. There will be minimal new above ground infrastructure. The pumping station is a relatively small-scale structure and is therefore unlikely to change the landscape character of the area or affect visual amenity during operation.	Re-routing of the pipeline to minimise damage and disruption to woodland, or utilise directional drilling or other trenchless techniques to reduce construction effects. Best practice measures to be implemented to minimise effects during construction including although temporary effects during construction may remain. Land reinstated upon completion so with mitigation, no residual effects are likely to remain during operation.	0	-	0	0
Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	0	-	0	0	The option is within 500m of Bramerton Conservation area, and is within proximity of a number of listed buildings. Construction may affect the setting of these historic assets, however this is likely to be temporary as the pipeline will be buried. There is potential for the excavation of the pipeline to impact buried archaeology if present. There will be minimal new above ground infrastructure, which is unlikely to have effects on the setting of heritage assets during operation.	Best practice measures to be implemented to minimise setting effects for other heritage assets during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	0
	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing	+	-	0	0	The pipeline crosses the Broads National Park and is within 500m of two Noise Action Planning Important Areas and religious grounds. There is likely to be temporary disturbance to users of these sites and the local community during construction. This option may contribute to the local economy through employment opportunities during the construction phase. During operation, it is unlikely to contribute to the local economy. IMD deciles along the pipeline route vary from four to nine.	Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur during construction.	+	-	0	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	0	0	There are no shellfish waters or bathing waters within 500m of the option location. The movement of water from one point to another increases the risks of disease transmission. All potable water transfers have been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	N/A	0	0	0	0

Population and Human Health	To increase access and connect customers to the natural environment, provide education or information resources for the public	0	-	0	0	The proposed pipeline route will cross three National Cycle Network routes. There may be temporary disturbance on users of these, as well as other walking and cycling routes, and other public rights of way during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. There could be potential to enhance the cycleways as part of the works (e.g. during re-instatement).	0	0	+	0
	Maintain and enhance tourism and recreation	0	-	0	0	The pipeline route crosses the Broads National Park, open spaces, watercourses and habitat areas/woodland that could be used for recreation. Therefore there may be some temporary effects on recreation, angling and other water based activities during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0
Material Assets	Minimise resource use and waste production	0	-	0	0	New infrastructure required for option which will use materials and generate waste and excavated material.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	0
	Avoid negative effects on built assets and infrastructure	0	--	0	0	The option crosses a railway line, major roads and three National Cycle Network routes. Likely to be temporary impacts during construction due to disruption for users. It is assumed that trenchless techniques will be used for pipelines which cross railway lines and major roads. During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-TRA-008
Option Name	Sizewell x Saxmundham Transfer
Water company	Essex & Suffolk Water
Option Description	Transfer (8 Ml/d) from AW Sizewell desalination plant to Saxmundham Tower Transfer is approximately 10.1 km long.
WRZ	Essex & Suffolk Water

Option rejected. Further information can be found in Section 2.2.6 of the Supply Option Development Technical Report.

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
	To protect designated sites and their qualifying features.	0	--	0	0	Sizewell Marshes SSSI (100% favourable), Leiston - Aldeburgh SSSI (58% favourable, 39% unfavourable - recovering, 3% unfavourable - declining) and Sandlings SPA and RSPB are within 2km of the option. No direct effects likely but there may be disturbance effects during the construction phase. Operational effects are not anticipated as the pipeline will be buried and the other assets are existing. The HRA ToLS identified 10 Natura 2000 sites that could be affected. Likely significant effects concluded for; Sandlings SPA (0.9km), Alde-Ore Estuary SPA (5km), Minsmere-Walberswick SPA (2.6km), Outer Thames Estuary SPA (2.1km), Alde-Ore Estuary Ramsar (5km), Minsmere-Walberswick Ramsar (2.6km), Alde-Ore & Butley Estuaries SAC (5km) due to construction effects from hydrological links of rivers the pipeline crosses to the designated sites. The effects of Minsmere to Walberswick Heaths & Marshes SAC (2.6km) are uncertain as any effects are likely to be only temporary. No LSE concluded for Southern North Sea SAC (2.1km), Dew's Ponds SAC (8km).	Best practice methods to be implemented to minimise disturbance effects to the SSSI. Ecology surveys will be required at future design stages to determine effects and mitigation required. HRA AA required to assess uncertain effects on Sandlings SPA (0.9km), Alde-Ore Estuary SPA (5km), Minsmere-Walberswick SPA (2.6km), Outer Thames Estuary SPA (2.1km), Alde-Ore Estuary Ramsar (5km), Minsmere-Walberswick Ramsar (2.6km), Alde-Ore & Butley Estuaries SAC (5km). Directional drilling under rivers may reduce effects on designated sites.	0	-	0	0

Biodiversity, flora and fauna	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	---	0	0	The pipeline passes through areas of the following priority habitats; deciduous woodland and traditional orchard. Potential permanent loss of these priority habitats. The option passes within 500m of ancient woodland. No direct effects on ancient woodland but there may be disturbance effects during the construction phase and potential effects on protected species. There are two Groundwater Dependent Terrestrial Ecosystems (GWDTE) within 2km of the option. The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. The percentage change is -28.66%. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost.	Consider minor rerouting to avoid most high value habitats. Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid priority habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened.	0	--	0	0
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	Very low risk of transfer of INNS as the treated source water is likely to be entirely free of INNS. Construction phase risk of INNS is also considered to be very low.	N/A	0	0	0	0
	To meet WFD objectives relating to biodiversity.	0	-	0	0	The WFD Phase 1 assessment results show there would be a low risk for ecology during construction but no effects during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	--	0	0	The option crosses grade 2, 3 and 4 agricultural land with disturbance to these soils during construction. During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any loss of land quality from the transfer pipeline. The location of the pumping station is currently unknown. However, it is likely that this land, if agricultural, will not be reinstated as it is a permanent structure, therefore this land would be permanently lost. This option is within 500m of four historic landfill sites.	Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land permanently taken or temporarily disturbed. Ground will be reinstated therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. There will be permanent loss as a result of the pumping station although this is a relatively small area so neutral effects identified. Best practice techniques to prevent disturbance of contaminated material during construction.	0	0	0	0
	To reduce or manage flood risk, taking climate change into account.	0	-	0	0	The majority of the option is within Flood Zone 1, however the option does pass through Flood Zones 2 and 3 and may have an impact on construction. Impacts on operation unlikely given the pipeline is buried. The pipeline is unlikely to increase the risk of flooding.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain.	0	-	0	0

Water	To enhance or maintain surface water quality, flows and quantity.	0	-	0	0	The transfer pipeline crosses watercourses therefore potential for impacts on water quality during the construction phase. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option is located within a number of groundwater SPZs with potential for impacts on water quality during the construction phase.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	0	The WFD Phase 1 assessment determined that the option would have a moderate level of effect on one or more waterbodies during the construction phase as de-watering needed for shafts at crossings may reduce the groundwater balance temporarily. No effects anticipated during operation.	Risk assessments will need to be undertaken for excavation works and dewatering to ensure no adverse impact on watercourses, wetland habitats or abstractions. If impact likely appropriate mitigation to be put in place Dewatering discharge will be treated before discharge. Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	The option will transfer water from an area of surplus to one of deficit and does not require further abstraction therefore supports resilience of water supplies during potential future drought scenarios.	N/A	0	0	+	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA. Construction likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	Effects during construction of the option due to resource use and emissions, and effects during the operational phase as the option requires a pumping station.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	0	0	Water levels not predicted to be significantly affected therefore unlikely to affect resilience of the local environment to climate change.	N/A	0	0	0	0

Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	-	0	0	This option is within 500m of Suffolk Coast and Heaths AONB. The option crosses the Suffolk coast and Heaths and South Norfolk and High Suffolk Claylands NCA. Negative effects during construction likely as excavation will be required for the transfer pipeline. Construction will also result in permanent loss of woodland, with impacts on landscape character. There will be minimal new above ground infrastructure. The pumping station is a relatively small-scale structure and is therefore unlikely to change the landscape character of the area or affect visual amenity during operation.	Re-routing of the pipeline to minimise damage and disruption to woodland, or utilise directional drilling or other trenchless techniques to reduce construction effects. Best practice measures to be implemented to minimise effects to the AONB during construction including although temporary effects during construction may remain. Land reinstated upon completion so with mitigation, no residual effects are likely to remain during operation.	0	-	0	0
Historic Environment	To conserve/protect and enhance historic environment and heritage assets, and their setting, including archaeologically important sites.	0	-	0	0	The option is within 500m of the Saxmundham Conservation Area and one scheduled monument and is 2km from the Suffolk heritage coast. The option is within proximity of a number of listed buildings. Construction may affect the setting of these historic assets, however this is likely to be temporary as the pipeline will be buried. There is potential for the excavation of the pipeline to impact buried archaeology if present. There will be minimal new above ground infrastructure, which is unlikely to have effects on the setting of heritage assets during operation.	Best practice measures to be implemented to minimise setting effects for other heritage assets during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	0
Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	-	0	0	The pipeline intersects two playing fields. The pipeline is within 500m of three primary schools, two secondary schools, sports facilities, allotments, playing fields and religious grounds. There is likely to be temporary disturbance to users of these sites and the local community during construction. Land will be reinstated. This option may contribute to the local economy through employment opportunities during the construction phase. During operation, it is unlikely to contribute to the local economy. IMD deciles along the pipeline route vary from four to six.	Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur during construction.	+	-	0	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	0	0	There are no shellfish waters or bathing waters within 500m of the option location. The movement of water from one point to another increases the risks of disease transmission. All potable water transfers have been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	N/A	0	0	0	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	-	0	0	The proposed pipeline route will cross a National Cycle Network route. There may be temporary disturbance on users of these, as well as other walking and cycling routes, and other public rights of way during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Temporary diversions of cycle route required to mitigate disruption during works. There could be potential to enhance the cycleways as part of the works (e.g. during re-instatement).	0	0	+	0
	Maintain and enhance tourism and recreation	0	-	0	0	The pipeline route crosses open spaces, watercourses and habitat areas/woodland that could be used for recreation and is within 500m of playing fields, religious grounds sports facilities, and allotments. Therefore there may be some temporary effects on recreation, angling and other water based activities during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0

Material Assets	Minimise resource use and waste production	0	-	0	0	New infrastructure required for option which will use materials and generate waste and excavated material.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	0
	Avoid negative effects on built assets and infrastructure	0	--	0	0	The option crosses a railway line, major roads and a National Cycle Network route. Likely to be temporary impacts during construction due to disruption for users. It is assumed that trenchless techniques will be used for pipelines which cross railway lines and major roads. During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-TRA-010
Option Name	Wherstead to Saxmundham transfer
Water company	Essex & Suffolk Water
Option Description	Transfer from Wherstead to new service reservoir near Saxmundham WT. Transfer is approximately 46.1 km long, with 10 ml/d max capacity.
WRZ	Essex & Suffolk Water

Option rejected. Further information can be found in Section 2.2.6 of the Supply Option Development Technical Report.

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	--	0	0	The option overlaps Bramford Meadows LNR with potential to directly impact on LNR. Designated sites within 2km which may be indirectly affected are Stour and Orwell Estuaries SPA, Sandlings SPA, Stour and Orwell Estuaries Ramsar. The option is entirely located within SSSI Impact Risk Zones. There are no MCZ/MPAs within 500m of the option. The HRA ToLS identified 15 Natura 2000 sites that could be affected Sandlings SPA (UK9020286) (~1.8km), Stour and Orwell Estuaries Ramsar (UK11067) (~1.9km), Stour and Orwell Estuaries SPA (UK9009121) (~1.9km), Alde-Ore & Butley Estuaries SAC (UK0030076) (~2.3km), Alde-Ore Estuary Ramsar (UK11002) (~2.3km), Alde-Ore Estuary SPA (UK9009112) (~2.3km), Deben Estuary SPA (UK9009261) (~4.9km), Deben Estuary Ramsar (UK11017) (~4.9km), Staverton Park & The Thicks, Wantisden SAC (UK0012741) (~6km), Minsmere to Walberswick Heaths & Marshes SAC (UK0012809) (~7.8km), Minsmere-Walberswick Ramsar (UK11044) (~7.8km), Minsmere-Walberswick SPA (UK9009101) (~7.8km), Dew's Ponds SAC (UK0030133) (~8.7km), Outer Thames Estuary SPA (UK9020309) (~9.8km), Southern North Sea SAC (UK0030395) (~9.9km). No LSE concluded for all sites.	Refine pipeline alignment or use trenchless techniques to avoid LNR. Best practice methods to be implemented to minimise disturbance effects. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened although this wouldn't negate the need for a potential appropriate assessment.	0	-	0	0
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	---	0	0	The pipeline passes adjacent to and through small parcels of Ancient Woodland and BAP Priority Habitat (coastal and floodplain grazing marsh, deciduous woodland and good quality semi-improved grassland). Potential permanent loss of deciduous woodland and other BAP Priority Habitat. No direct effects on Ancient Woodlands but there may be disturbance effects during the construction phase and potential effects on protected species. There are three GWDTE within 2km of the option, Gromford Meadow (SSSI), Orwell Estuary (SSSI), Freston & Cutler's Woods (SSSI). The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. The percentage change is -23.17%. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost.	Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid woodland habitat, in particular Ancient Woodland and BAP Priority Habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened.	0	--	0	0
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	Very low risk of transfer of INNS as the treated source water is likely to be entirely free of INNS. Construction phase risk of INNS is also considered to be very low.	During construction best practice will be implemented to prevent the spread of INNS.	0	0	0	0

	To meet WFD objectives relating to biodiversity.	0	-	0	0	The WFD Phase 1 assessment results show there would be low risks for ecology during construction due to installation and repair of tunnels and conduits, and other below ground structures requiring dewatering. Low risks to ecology are also anticipated during operation due to the draining of pipelines into local waterbodies for maintenance.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	--	0	0	The option crosses grade 2, 3 and 4 agricultural land with disturbance to these soils during construction. During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any loss of land quality from the transfer pipeline. The location of the pumping station is currently unknown. However, it is likely that this land, if agricultural, will not be reinstated as it is a permanent structure, therefore this land would be permanently lost. The option intersects an Authorised Landfill site (Bramford Landfill). The option crosses a historic landfill site (Paper Mill Lane) and is within 500m of 9 other historic landfill sites with potential to disturb contaminated material during construction.	Reduce damage to agricultural land by reducing the option footprint and the construction working area. This will reduce the amount of land permanently taken or temporarily disturbed. Ground will be reinstated therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. There will be permanent loss as a result of the pumping station although this is a relatively small area so neutral effects identified. Pipeline realignment or trenchless techniques to avoid historic and authorised landfill. Best practice techniques to prevent disturbance of contaminated material during construction.	0	0	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	-	0	0	The majority of the option is within Flood Zone 1, however the option does pass through Flood Zones 2 and 3, and flood defences, which may result in construction phase impacts. Impacts during operation are unlikely given the pipeline is buried. The pipeline is unlikely to increase the risk of flooding.	Measures to be included to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	0	The transfer pipeline crosses watercourses therefore potential for impacts on water quality during the construction phase. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option is located within a number of groundwater SPZs with potential for impacts on water quality during the construction phase.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	0	The WFD Phase 1 assessment determined that the option would have a low level of effect on 13 waterbodies during the construction phase and a low level of effects during operation. No further WFD assessments required.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	The option will transfer water from an area of surplus to one of deficit and does not require further abstraction therefore supports resilience of water supplies during potential future drought scenarios.	N/A	0	0	+	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA although The Suffolk Coastal District Council Air Quality Management Area No 3 is within 2km. Construction activities and traffic are likely to have a negative impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0

Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	Effects during construction of the option due to resource use and emissions, and effects during the operational phase as the option requires a pumping station.	Investigate use of renewable energy sources 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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	0	0	Water levels not predicted to be significantly affected therefore unlikely to affect resilience of the local environment to climate change.	N/A	0	0	0	0
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	--	0	0	Option overlaps three NCA(s) (with % proportion of NCA affected): South Norfolk and High Suffolk Claylands (0.03%), Suffolk Coast and Heaths (0.03%) and South Suffolk and North Essex Clayland (0.01%). Negative effects during construction likely as excavation will be required for the transfer pipeline. Construction will also result in permanent loss of woodland, with impacts on landscape character. There will be minimal new above ground infrastructure. The pumping station is a relatively small-scale structure and is therefore unlikely to change the landscape character of the area or affect visual amenity during operation.	Re-routing of the pipeline to minimise damage and disruption to woodland, or utilise directional drilling or other trenchless techniques to reduce construction effects. Best practice measures to be implemented to minimise effects during construction including although temporary effects during construction may remain. Land reinstated upon completion so with mitigation, no residual effects are likely to remain during operation.	0	-	0	0
Historic Environment	To conserve/protect and enhance historic environment and heritage assets, and their setting, including archaeologically important sites.	0	--	0	0	The option is within proximity of a number of listed buildings and within 500m of two scheduled monuments (Moated site and ponds at Thistleton Hall and Settlement site around St Botolph's Church) and one conservation area (Wickham Market) . Construction may affect the setting of these historic assets, however this is likely to be temporary as the pipeline will be buried. There is potential for the excavation of the pipeline to impact buried archaeology if present. There will be minimal new above ground infrastructure, which is unlikely to have effects on the setting of heritage assets during operation.	Best practice measures to be implemented to minimise setting effects for other heritage assets during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	0
Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	--	0	0	The pipeline route overlays with Saxmundham War Memorial Playing Field and Benhall Lodge Park with potential to directly impact these areas. The pipeline is within 500m of three Noise Action Planning Important Areas, and within 500m of three primary and one secondary school, a nursing home, a roadside services, multiple religious grounds, sport facilities, cemeteries, a golf course, playing fields and play areas, three Public parks/Gardens and numerous allotments. There is no direct land take from these areas. There is likely to be temporary disturbance to users of these sites and the local community during construction. This option may contribute to the local economy through employment opportunities during the construction phase. During operation, it is unlikely to contribute to the local economy. IMD deciles along the pipeline route vary from 1 and 4 to 10.	Route alignment to be amended or trenchless techniques to be used to avoid direct impacts on property and community assets. Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction and land will be reinstated. However, temporary effects are likely to still occur during construction.	+	-	0	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	0	0	There are no shellfish waters or bathing waters within 500m of the option location. The movement of water from one point to another increases the risks of disease transmission. All potable water transfers have been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	N/A	0	0	0	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	0	0	0	The proposed pipeline route will cross two National Cycle Network routes. There may be temporary disturbance on users of these, as well as other walking and cycling routes, and other public rights of way during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. There could be potential to enhance the cycleways as part of the works (e.g. during re-instatement).	0	0	+	0

	Maintain and enhance tourism and recreation	0	-	0	0	The pipeline route is within 500m of a golf course, playing fields and three public parks/gardens, and crosses open spaces, sport facilities, watercourses and habitat areas/woodland that could be used for recreation. Therefore there may be some temporary effects on recreation, angling and other water based activities during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0
Material Assets	Minimise resource use and waste production	0	-	0	0	New infrastructure required for option which will use materials and generate waste and excavated material.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	0
	Avoid negative effects on built assets and infrastructure	0	--	0	0	The option crosses railway lines, major roads and National Cycle Network routes. Likely to be temporary impacts during construction due to disruption for users. It is assumed that trenchless techniques will be used for pipelines which cross railway lines and major roads. During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-TRA-011
Option Name	Saxmundham to Eye transfer
Water company	Essex & Suffolk Water
Option Description	Transfer from Saxmundham WT to Eye Airfield Transfer is approximately 30.2 km long, with 9.5 Ml/d max capacity.
WRZ	Essex & Suffolk Water

Option rejected. Further information can be found in Section 2.2.6 of the Supply Option Development Technical Report.

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	--	0	0	Hoxne Brick Pit SSSI (69% favourable, 31% unfavourable - declining) is potentially directly impacted by the option. The option is entirely located within SSSI Impact Risk Zones. There are no MCZ/MPAs within 500m of the option. The HRA ToLS identified 12 Natura 2000 sites that could be affected Sandlings SPA (UK9020286) (~5.5km), Alde-Ore & Butley Estuaries SAC (UK0030076) (~6km), Alde-Ore Estuary Ramsar (UK11002) (~6km), Alde-Ore Estuary SPA (UK9009112) (~6km), Minsmere-Walberswick Ramsar (UK11044) (~8km), Minsmere to Walberswick Heaths & Marshes SAC (UK0012809) (~8km), Minsmere-Walberswick SPA (UK9009101) (~8km), Dew's Ponds SAC (UK0030133) (~9km), Redgrave & South Lopham Fens Ramsar (UK11056) (~9.5km), Waveney & Little Ouse Valley Fens SAC (UK0012882) (~9.5km), Outer Thames Estuary SPA (UK9020309) (~9.9km), Southern North Sea SAC (UK0030395) (~9.9km). LSE conlcuded for Alde-Ore Estuary Ramsar, SPA and Alde-Ore & Butley Estuaries SAC, Outer Thames Estuary SPA and Southern North Sea SAC during the constructional phase due to crossing the waterbodies resulting in possible water contamination. The effects for these are toxic and non-toxic contamination and biological disturbances. No LSE for the other sites.	Best practice methods to be implemented to minimise disturbance effects to the SSSI. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened although this wouldn't negate the need for a potential appropriate assessment.	0	-	0	0
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	-	0	0	The pipeline passes adjacent to and through small parcels of Ancient Woodland and BAP Priority Habitat (Coastal and floodplain grazing marsh and Deciduous woodland). Potential permanent loss of Ancient Woodland and other BAP Priority Habitat. There are also likely to be indirect impacts on Priority Habitats such as disturbance effects during the construction phase and potential effects on protected species. There are no Groundwater Dependent Terrestrial Ecosystems (GWDTE) or chalk rivers within 2km of the option. The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. The percentage change is -8.23%. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost.	Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid woodland habitat, in particular Ancient Woodland and BAP Priority Habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened.	0	-	0	0
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	Very low risk of transfer of INNS as the treated source water is likely to be entirely free of INNS. Construction phase risk of INNS is also considered to be very low.	During construction best practice will be implemented to prevent the spread of INNS.	0	0	0	0
	To meet WFD objectives relating to biodiversity.	0	-	0	0	The WFD Phase 1 assessment results show there would be a low risks for ecology during construction due to installation and repairs to tunnels, conduits and other below ground structures, additionally low impacts are anticipated during operation due to the draining of pipelines into local watercourses for maintenance.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0

Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	--	0	0	Hoxne Brick Pit SSSI (69% favourable, 31% unfavourable - declining) is within 500m of the option. The option crosses mostly grade 2 and 3 agricultural land and small section of grade 4 with disturbance to these soils during construction. During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any loss of land quality from the transfer pipeline. The location of the pumping station is currently unknown. However, it is likely that this land, if agricultural, will not be reinstated as it is a permanent structure, therefore this land would be permanently lost. The option is within 500m of three historic landfill sites with potential to disturb contaminated material during construction.	No residual effects likely if Hoxne Brick Pitt can be avoided through the design. Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land permanently taken or temporarily disturbed. Ground will be reinstated therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. There will be permanent loss as a result of the pumping station although this is a relatively small area so neutral effects identified. Best practice techniques to prevent disturbance of contaminated material during construction.	0	-	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	-	0	0	The majority of the option is within Flood Zone 1, however, the option does pass through Flood Zones 2 and 3 and flood defences, and may have an impact on construction. Impacts during operation are unlikely given the pipeline is buried. The pipeline is unlikely to increase the risk of flooding.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	0	The transfer pipeline crosses watercourses therefore potential for impacts on water quality during the construction phase. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option is located within a number of groundwater SPZs with potential for impacts on water quality during the construction phase.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	0	The WFD Phase 1 assessment determined that the option would have a low level of effect on eight waterbodies during the construction and operational phases.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	The option will transfer water from an area of surplus to one of deficit and does not require further abstraction therefore supports resilience of water supplies during potential future drought scenarios.	N/A	0	0	+	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA nor are there any within 2km. Construction activities and traffic likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	Effects during construction of the option due to resource use and emissions, and effects during the operational phase as the option requires a pumping station.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	0	0	Water levels not predicted to be significantly affected therefore unlikely to affect resilience of the local environment to climate change.	N/A	0	0	0	0

Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	--	0	0	Option overlaps two NCA(s) (with % proportion of NCA affected): South Norfolk and High Suffolk Claylands (0.03%); Suffolk Coast and Heaths (0.1%). Negative effects during construction are likely as excavation will be required for the transfer pipeline. Construction will also result in permanent loss of woodland, including Ancient Woodland, with impacts on landscape character. There will be minimal new above-ground infrastructure. The pumping station is a relatively small-scale structure and is therefore unlikely to change the landscape character of the area or affect visual amenity during operation.	Re-routing of the pipeline to minimise damage and disruption to woodland, including Ancient Woodland, or utilise directional drilling or other trenchless techniques to reduce construction effects. Best practice measures to be implemented to minimise effects during construction including although temporary effects during construction may remain. Land reinstated upon completion so with mitigation, no residual effects are likely to remain during operation.	0	-	0	0
Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	0	--	0	0	The option passes within 500m of one Scheduled Monument (Moated site immediately south east of St Mary's Church), and is within 500m of a number of listed buildings. Construction may affect the setting of these historic assets, however this is likely to be temporary as the pipeline will be buried. There is potential for the excavation of the pipeline to impact buried archaeology if present. There will be minimal new above ground infrastructure, which is unlikely to have effects on the setting of heritage assets during operation.	Best practice measures to be implemented to minimise setting effects for other heritage assets during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	0
Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	--	0	0	The pipeline crosses a playing field, and is within 500m of secondary and primary schools, a fire station, cemeteries, religious grounds/buildings, bowling greens, a museum, playing fields, and play areas. There is likely to be temporary disturbance to users of these sites and the local community during construction. This option may contribute to the local economy through employment opportunities during the construction phase. During operation, it is unlikely to contribute to the local economy. IMD deciles along the pipeline route vary from four, five, six and eight.	Route alignment to be amended or trenchless techniques to be used to avoid direct impacts on property and community assets. Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction and land will be reinstated. However, temporary effects are likely to still occur during construction.	+	-	0	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	0	0	There are no shellfish waters or bathing waters within 500m of the option location. The movement of water from one point to another increases the risks of disease transmission. All potable water transfers have been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	N/A	0	0	0	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	--	0	0	The proposed pipeline route will cross three National Cycle Network routes. There may be temporary disturbance on users of these, as well as other walking and cycling routes, and other public rights of way during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. There could be potential to enhance the cycleways as part of the works (e.g. during re-instatement).	0	0	+	0
	Maintain and enhance tourism and recreation	0	-	0	0	The pipeline route is within 500m of a museum, bowling greens, playing fields, and crosses open spaces, watercourses and habitat areas/woodland that could be used for recreation. Therefore there may be some temporary effects on recreation, angling and other water based activities during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0
Material Assets	Minimise resource use and waste production	0	-	0	0	New infrastructure required for option which will use materials and generate waste and excavated material.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	0
	Avoid negative effects on built assets and infrastructure	0	--	0	0	The option crosses railway lines, a major road and National Cycle Network route. Likely to be temporary impacts during construction due to disruption for users. It is assumed that trenchless techniques will be used for pipelines which cross railway lines and major roads. During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-TRA-012
Option Name	Eye to Saxmundham transfer
Water company	Essex & Suffolk Water
Option Description	Transfer from Eye Airfield to Saxmundham WT. Transfer is approximately 30.2 km long, with 8 Ml/d max capacity. Alignment is the same as for ESW-TRA-011, but with opposite water transfer direction.
WRZ	Essex & Suffolk Water

Option rejected. Further information can be found in Section 2.2.6 of the Supply Option Development Technical Report.

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	--	0	0	Hoxne Brick Pit SSSI (69% favourable, 31% unfavourable - declining) is potentially directly impacted by the option. The option is entirely located within SSSI Impact Risk Zones. There are no MCZ/MPAs within 500m of the option. The HRA ToLS identified twelve Natura 2000 sites that could be affected Sandlings SPA (UK9020286) (~5.5km), Alde-Ore & Butley Estuaries SAC (UK0030076) (~6km), Alde-Ore Estuary Ramsar (UK11002) (~6km), Alde-Ore Estuary SPA (UK9009112) (~6km), Minsmere-Walberswick Ramsar (UK11044) (~6km), Minsmere to Walberswick Heaths & Marshes SAC (UK0012809) (~8km), Minsmere-Walberswick SPA (UK9009101) (~8km), Dew's Ponds SAC (UK0030113) (~9km), Redgrave & South Lopham Fens Ramsar (UK11056) (9.5km), Waveney & Little Ouse Valley Fens SAC (UK0012882) (~9.5km), Outer Thames Estuary SPA (UK9020309) (~9.9km), Southern North Sea SAC (UK0030395) (~9.9km). LSE conlcuded for Alde-Ore Estuary Ramsar, SPA and Alde-Ore & Butley Estuaries SAC, Outer Thames Estuary SPA and Southern North Sea SAC during the constructional phase due to crossing the waterbodies resulting in possible water contamination. The effects for these are toxic and non-toxic contamination and biological disturbances. No LSE for the other sites.	Best practice methods to be implemented to minimise disturbance effects to the SSSI. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened, although this would not negate the need for an appropriate assessment if one is required.	0	-	0	0
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	-	0	0	The pipeline passes adjacent to and through small parcels of Ancient Woodland and BAP Priority Habitat (Coastal and floodplain grazing marsh and Deciduous woodland). Potential permanent loss of Ancient Woodland and other BAP Priority Habitat. There are also likely to be indirect impacts on Priority Habitats such as disturbance effects during the construction phase and potential effects on protected species. There are no Groundwater Dependent Terrestrial Ecosystems (GWDTE) or chalk rivers within 2km of the option. The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. The percentage change is -7.95%. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost.	Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid woodland habitat, in particular Ancient Woodland and BAP Priority Habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened.	0	-	0	0

	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	Very low risk of transfer of INNS as the treated source water is likely to be entirely free of INNS. Construction phase risk of INNS is also considered to be very low.	During construction best practice principles will be implemented to prevent the spread of INNS.	0	0	0	0
	To meet WFD objectives relating to biodiversity.	0	-	0	0	The WFD Phase 1 assessment results show there would be a low risks for ecology during construction due to installation and repairs to tunnels, conduits and other below ground structures, additionally low impacts are anticipated during operation due to the draining of pipelines into local watercourses for maintenance.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	--	0	0	Hoxne Brick Pit SSSI (69% favourable, 31% unfavourable - declining) is within 500m of the option. The option crosses mostly grade 2 and 3 agricultural land and small section of grade 4 with disturbance to these soils anticipated during construction. During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any loss of land quality from the transfer pipeline. The location of the pumping station is currently unknown. However, it is likely that this land, if agricultural, will not be reinstated as it is a permanent structure, therefore this land would be permanently lost. The option is within 500m of three historic landfill sites with potential to disturb contaminated material during construction.	There are no residual effects to the geological SSSI likely if it is avoided. Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land permanently taken or temporarily disturbed. Ground will be reinstated therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. There will be permanent loss as a result of the pumping station although this is a relatively small area so neutral effects have been identified. Best practice techniques to prevent disturbance of contaminated material during construction.	0	0	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	-	0	-	The majority of the option is within Flood Zone 1, however, the option does pass through Flood Zones 2 and 3 and in close proximity to flood defences, and may have an impact on construction. Impacts on operation unlikely given the pipeline is buried. The pipeline is unlikely to increase the risk of flooding. The pumping station is likely to increase the hard standing over the long term and therefore may increase the risk of flooding. However this is anticipated to be minimal and above ground infrastructure can be design to be resilient.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	0	The transfer pipeline crosses watercourses therefore potential for impacts on water quality during the construction phase. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option is located within a number of groundwater SPZs with potential for impacts on water quality during the construction phase.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	-	The WFD Phase 1 assessment determined that the option would have a low level of effect on all eight waterbodies during the construction and operation phases.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0

	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	The option will transfer water from an area of surplus to one of deficit and does not require further abstraction therefore supports resilience of water supplies during potential future drought scenarios.	N/A	0	0	+	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA nor are there any within 2km. Construction likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	Effects during construction of the option due to resource use and emissions, and effects during the operational phase as the option requires a pumping station.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	0	0	Water levels not predicted to be significantly affected therefore unlikely to affect resilience of the local environment to climate change.	N/A	0	0	0	0
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	--	0	0	Option overlaps two NCA(s) (with % proportion of NCA affected): South Norfolk and High Suffolk Claylands (0.03%); Suffolk Coast and Heaths (0.01%). Negative effects during construction likely as excavation will be required for the transfer pipeline. Construction will also result in permanent loss of woodland, including Ancient Woodland, with impacts on landscape character. There will be minimal new above ground infrastructure. The pumping station is a relatively small-scale structure and is therefore unlikely to change the landscape character of the area or affect visual amenity during operation.	Re-routing of the pipeline to minimise damage and disruption to woodland, including Ancient Woodland, or utilise directional drilling or other trenchless techniques to reduce construction effects. Best practice measures to be implemented to minimise effects during construction although temporary effects during construction may remain. Land reinstated upon completion so with mitigation, such as tree planting, no residual effects are likely to remain during operation.	0	-	0	0
Historic Environment	To conserve/protect and enhance historic environment and heritage assets, and their setting, including archaeologically important sites.	0	--	0	0	The option passes within 500m of one Scheduled Monument (Moated site immediately south east of St Mary's Church), and is within proximity of a number of listed buildings. Construction may affect the setting of these historic assets, however this is likely to be temporary as the pipeline will be buried. There is potential for the excavation of the pipeline to impact buried archaeology if present. There will be minimal new above ground infrastructure, which is unlikely to have effects on the setting of heritage assets during operation.	Best practice measures to be implemented to minimise setting effects for other heritage assets during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	0
	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	--	0	0	The pipeline crosses a playing field, and is within 500m of secondary and primary schools, a fire station, cemeteries, religious grounds/buildings, bowling greens, a museum, playing fields, and play areas. There is likely to be temporary disturbance to users of these sites and the local community during construction. This option may contribute to the local economy through employment opportunities during the construction phase. During operation, it is unlikely to contribute to the local economy. IMD deciles along the pipeline route vary from four, five, six and eight.	Route alignment to be amended or trenchless techniques to be used to avoid direct impacts on property and community assets. Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction and land will be reinstated. However, temporary effects are likely to still occur during construction.	+	-	0	0

Population and Human Health	To secure resilient water supplies for the health and wellbeing of customers.	0	0	0	0	There are no shellfish waters or bathing waters within 500m of the option location. The movement of water from one point to another increases the risks of disease transmission. All potable water transfers have been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	N/A	0	0	0	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	--	0	0	The proposed pipeline route will cross three National Cycle Network routes. There may be temporary disturbance on users of these, as well as other walking and cycling routes, and other public rights of way during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. There could be potential to enhance the cycleways as part of the works (e.g. during re-instatement).	0	-	+	0
	Maintain and enhance tourism and recreation	0	-	0	0	The pipeline route is within 500m of a museum, bowling greens, playing fields, and crosses open spaces, watercourses and habitat areas/woodland that could be used for recreation. Therefore there may be some temporary effects on recreation, angling and other water based activities during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0
Material Assets	Minimise resource use and waste production	0	-	0	0	New infrastructure required for option which will use materials and generate waste and excavated material.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	0
	Avoid negative effects on built assets and infrastructure	0	--	0	0	The option crosses railway lines, a major road and National Cycle Network route. Likely to be temporary impacts during construction due to disruption for users. It is assumed that trenchless techniques will be used for pipelines which cross railway lines and major roads. During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-TRA-013
Option Name	Saxmundham to Barsham Transfer
Water company	Essex & Suffolk Water
Option Description	26.5 Ml/d transfer from Saxmundham WT to Barsham WTW. Transfer length approximately 28.3 km long.
WRZ	Essex & Suffolk Water

Option rejected. Further information can be found in Section 2.2.6 of the Supply Option Development Technical Report.

SEA Topic	SEA Objective	Construction Effects +	Construction Effects -	Operational Effects +	Operational Effects -	Comment	Mitigation	Residual +	Residual -	Residual Operational +	Residual Operational -
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	---	0	0	Dew's Ponds SSSI (100% favourable) and SAC is within 500m of the option. No direct effects but there may be disturbance effects during the construction phase. Other designated sites within 2km which may be indirectly affected include ancient woodlands and areas of priority habitat (coastal and floodplain grazing marsh and deciduous woodland). The option is entirely located within SSSI Impact Risk Zones. There are no MCZ/MPAs within 500m of the option. The HRA ToLS identified 15 Natura 2000 sites that could be affected Dew's Pond SAC (UK0030133) (~0.1km), The Broads SAC (UK0013577) (~2.1km), Broadland Ramsar (UK11010) and SPA (UK9009243) (~2.1km), Minsmere-Walberswick SPA (UK9009101) (~5.5km), Minsmere to Walberswick Ramsar (UK11044) (~5.5km), Minsmere to Walberswick Heaths & Marshes SAC (UK0012809) (~5.5km), Alde-Ore Estuary Ramsar (UK11002) (~6km), Alde-Ore SPA (UK9009112) (~6km), Alde-Ore & Butley Estuaries SAC (UK0030076) (~6km), Sandlings SPA (UK902086) (~6km), Benacre to Easton Bavents SPA (UK9009291) (~9km), Benacre to Easton Bavents Lagoons SAC (UK0013104) (~9km), Outer Thames Estuary SPA (UK9020309) (~9km), and Southern North Sea SAC (UK0030395) (9km). Likely significant effects were identified for Dew's Ponds SAC due to its location within 100 metres of the works and its designation for great crested newt populations, due to their mobile nature suitable habitat outside of the SAC is considered intrinsically linked. Construction impacts are likely to include loss and damage to habitat, and disturbance due to light and noise, contamination and biological disturbances. LSE also anticipated for Broadland SPA as a result of non-physical and biological distrubances during the construction phase. No operational effects are anticipated at either of these sites. No LSE concluded for the remaining 13 sites.	Best practice methods to be implemented to minimise disturbance effects. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened although this wouldn´t negate the need for a potential appropriate assessment.	0	--	0	0
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	-	0	0	The pipeline passes adjacent to and through small parcels of BAP Priority Habitat (Floodplain and coastal grazing marsh, and deciduous woodland). Potential permanent loss of deciduous woodland, and floodplain and coastal grazing marsh BAP Priority Habitat. No direct effects on other Priority Habitats but there may be disturbance effects during the construction phase and potential effects on protected species. There are no Groundwater Dependent Terrestrial Ecosystems (GWDTE) or chalk rivers within 2km of the option. The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. The percentage change is -9.95%. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost.	Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid woodland habitat, in particular Ancient Woodland and BAP Priority Habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required.	0	-	0	0

	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	No risk of transfer of INNS as the physical transfer of treated water (between two locations assumed currently unconnected) the treated source water is expected to be entirely free of INNS. Construction phase risk of INNS is also considered to be very low.	During construction best practice principles will be implemented to prevent the spread of INNS.	0	0	0	0
	To meet WFD objectives relating to biodiversity.	0	-	0	0	The WFD Phase 1 assessment results show there would be a low risk for ecology during construction due to installation and repairs to tunnels, conduits and other below ground structures, additionally low impacts are anticipated during operation due to the draining of pipelines into local watercourses for maintenance.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	--	0	0	The option crosses grade 2, 3 and 4 agricultural land with disturbance to these soils anticipated during construction. During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any loss of land quality from the transfer pipeline. The location of the pumping station is currently unknown. However, it is likely that this land, if agricultural, will not be reinstated as it is a permanent structure, therefore this land would be permanently lost. The option is within 500m of two historic landfill sites, Grove Farm and Site at Ringsfield with potential to disturb contaminated material during construction.	Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land permanently taken or temporarily disturbed. Ground will be reinstated therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. There will be permanent loss as a result of the pumping station although this is a relatively small area so neutral effects identified. Best practice techniques to prevent disturbance of contaminated material during construction.	0	-	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	--	0	0	The majority of the option is within Flood Zone 1 however it does intersect with areas of Flood Zones 2 and 3, passes in close proximity to flood defences. This may have an impact on construction. Impacts on operation unlikely given the pipeline is buried. The pipeline is unlikely to increase the risk of flooding. The pumping station will increase hardstanding in the area which has the potential to increase flood risk, however this risk is anticipated to be minimal.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	0	The transfer pipeline crosses watercourses therefore potential for impacts on water quality during the construction phase. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option is located within a two SPZs (1 and 2) and intersects with two WFD Groundwater Bodies (Broadland Rivers Chalk and Crag and Waveney and East Suffolk Chalk and Crag) with potential for impacts on water quality during the construction phase.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	0	The WFD Phase 1 assessment determined that the option would have a low level of impact to all waterbodies during the construction phase and operational phase, due to the construction and repair of tunnels and conduits, construction of below ground structures with dewatering, and the draining of pipelines for faineance.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	The option will transfer water from an area of surplus to one of deficit and does not require further abstraction therefore supports resilience of water supplies during potential future drought scenarios.	N/A	0	0	+	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA nor are there any within 2km. Construction likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0

Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	Effects are anticipated during construction of the option due to resource use and emissions. Effects also anticipated during the operational phase as the option requires a pumping station.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	0	0	Water levels not predicted to be significantly affected therefore unlikely to affect resilience of the local environment to climate change.	N/A	0	0	0	0
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	--	0	0	Option overlaps 2 NCAs, South Norfolk and High Suffolk Claylands (with 0.03 affected) and The Broads (with 0.01% affected). Negative effects during construction likely as excavation will be required for the transfer pipeline. Construction will also result in permanent loss of woodland, with impacts on landscape character. The option is located within 500m of The Broads National Park. There will be minimal new above ground infrastructure. The pumping station is a relatively small-scale structure and is therefore unlikely to change the landscape character of the area or affect visual amenity during operation.	Re-routing of the pipeline to minimise damage and disruption to woodland, or utilise directional drilling or other trenchless techniques to reduce construction effects. Best practice measures to be implemented to minimise effects during construction including although temporary effects during construction may remain. Land reinstated upon completion so with mitigation, no residual effects are likely to remain during operation.	0	-	0	0
Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting	0	--	0	0	The option is within 500 metres of Halesworth Conservation Area, and a number of listed buildings. Construction may affect the setting of these historic assets, however this is likely to be temporary as the pipeline will be buried. There is potential for the excavation of the pipeline to impact buried archaeology if present. There will be minimal new above ground infrastructure, which is unlikely to have effects on the setting of heritage assets during operation.	Best practice measures to be implemented to minimise effects on the settings of heritage assets during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	0
Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	--	0	0	The pipeline crosses an allotment, cemetery, playing field, and three national cycle routes, and is within 500m of playing fields, a national park, three places of worship, tennis courts and another allotment. There is no direct land take from these areas. There is likely to be temporary disturbance to users of these sites and the local community during construction. This option may contribute to the local economy through employment opportunities during the construction phase. During operation, it is unlikely to contribute to the local economy. IMD deciles along the pipeline route vary from 1four to seven	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction and land will be reinstated. However, temporary effects are likely to still occur during construction.	+	-	0	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	0	0	There are no shellfish waters or bathing waters within 500m of the option location. The movement of water from one point to another increases the risks of disease transmission. All potable water transfers have been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	N/A	0	0	0	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	--	0	0	The proposed pipeline route will cross three National Cycle Network routes. There may be temporary disturbance on users of these, as well as other walking and cycling routes, and other public rights of way during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. There could be potential to enhance the cycleways as part of the works (e.g. during re-instatement).	0	0	0	0

	Maintain and enhance tourism and recreation	0	--	0	0	The pipeline route is within 500m of playing fields, a national park, three places of worship, tennis courts, an allotment, and crosses open spaces, watercourses and habitat areas/woodland that could be used for recreation. Therefore there may be some temporary effects on recreation, angling and other water based activities during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0
Material Assets	Minimise resource use and waste production	0	-	0	0	New infrastructure is required for this option which will use materials and generate waste and excavated material.	Seek opportunities to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	0
	Avoid negative effects on built assets and infrastructure	0	--	0	0	The option crosses railway lines, a major road and National Cycle Network route. Likely to be temporary impacts during construction due to disruption for users. It is assumed that trenchless techniques will be used for pipelines which cross railway lines and major roads. During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-TRA-014
Option Name	Eye to Barsham transfer
Water company	Essex & Suffolk Water
Option Description	Transfer from Eye Airfield to Barsham WTW. Transfer is approximately 33 km long, with 26.5 Ml/d max capacity.
WRZ	Essex & Suffolk Water

Option rejected. Further information can be found in Section 2.2.6 of the Supply Option Development Technical Report.

SEA Topic	SEA Objective	Construction +	Construction -	Ope +	Ope -	Comment	Mitigation	Residual +	Residual -	Residual Operational +	Residual Operational -
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	--	0	0	Abbey Wood, Flixton SSSI (10% favourable, 39% unfavourable - recovering, Unfavourable- No change 51%) is within 500m of the option. No direct effects but there may be disturbance effects during the construction phase. The option is entirely located within SSSI Impact Risk Zones. There are no MCZ/MPAs within 500m of the option. The HRA ToLS identified five Natura 2000 sites that could be affected Broadland SPA (UK9009253) (~2.1km), Broadland Ramsar (UK11010) (~2.1km), The Broads SAC (UK0013577) (~2.1km), Waveney & Little Ouse Valley Fens SAC (UK0012882) (~9.5km), Redgrave & South Lopham Fens Ramsar (UK11056) (~9.5km). Likely significant effects are anticipated for Broadland SPA as the site is hydrologically connected to the works footprint by a main river. There is potential for downstream effects to water quality and non-physical and biological disturbances during construction. There are no operational effects anticipated. Similarly, Broadland Ramsar, The Broads SAC, Waveney & Little Ouse Valley Fens SAC and Redgrave & South Lopham Fens Ramsar sites may have toxic and non-toxic contamination and biological disturbances.	Best practice methods to be implemented to minimise disturbance effects. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened although this would not negate the need for further appropriate assessment.	0	-	0	0
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	---	0	0	The pipeline passes adjacent to and through small parcels of Ancient Woodland and BAP Priority Habitat (coastal and floodplain grazing, deciduous woodland and good quality semi-improved grassland). Potential permanent loss of Ancient Woodland and other BAP Priority Habitat. There may also be disturbance effects during the construction phase and potential effects on protected species. There are no Groundwater Dependent Terrestrial Ecosystems (GWDTE) or chalk rivers within 2km of the option. The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. The percentage change is -22.09%. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost.	Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid woodland habitat, in particular Ancient Woodland and BAP Priority Habitats. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened.	0	--	0	0

	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	Very low risk of transfer of INNS as transfer is of treated water. The transfer is within same WFD management catchment and crosses four rivers including major rivers River Dove and River Waveney. There are no additional connections to other waterbodies. There are several SSSI sites within 1km of the option boundary. However, as the source water is treated this poses no additional INNS risk. Construction phase risk of INNS is also considered to be very low.	During construction best practice principles will be implemented to prevent the spread of INNS.	0	0	0	0
	To meet WFD objectives relating to biodiversity.	0	-	0	0	The WFD Phase 1 assessment results show there would be a low risk to ecology during construction due to installation and repairs to tunnels, conduits and other below ground structures, additionally minimal effects are anticipated during operation due to the draining of pipelines into local watercourses for maintenance.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	--	0	0	The option crosses grade 2, 3 and 4 agricultural land with disturbance to these soils anticipated during construction. During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any permanent loss of land quality from the transfer pipeline. The location of the pumping station is currently unknown. However, it is likely that this land, if agricultural, will not be reinstated as it is a permanent structure, therefore this land would be permanently lost. The option is within 500m of five historic landfill sites with potential to disturb contaminated material during construction.	Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land permanently taken or temporarily disturbed. Ground will be reinstated therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. There will be permanent loss as a result of the pumping station although this is a relatively small area so neutral effects identified. Best practice techniques to prevent disturbance of contaminated material during construction.	0	-	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	-	0	-	The majority of the option is within Flood Zone 1 however, the option does pass through Flood Zones 2 and 3 and flood defences, and may have an impact on construction. Impacts on operation unlikely given the pipeline is buried. The pipeline is unlikely to increase the risk of flooding. The pumping station will likely increase surface level hardstanding which could increase flood risk however this is anticipated to be minimal.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	0	The transfer pipeline crosses watercourses therefore there is potential for impacts on water quality during the construction phase. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option is located within a number of groundwater SPZs (1 and 2) with potential for impacts on water quality during the construction phase.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0

	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	0	The WFD Phase 1 assessment determined that the option would have a low level of effect on ten waterbodies in the vicinity, during the construction and operation phases.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	The option will transfer water from an area of surplus to one of deficit and does not require further abstraction therefore supports resilience of water supplies during potential future drought scenarios.	N/A	0	0	+	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA nor are there any within 2km. Construction likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	Effects during construction of the option due to resource use and emissions, and effects during the operational phase as the option requires a pumping station.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	0	0	Water levels not predicted to be significantly affected therefore unlikely to affect resilience of the local environment to climate change.	N/A	0	0	0	0
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	--	0	0	Option overlaps two NCA(s) (with % proportion of NCA affected): South Norfolk and High Suffolk Claylands (0.03%); The Broads (0.1%). The pipeline is also within 500m of The Broads National Park. Negative effects during construction likely as excavation will be required for the transfer pipeline. Construction will also result in permanent loss of woodland, including Ancient Woodland, with impacts on landscape character. There will be minimal new above ground infrastructure. The pumping station is a relatively small-scale structure and is therefore unlikely to change the landscape character of the area or affect visual amenity during operation.	Re-routing of the pipeline to minimise damage and disruption to woodland, including Ancient Woodland, or utilise directional drilling or other trenchless techniques to reduce construction effects. Best practice measures to be implemented to minimise effects during construction including although temporary effects during construction may remain. Land reinstated upon completion so with mitigation, no residual effects are likely to remain during operation.	0	-	0	0

Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	0	---	0	0	The option passes through one Conservation Area (Hoxne), and is within 500m of two others (Thorpe Abbots and Brockdish). The option is also within proximity of a number of listed buildings and four Scheduled Monuments. Construction may affect the setting of these historic assets, however this is likely to be temporary as the pipeline will be buried. There is potential for the excavation of the pipeline to impact buried archaeology if present. There will be minimal new above ground infrastructure, which is unlikely to have effects on the setting of heritage assets during operation.	Preferred mitigation for a conservation area is to re-route the pipeline; however, if this is not possible then careful construction and reinstatement to its original condition with no detrimental effect on the character, appearance, or design of the conservation area should be implemented. Best practice measures to be implemented to minimise setting effects for other heritage assets during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	--	0	0
Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	--	0	0	The pipeline is within 500m of a national park, public parks/garden, post office, schools, religious grounds/buildings, bowling greens, registered common land, two country parks, and allotments. There is no direct land take from these areas. There is likely to be temporary disturbance to users of these sites and the local community during construction. This option may contribute to the local economy through employment opportunities during the construction phase. During operation, it is unlikely to contribute to the local economy. IMD deciles along the pipeline route vary from 4,5,6 and 9.	Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur during construction.	+	-	0	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	0	0	There are no shellfish waters or bathing waters within 500m of the option location. The movement of water from one point to another increases the risks of disease transmission. All potable water transfers have been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	N/A	0	0	0	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	0	0	0	The proposed pipeline route will cross three National Cycle Network routes (multiple times). There may be temporary disturbance on users of these, as well as other walking and cycling routes, and other public rights of way during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. There could be potential to enhance the cycleways as part of the works (e.g. during re-instatement).	0	0	+	0
	Maintain and enhance tourism and recreation	0	-	0	0	The pipeline route is within 500m of a national park, public parks/garden, bowling greens, registered common land, two country parks, and crosses open spaces, watercourses and habitat areas/woodland that could be used for recreation. Therefore there may be some temporary effects on recreation, angling and other water based activities during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0
	Minimise resource use and waste production	0	-	0	0	New infrastructure required for option which will use materials and generate waste and excavated material.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	0

Material Assets	Avoid negative effects on built assets and infrastructure	0	--	0	0	The option crosses a major road and National Cycle Network route. Likely to be temporary impacts during construction due to disruption for users. It is assumed that trenchless techniques will be used for pipelines which cross railway lines and major roads. During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-TRA-015
Option Name	Barsham to Eye transfer
Water company	Essex & Suffolk Water
Option Description	Transfer from Barsham WTW to Eye Airfield. Transfer is approximately 33 km long, with 26.5 Ml/d max capacity.
WRZ	Essex & Suffolk Water

Option rejected. Further information can be found in Section 2.2.6 of the Supply Option Development Technical Report.

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual		Residual Operational	
		+	-	+	-			+	-	+	-
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	--	0	0	Abbey Wood, Flixton SSSI (10% favourable, 39% unfavourable - recovering, Unfavourable- No change 51%) is within 500m of the option. No direct effects but there may be disturbance effects during the construction phase. The option is entirely located within SSSI Impact Risk Zones. There are no MCZ/MPAs within 500m of the option. The HRA ToLS identified five Natura 2000 sites that could be affected Broadland SPA (UK9009253) (~2.1km), Broadland Ramsar (UK11010) (~2.1km), The Broads SAC (UK0013577) (~2.1km), Waveney & Little Ouse Valley Fens SAC (UK0012882) (~9.5km), Redgrave & South Lopham Fens Ramsar (UK11056) (~9.5km). Likely significant effects anticipated for one site; The Broadland SPA site, where the pipeline crosses waterbodies linked to the site there is potential to affect downstream water quality, could result in non-physical disturbance, such as light or noise pollution, and biological disturbances during construction phases. No operational effects are anticipated. No LSE for the other four sites.	Best practice methods to be implemented to minimise disturbance effects. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened although this wouldn't negate the need for potential appropriate assessment.	0	-	0	0
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	--	0	0	The pipeline passes adjacent to and through small parcels of Ancient Woodland and BAP Priority Habitat (coastal and floodplain grazing, deciduous woodland and good quality semi-improved grassland). Potential permanent loss of Ancient Woodland and other BAP Priority Habitat. There may also be disturbance effects during the construction phase and potential effects on protected species. There are no Groundwater Dependent Terrestrial Ecosystems (GWDTE) or chalk rivers within 2km of the option. The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. The percentage change is -18.73%. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost.	Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid woodland habitat, in particular Ancient Woodland and BAP Priority Habitats. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened.	0	-	0	0
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	Very low risk of transfer of INNS as physical transfer of treated water (between two locations assumed currently unconnected) with no INNS risk as treated water will be free from INNS). Construction phase risk of INNS is also considered to be very low.	During construction, best practice principles will be implemented to prevent the spread of INNS.	0	0	0	0
	To meet WFD objectives relating to biodiversity.	0	-	0	0	The WFD Phase 1 assessment results show there would be a low risks for ecology during construction due to installation and repairs to tunnels, conduits and other below ground structures, additionally low impacts are anticipated during operation due to the draining of pipelines into local watercourses for maintenance.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0

Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	--	0	0	The option crosses grade 2, 3 and 4 agricultural land with potential disturbance to these soils anticipated during construction. During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any loss of land quality from the transfer pipeline. The location of the pumping station is currently unknown. However, it is likely that this land, if agricultural, will not be reinstated as it is a permanent structure, therefore this land would be permanently lost. The option is within 500m of five historic landfill sites with potential to disturb contaminated material during construction.	Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land permanently taken or temporarily disturbed. Ground will be reinstated therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. There will be permanent loss as a result of the pumping station although this is a relatively small area so neutral effects identified. Best practice techniques to eb employed to prevent disturbance of contaminated material during construction.	0	0	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	-	0	-	The majority of the option is within Flood Zone 1 however, the option does pass through Flood Zones 2 and 3 and flood defences, and may have an impact on construction. Impacts on operation unlikely given the pipeline is buried. The pipeline is unlikely to increase the risk of flooding. The pumping station may increase the surface level hardstanding however this is likely to lead to a negligible increase in flood risk during operation.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	0	The transfer pipeline crosses watercourses therefore there is potential for impacts on water quality during the construction phase. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option is located within a number of groundwater SPZs (1 and 2) with potential for impacts on water quality during the construction phase.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	0	The WFD Phase 1 assessment determined that the option would have a low level of effect on ten waterbodies in the vicinity during the construction and operation phase.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	The option will transfer water from an area of surplus to one of deficit and does not require further abstraction therefore supports resilience of water supplies during potential future drought scenarios.	N/A	0	0	+	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA nor are there any within 2km. Construction likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	Effects during construction of the option due to resource use and emissions, and effects during the operational phase as the option requires a pumping station.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	0	0	Water levels not predicted to be significantly affected therefore unlikely to affect resilience of the local environment to climate change.	N/A	0	0	0	0

Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	--	0	0	Option overlaps two NCA(s) (with % proportion of NCA affected): South Norfolk and High Suffolk Claylands (0.03%); The Broads (0.1%). The pipeline is also within 500m of The Broads National Park. Negative effects during construction likely as excavation will be required for the transfer pipeline. Construction will also result in permanent loss of woodland, including Ancient Woodland, with impacts on landscape character. There will be minimal new above ground infrastructure. The pumping station is a relatively small-scale structure and is therefore unlikely to change the landscape character of the area or affect visual amenity during operation.	Re-routing of the pipeline to minimise damage and disruption to woodland, including Ancient Woodland, or utilise directional drilling or other trenchless techniques to reduce construction effects. Best practice measures to be implemented to minimise effects during construction including although temporary effects during construction may remain. Land reinstated upon completion so with mitigation, no residual effects are likely to remain during operation.	0	-	0	0
Historic Environment	To conserve/protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	0	---	0	0	The option passes through one Conservation Area (Hoxne), and is within proximity of two more (Thorpe Abbotts and Brockdish). The option is also within proximity of a number of listed buildings and 4 Scheduled Monuments. Construction may affect the setting of these historic assets, however this is likely to be temporary as the pipeline will be buried. There is potential for the excavation of the pipeline to impact buried archaeology if present. There will be minimal new above ground infrastructure, which is unlikely to have effects on the setting of heritage assets during operation.	Preferred mitigation for a conservation area is to re-route the pipeline; however, if this is not possible then careful construction and reinstatement to its original condition with no detrimental effect on the character, appearance, or design of the conservation area should be implemented. Best practice measures to be implemented to minimise setting effects for other heritage assets during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	0
Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	-	0	0	The pipeline is within 500m of a national park, public parks/garden, post office, schools, religious grounds/buildings, bowling greens, registered common land, two country parks, and allotments. There is no direct land take from these areas. There is likely to be temporary disturbance to users of these sites and the local community during construction. This option may contribute to the local economy through employment opportunities during the construction phase. During operation, it is unlikely to contribute to the local economy. IMD deciles along the pipeline route vary from four, five, six, and nine.	Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur during construction.	+	-	0	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	0	0	There are no shellfish waters or bathing waters within 500m of the option location. The movement of water from one point to another increases the risks of disease transmission. All potable water transfers have been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	N/A	0	0	0	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	-	0	0	The proposed pipeline route will cross three National Cycle Network routes (multiple times). There may be temporary disturbance on users of these, as well as other walking and cycling routes, and other public rights of way during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. However, temporary effects are likely to still occur during construction. There could be potential to enhance the cycleways as part of the works (e.g. during re-instatement)	0	-	+	0
	Maintain and enhance tourism and recreation	0	-	0	0	The pipeline route is within 500m of a national park, public parks/garden, bowling greens, registered common land, two country parks, and crosses open spaces, watercourses and habitat areas/woodland that could be used for recreation. Therefore there may be some temporary effects on recreation, angling and other water based activities during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0

Material Assets	Minimise resource use and waste production	0	-	0	0	New infrastructure required for option which will use materials and generate waste and excavated material.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	0
	Avoid negative effects on built assets and infrastructure	0	--	0	0	The option crosses a major road and National Cycle Network route. Likely to be temporary impacts during construction due to disruption for users. It is assumed that trenchless techniques will be used for pipelines which cross railway lines and major roads. During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-TRA-016
Option Name	Norwich (west) to Eye transfer
Water company	Essex & Suffolk Water
Option Description	Transfer from Norwich (west) to Eye Airfield. Transfer is approximately 49 km long, with 26.5 Ml/d max capacity.
WRZ	Essex & Suffolk Water

Option rejected. Further information can be found in Section 2.2.6 of the Supply Option Development Technical Report.

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual		Residual Operational	
		+	-	+	-			+	-	+	-
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	-	0	0	Gawdyhall Big Wood, Harleston SSSI (17% favourable, 83% unfavourable - recovering), and Shotesham-Woodton Hornbeam Woods SSSI (82% unfavourable - recovering, unfavourable- no change 18%) are within 500m of the option. The option is within 500m of Dunston Common LNR. No direct effects but there may be disturbance effects during the construction phase. There are an additional 5 SSSIs and 6 LNRs within 2km. The option is entirely located within SSSI Impact Risk Zones. There are no MCZ/MPAs within 500m of the option. The HRA ToLS identified seven Natura 2000 sites that could be affected River Wensum SAC (UK0012647) (~4km), Norfolk Valley Fens SAC (UK0012892) (~6.8km), Broadland SPA (UK9009253) (~7.2km), Broadland Ramsar (UK11010) (~7.2km), The Broads SAC (UK0013577) (~7.2km), Waveney & Little Ouse Valley Fens SAC (UK0012882) (~9.5km), Redgrave & South Lopham Fens Ramsar (UK11056) (~9.5km). LSE concluded for Waveney & Little Ouse Valley Fens SAC and Redgrave & South Lopham Fens Ramsar due to toxic and non-toxic xontamination and biological disturbances during the construction phases. No effects due to operational	Best practice methods to be implemented to minimise disturbance effects to SSSIs and LNRs. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened although this wouldn't negate the need for a potential appropriate assessment.	0	-	0	0
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	--	0	0	The pipeline passes adjacent to small parcels of Ancient Woodland and BAP Priority Habitat Coastal and floodplain grazing marsh, deciduous woodland and good quality semi-improved grassland. Potential permanent loss of deciduous and other BAP Priority Habitat. No direct effects on Ancient Woodland but there may be disturbance effects during the construction phase and potential effects on protected species. There are two Groundwater Dependent Terrestrial Ecosystems (GWDTE) (Shotesham Common (SSSI), and Fritton Common (SSSI) within 2km of the option. The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. The percentage change is -15.83%. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost.	Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid woodland habitat, in particular Ancient Woodland and BAP Priority Habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened	0	-	0	0
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	Very low risk of transfer of INNS as physical transfer of treated water (between two locations assumed currently unconnected) where the treated source water is likely to be entirely free of INNS. Construction phase risk of INNS is also considered to be very low.	During construction best practice will be implemented to prevent the spread of INNS.	0	0	0	0

	To meet WFD objectives relating to biodiversity.	0	-	0	0	The WFD Phase 1 assessment results show there would be a low risks for ecology during construction due to installation and repairs to tunnels, conduits and other below ground structures, additionally low impacts are anticipated during operation due to the draining of pipelines into local watercourses for maintenance.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	--	0	0	Caistor St. Edmund Chalk Pit SSSI (100% favourable) is within 500m of the option. The option crosses grade 2, 3 and 4 agricultural land with disturbance to these soils anticipated during construction. During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any loss of land quality from the transfer pipeline. The location of the pumping station is currently unknown. However, it is likely that this land, if agricultural, will not be reinstated as it is a permanent structure, therefore this land would be permanently lost. The option is within 500m of nine historic landfill sites with potential to disturb contaminated material during construction.	No residual effects to the Geological SSSI likely if it can be avoided through design alterations. Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land permanently taken or temporarily disturbed. Ground will be reinstated therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. There will be permanent loss as a result of the pumping station although this is a relatively small area so neutral effects identified. Best practice techniques to prevent disturbance of contaminated material during construction.	0	-	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	-	0	-	The majority of the option is within Flood Zone 1 however, the option does pass through Flood Zones 2 and 3 and in the vicinity of flood defences, and may have an impact on construction. Impacts on operation unlikely given the pipeline is buried. The pipeline is unlikely to increase the risk of flooding. The pumping station may increase the hard standing in the area leading to potential operational increases in flood risk.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	0	The transfer pipeline crosses watercourses therefore there is potential for effects on water quality during the construction phase. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option is located within a number of groundwater SPZs (1 and 2) with potential for impacts on water quality during the construction phase.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	0	The WFD Phase 1 assessment determined that the option would have a low level of effect on all waterbodies in the vicinity during the construction and operation phases.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	The option will transfer water from an area of surplus to one of deficit and does not require further abstraction therefore supports resilience of water supplies during potential future drought scenarios.	N/A	0	0	+	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA nor are there any within 2km. Construction activities are likely to have a temporary effect on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0

Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	Effects during construction of the option due to resource use and emissions, and effects during the operational phase as the option requires a pumping station.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	0	0	Water levels not predicted to be significantly affected therefore unlikely to affect resilience of the local environment to climate change.	N/A	0	0	0	0
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	--	0	0	Option overlaps two NCA(s) (with % proportion of NCA affected): Mid Norfolk (0.03%); South Norfolk and High Suffolk Claylands (0.04%). Negative effects during construction likely as excavation will be required for the transfer pipeline. Construction will also result in permanent loss of woodland, with impacts on landscape character. There will be minimal new above ground infrastructure. The pumping station is a relatively small-scale structure and is therefore unlikely to change the landscape character of the area or affect visual amenity during operation.	Re-routing of the pipeline to minimise damage and disruption to woodland, including Ancient Woodland, or utilise directional drilling or other trenchless techniques to reduce construction effects. Best practice measures to be implemented to minimise effects during construction including although temporary effects during construction may remain. Land reinstated upon completion so with mitigation, no residual effects are likely to remain during operation.	0	-	0	0
Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	0	---	0	0	The option passes through a Grade II* Registered Park and Garden (Intwood Hall) and a Conservation Area (Hoxne), and a Scheduled Monument (Venta Icenoru). The option is also within proximity of a number of listed buildings. The option also passes within 500m of 5 other Conservation Areas and 6 Scheduled Monuments. Construction may affect the setting of these historic assets, however, this is likely to be temporary as the pipeline will be buried. There is potential for the excavation of the pipeline to impact buried archaeology if present. There will be minimal new above ground infrastructure, which is unlikely to have effects on the setting of heritage assets during operation.	Preferred mitigation for the Registered Park and Garden and conservation area and Scheduled Monuments is to re-route the pipeline; however, if this is not possible then careful construction and reinstatement to its original condition with no detrimental effect on the character, appearance, or design of the these areas should be implemented. Best practice measures to be implemented to minimise setting effects for other heritage assets during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	--	0	0
Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	--	0	0	The pipeline crosses access land and is within 500m of Secondary and Primary schools, a service station, a hospital, registered common land, access land, a cemetery, playing fields, a sport facility, allotments, a public park and gardens, a golf course, and bowling greens. There is no direct land take from these areas. There is likely to be temporary disturbance to users of these sites and the local community during construction. This option may contribute to the local economy through employment opportunities during the construction phase. During operation, it is unlikely to contribute to the local economy. IMD deciles along the pipeline route vary from 4,5,6,7,9 and 10.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction and land will be reinstated. However, temporary effects are likely to still occur during construction.	+	-	0	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	0	0	There are no shellfish waters or bathing waters within 500m of the option location. The movement of water from one point to another increases the risks of disease transmission. All potable water transfers have been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	N/A	0	0	0	0

	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	-	0	0	The proposed pipeline route will cross one National Cycle Network routes (multiple times). There may be temporary disturbance on users of these, as well as other walking and cycling routes, and other public rights of way during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. However there may still be temporary residual effects. There could be potential to enhance the cycleways as part of the works (e.g. during re-instatement).	0	-	+	0
	Maintain and enhance tourism and recreation	0	-	0	0	The pipeline route is within 500m of a services, a golf course, playing fields, bowling greens, a sports facility a public park/gardens and crosses open spaces, watercourses and habitat areas/woodland that could be used for recreation. Therefore there may be some temporary effects on recreation, angling and other water based activities during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0
Material Assets	Minimise resource use and waste production	0	-	0	0	New infrastructure required for option which will use materials and generate waste and excavated material.	Seek opportunities to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	0
	Avoid negative effects on built assets and infrastructure	0	--	0	0	The option crosses railway lines, major roads and National Cycle Network route. There is likely to be temporary effects during construction due to disruption for users. It is assumed that trenchless techniques will be used for pipelines which cross railway lines and major roads. During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-TRA-017
Option Name	Saxmundham to Sizewell transfer
Water company	Essex & Suffolk Water
Option Description	Transfer from Saxmundham Tower to AW Sizewell desalination plant. Transfer is approximately 10.1 km long, with 2.5 Ml/d max capacity.
WRZ	Essex & Suffolk Water

Option rejected. Further information can be found in Section 2.2.6 of the Supply Option Development Technical Report.

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	-	0	0	Designated sites within 2km which may be indirectly affected are Sandlings SPA. Within 2km is Suffolk Sandlings an Important Bird Area (RSPB) The option is entirely located within SSSI Impact Risk Zones. There are no MCZ/MPAs within 500m of the option. The HRA ToLS identified ten Natura 2000 sites that could be affected Sandlings SPA (UK9020286) (~1.2km), Outer Thames Estuary SPA (UK9020309) (~2.5km), Southern North Sea SAC (UK0030395) (~2.5km), Minsmere-Walberswick Ramsar (UK11044) (~2.7km), Minsmere to Walberswick Heaths & Marshes SAC (UK0012809) (~2.7km), Minsmere-Walberswick SPA (UK9009101) (~2.7km), Alde-Ore & Butley Estuaries SAC (UK0030079) (~4.9km), Alde-Ore Estuary Ramsar (UK11002) (~4.9km), Alde-Ore Estuary SPA (UK9009112) (~4.9km), Dew's Ponds SAC (UK0030133) (~7.9km). Likely significant effects were identified for Minsmere-Walberswick Ramsar and SPA and Alde-Ore Estuary SPA. Effects are anticipated during the construction phase due to non-physical disturbances such as noise and light pollution, and biological disturbances. No effects have been identified for these sites during the operational phase. No LSE concluded for the remaining seven sites.	Best practice methods to be implemented to minimise disturbance effects. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened although this wouldn't negate the need for potential appropriate assessment.	0	-	0	0
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	--	0	0	The pipeline passes adjacent to small parcels of Ancient Woodland and BAP Priority Habitat (traditional orchard and deciduous woodland). Potential permanent loss of BAP Priority Habitat. No direct effects on Ancient Woodlands but there may be disturbance effects during the construction phase and potential effects on protected species. There are two Groundwater Dependent Terrestrial Ecosystems (GWDTE) within 2km of the option, Sizewell Marshes SSSI and Leiston - Aldeburgh SSSI. The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. The percentage change is -11.17%. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost.	Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid woodland habitat, in particular Ancient Woodland and BAP Priority Habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened.	0	-	0	0
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	Very low risk of transfer of INNS as the physical transfer of treated/potable water (between two locations assumed currently unconnected) where treated water will be free from INNS). Construction phase risk of INNS is also considered to be very low.	During construction best practice principles will be implemented to prevent the spread of INNS.	0	0	0	0

	To meet WFD objectives relating to biodiversity.	0	-	0	0	The WFD Phase 1 assessment results show there would be medium risks for ecology in one waterbody during construction (Waveney and East Suffolk Chalk & Crag (GB40501G400600)) due to the construction of below ground structures within 500 metres of a sensitive waterbody. There would be a low risk for ecology during construction to all other waterbodies in the vicinity due to installation and repairs to tunnels, conduits and other below ground structures, additionally low risk is anticipated during operation to all four waterbodies due to the draining of pipelines into local watercourses for maintenance.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	--	0	0	The option crosses grade 2, 3 and 4 agricultural land with disturbance to these soils during construction. During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any loss of land quality from the transfer pipeline. The location of the pumping station is currently unknown. However, it is likely that this land, if agricultural, will not be reinstated as it is a permanent structure, therefore this land would be permanently lost. The option is within 500m of four historic landfill sites with potential to disturb contaminated material during construction.	Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land permanently taken or temporarily disturbed. Ground will be reinstated therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. There will be permanent loss as a result of the pumping station although this is a relatively small area so neutral effects identified. Pipeline realignment or trenchless techniques to avoid historic landfill. Best practice techniques to prevent disturbance of contaminated material during construction.	0	0	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	-	0	0	The majority of the option is within Flood Zone 1, however the option does pass through Flood zones 2 and 3, flood alert/warning areas and flood defences, and may have an impact on construction. Impacts on operation unlikely given the pipeline is buried. The pipeline is unlikely to increase the risk of flooding.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	0	The transfer pipeline crosses watercourses therefore potential for impacts on water quality during the construction phase. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option is located within a number of groundwater SPZs (mostly zone 3 but western extent falls within Zone 2 and 1) with potential for impacts on water quality during the construction phase.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	--	0	0	The WFD Phase 1 assessment determined that the option would have a moderate level of effect on one waterbody during the construction phase, requiring further assessment with low effects anticipated during construction for the other three assessed. Low level effects are anticipated for all four waterbodies during operation.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	-	0	0
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	The option will transfer water from an area of surplus to one of deficit and does not require further abstraction therefore supports resilience of water supplies during potential future drought scenarios.	N/A	0	0	+	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA nor are there any within 2km. Construction likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0

Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	Effects during construction of the option due to resource use and emissions, and effects during the operational phase as the option requires a pumping station.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	0	0	Water levels not predicted to be significantly affected therefore unlikely to affect resilience of the local environment to climate change.	N/A	0	0	0	0
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	--	0	0	Option overlaps two NCA(s) (with % proportion of NCA affected): South Norfolk and High Suffolk Claylands (0.01%); Suffolk Coast and Heaths (0.01%). Negative effects during construction likely as excavation will be required for the transfer pipeline. Construction will also result in permanent loss of woodland, with impacts on landscape character. There will be minimal new above ground infrastructure. The pumping station is a relatively small-scale structure and is therefore unlikely to change the landscape character of the area or affect visual amenity during operation.	Re-routing of the pipeline to minimise damage and disruption to woodland, or utilise directional drilling or other trenchless techniques to reduce construction effects. Best practice measures to be implemented to minimise effects during construction including although temporary effects during construction may remain. Land reinstated upon completion so with mitigation, no residual effects are likely to remain during operation.	0	-	0	0
Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	0	--	0	0	The option is within proximity of a number of listed buildings and within 500m of one scheduled monuments (Leiston Abbey (second site) and moated site) and one conservation area (Saxmundham). It falls within 2km of a heritage coast (England). Construction may affect the setting of these historic assets, however this is likely to be temporary as the pipeline will be buried. There is potential for the excavation of the pipeline to impact buried archaeology if present. There will be minimal new above ground infrastructure, which is unlikely to have effects on the setting of heritage assets during operation.	Best practice measures to be implemented to minimise setting effects for other heritage assets during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	0
Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	---	0	0	The pipeline route overlays with Saxmundham War Memorial Playing Field with potential to directly impact these areas. The pipeline is within 500m of three primary and two secondary school, religious grounds, a sports facility, cemeteries, a medical care building, playing fields and play areas, tennis court, bowling greens, an allotment, fire station, police station and library. There is no direct land take from these areas. There is likely to be temporary disturbance to users of these sites and the local community during construction. This option may contribute to the local economy through employment opportunities during the construction phase. During operation, it is unlikely to contribute to the local economy. IMD deciles along the pipeline route vary from four-six.	Route alignment to be amended or trenchless techniques to be used to avoid direct impacts on property and community assets. Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction and land will be reinstated. However, temporary effects are likely to still occur during construction.	+	-	0	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	0	0	There are no shellfish waters or bathing waters within 500m of the option location. The movement of water from one point to another increases the risks of disease transmission. All potable water transfers have been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	N/A	0	0	0	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	0	0	0	The proposed pipeline route will cross one National Cycle Network routes. There may be temporary disturbance on users of these, as well as other walking and cycling routes, and other public rights of way during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. There could be potential to enhance the cycleways as part of the works (e.g. during re-instatement).	0	0	+	0

	Maintain and enhance tourism and recreation	0	-	0	0	The pipeline route is within 500m of a tennis courts, bowling greens, war memorial, playing fields and crosses open spaces, sport facilities, watercourses and habitat areas/woodland that could be used for recreation. Therefore there may be some temporary effects on recreation, angling and other water based activities during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0
Material Assets	Minimise resource use and waste production	0	-	0	0	New infrastructure required for option which will use materials and generate waste and excavated material.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	0
	Avoid negative effects on built assets and infrastructure	0	--	0	0	The option crosses railway lines, major roads and National Cycle Network routes. Likely to be temporary impacts during construction due to disruption for users. It is assumed that trenchless techniques will be used for pipelines which cross railway lines and major roads. During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-TRA-018
Option Name	Bungay Wells to Broome WTW transfer
Water company	Essex & Suffolk Water
Option Description	Transfer from Bungay Wells to Broome WTW. Transfer is approximately 3.6 km long, with 1 Ml/d max capacity.
WRZ	Essex & Suffolk Water

Option selected in the following plans:

- Central Preferred
- Least Cost
- Best Value
- Best Environment
- High PCC
- North Suffolk Reservoir
- Habs Regs SR

SEA Topic	SEA Objective	Construction		Operational Effects		Comment	Mitigation	Residual		Residual Operational	
		+	-	+	-			+	-	+	-
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	--	0	0	There are no biological SSSIs within 500m of the option. There is one LNR within 500m (Broome Heath) and one LNR within 2km (Bath Hills) of the option. The option is entirely located within SSSI Impact Risk Zones. There are no MCZ/MPAs within 500m of the option. The HRA ToLS identified three Natura 2000 sites that could be affected Broadland SPA (UK9009253) (~3.7km), Broadland Ramsar (UK11010) (~3.7km), The Broads SAC (UK0013577) (~3.7km). Likely Significant Effects are anticipated for all sites as a result of biological disturbances, toxic and non-toxic contamination during the construction phase, with Broadland SPA also having possible non-physical disturbances. No effects are anticipated during operation. Following this HRA AA, it is considered that adverse effects on the following Designaed Sites are possible, and thus further investigtion is recommended to assess potential effects in more detail on the qualifying features and to determine more targeted mitigation measures as well as reduce uncertainty: The Broads SAC (in relation to otter populations, Broadlad Ramsar (in relation to otter and bird populations, and Broadland SPA (in relation to bird populations).	Best practice methods to be implemented to minimise disturbance effects. For the following Designated Sites it is anticipated that with adherence to proposed mitigation, adverse impacts on the Designated Sites will be alleviated during th construction and operation phases of this option: Broadland SPA For the remaining sites, low and localised effects may still be possible during both the construction and operation phases. These effects cannot be ruled out due to uncertainty, thus further studies to better understand how the qualifying species use the linked habitatas are required and to determine more targeted mitigation measures. This option will need to be included in the in-combinaion assessment. These Designated Sites are: Broadland Ramsar and The Broads SAC.	0	-	0	0
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	---	0	0	The pipeline passes adjacent to and through BAP Priority Habitat (Coastal and floodplain grazing marsh, good quality semi improved grassland, and Deciduous woodland). Potential permanent loss of BAP Priority Habitat. There are also likely to be indirect impacts on Priority Habitats such as disturbance effects during the construction phase and potential effects on protected species. There are no Groundwater Dependent Terrestrial Ecosystems (GWDTE) or chalk rivers within 2km of the option. The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. The percentage change is -61.73%. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost.	Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid BAP Priority Habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required. It is assumed that mitigation recommended by further ecology surveys will be implemented and therefore residual construction effects are lessened although this wouldn't negate the need for a potential appropriate assessment..	0	--	0	0
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	Very low risk of transfer of INNS as the treated source water is likely to be entirely free of INNS. Construction phase risk of INNS is also considered to be very low.	During construction, best practice principles will be implemented to prevent the spread of INNS.	0	0	0	0

	To meet WFD objectives relating to biodiversity.	0	-	0	0	The WFD Phase 1 assessment results show there would be low risks for ecology during construction due to installation and repairs to tunnels, conduits and other below ground structures, additionally low impacts are anticipated during operation due to the draining of pipelines into local watercourses for maintenance. The Level 2 WFD assessment identified possible deterioration risks to quantitative dependent surface water due to the use of refurbished boreholes outside of current recent actual rates, although within existing licences quantities.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction. WFD Level 2 assessment results identified a precautionary compliance risk, pending further investigation. However, the option does not compromise achievement of WFD objectives for the Broadland Rivers Chalk & Crag waterbody in relation to biodiversity.	0	0	0	0
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	--	0	0	Broome Heath Pit SSSI (100% unfavourable - no change) is within 500m of the option. The option crosses predominately grade 4 agricultural land with disturbance to these soils during construction. During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any loss of land quality from the transfer pipeline. The location of the pumping station is currently unknown. However, it is likely that this land, if agricultural, will not be reinstated as it is a permanent structure, therefore this land would be permanently lost.	There are no residual effects likely to the Geological SSSI if avoided. Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land permanently taken or temporarily disturbed. Ground will be reinstated therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. There will be permanent loss as a result of the pumping station although this is a relatively small area so neutral effects identified.	0	0	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	--	0	0	The majority of the option is within Flood Zones 2 & 3, flood defences, and flood alert/warning areas and may have an impact on construction. Impacts on operation unlikely given the pipeline is buried. The pipeline is unlikely to increase the risk of flooding. The pumping station is likely to increase hardstanding and therefore has potential to increase flood risk at the site. This effect is likely to be minimal however.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	0	The transfer pipeline crosses watercourses therefore potential for impacts on water quality during the construction phase. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option is located within a groundwater SPZ3 with potential for impacts on water quality during the construction phase.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	--	The WFD Phase 1 assessment determined that the option would have a moderate level of effect on two waterbodies (Waveney (Starston Brook - Ellingham Mill) (GB105034045902) and Broadland Rivers Chalk and Crag (GB40501G400300)) during the operation phase, requiring further assessment, and low levels of effects during construction. A low level of effect during both construction and operation is anticipated on the remaining waterbody (Broome Beck). With mitigation, no effects are predicted as a result of construction. Results from WFD Level 2 assessment indicate that the option does not compromise achievement of WFD objectives for the Broadland River Chalk & Crag waterbody.	Best practice construction methods and pollution prevention measures to be implemented.	0	0	0	-

	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	The option will transfer water from an area of surplus to one of deficit and does not require further abstraction therefore supports resilience of water supplies during potential future drought scenarios.	N/A	0	0	+	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA nor are there any within 2km. Construction likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0
Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	Effects during construction of the option due to resource use and emissions, and effects during the operational phase as the option requires a pumping station.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	0	0	Water levels not predicted to be significantly affected therefore unlikely to affect resilience of the local environment to climate change.	N/A	0	0	0	0
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	---	0	0	Option overlaps one NCA(s) (with % proportion of NCA affected):The Broads (0.01%). Negative effects during construction likely as excavation will be required for the transfer pipeline. Construction will also result in permanent loss of woodland, with impacts on landscape character. The option overlaps almost completely with a national park, The Broads, and there are likely to be landscape and visual effects during the construction phase. There will be minimal new above ground infrastructure. The pumping station is a relatively small-scale structure and is therefore unlikely to change the landscape character of the area or affect visual amenity during operation.	Re-routing of the pipeline to minimise damage and disruption to woodland, and national park, or utilise directional drilling or other trenchless techniques to reduce construction effects. Best practice measures to be implemented to minimise effects during construction including although temporary effects during construction may remain. Land reinstated upon completion so with mitigation, no residual effects are likely to remain during operation.	0	--	0	0
Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	0	--	0	0	The option passes within 500m of three conservation areas (Bungay, Ditchingham Dam, Ditchingham Windmill Green) four Scheduled Monuments (Bungay Castle, Butter Cross, Earthwork on Broome Heath, and Long barrow and round barrows on Broome Heath), two heritage at risk areas, and is within proximity of a number of listed buildings. Construction may affect the setting of these historic assets, however this is likely to be temporary as the pipeline will be buried. There is potential for the excavation of the pipeline to impact buried archaeology if present. There will be minimal new above ground infrastructure, which is unlikely to have effects on the setting of heritage assets during operation.	Best practice measures to be implemented to minimise setting effects for other heritage assets during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	-	0	0
	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	---	0	0	The pipeline crosses a golf course, and is within 500m of an allotment, a sports facility, religious grounds, playing fields, a public park/garden, a hospital and a post office. There is likely to be temporary disturbance to users of these sites and the local community during construction. This option may contribute to the local economy through employment opportunities during the construction phase. During operation, it is unlikely to contribute positively to the local economy. IMD deciles along the pipeline route vary from four, five and seven.	Route alignment to be amended or trenchless techniques to be used to avoid direct impacts on property and community assets. Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction and land will be reinstated. However, temporary effects are likely to still occur during construction.	+	-	0	0

Population and Human Health	To secure resilient water supplies for the health and wellbeing of customers.	0	0	0	0	There are no shellfish waters or bathing waters within 500m of the option location. The movement of water from one point to another increases the risks of disease transmission. All potable water transfers have been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	N/A	0	0	0	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	--	0	0	The proposed pipeline route will cross one National Cycle Network routes. There may be temporary disturbance on users of this service, as well as other walking and cycling routes, and other public rights of way, during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. There could be potential to enhance the cycleways as part of the works (e.g. during re-instatement).	0	0	+	0
	Maintain and enhance tourism and recreation	0	-	0	0	The pipeline is directly within a national park and golf course. The pipeline route is within 500m of a public park/garden, sport facility, playing fields, and crosses open spaces, watercourses and habitat areas/woodland that could be used for recreation. Therefore there may be some temporary effects on recreation, angling and other water based activities during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0
Material Assets	Minimise resource use and waste production	0	-	0	0	New infrastructure required for option which will use materials and generate waste and excavated material.	Seek opportunity to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	0
	Avoid negative effects on built assets and infrastructure	0	--	0	0	The option crosses a major road and National Cycle Network route. Likely to be temporary impacts during construction due to disruption for users. It is assumed that trenchless techniques will be used for pipelines which cross railway lines and major roads. During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-TRA-019
Option Name	Transfer from Holton WTW to Eye Airfield
Water company	Essex & Suffolk Water
Option Description	8.5 Ml/d transfer from Holton WTW to Eye Airfield. Transfer length approximately 30.6 km.
WRZ	Essex & Suffolk Water

Option selected in the following plans:

- Central Preferred
- Least Cost
- Best Value
- Best Environment
- High PCC
- North Suffolk Reservoir
- Habs Regs SR

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
Biodiversity, flora and fauna	To protect designated sites and their qualifying features.	0	--	0	0	There are no SSSIs, LNRs or NNRs within 500m of the options. The option is entirely located within SSSI Impact Risk Zones. There are no MCZ/MPAs within 500m of the option. The HRA ToLS identified ten Natura 2000 sites that could be affected Minsmere-Walberswick SPA (UK9009101) (~5km), Minsmere to Walberswick Ramsar (UK11044) (~5km) and Minsmere to Walberswick Heaths & Marshs SAC (UK0012809) (~5km), Dew's Ponds SAC (UK0030133) (~5.5km), Benacre to Easton Bavents SPA (UK9009291) (~8km), Benachre to Easton Bavents Lagoons SAC (UK0013104) (~9km), Redgrave and South Lophan Fens Ramsar (UK11056) (~9.5km), Waveney and Little Ouse Valley Fens SAC (UK0012882) (~9.5km), Outer Thames Estuary SPA (UK9020309) (~9.9km), and Southern North Sea SAC (UK0030395) (~9.9km). LSE anticipated for Minsmere-Walberswick SPA and Minsmere to Walberswick Ramsar, and effects include potential non-physical and biological disturbance during the construction phase. LSE also concluded in the constructional phased of work for , Outer Thames Estuary SPA and Southern North Sea SAC through toxic and non-toxic contamination and biological disturbances. No LSE concluded for any of the remaining sites. Following HRA AA, it is considered that with aderence to the proposed mitigation, the proposed works associated with this option are not expected to have adverse effects on the overall integrity of the following sites and their qualifying features: Minsmere to Walberwick SPA, Ramsar and SAC, Outer Thames Estuary SPA and Southern North Sea SAC.	Best practice methods to be implemented to minimise disturbance effects. With this in place, adverse impacts on the Designated Sites will be alleviated during the construction and operation phases of this option.	0	-	0	0
	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	--	0	0	The pipeline passes adjacent to and through small parcels of BAP Priority Habitat (deciduous woodland, coastal and floodplain grazing marsh). Potential permanent loss of deciduous woodland, and coastal and floodplain grazing marsh BAP Priority Habitat. No direct effects on other Priority Habitats but there may be disturbance effects during the construction phase and potential effects on protected species. There are no Groundwater Dependent Terrestrial Ecosystems (GWDTE) or chalk rivers within 2km of the option. The option is expected to cause the loss of BNG units due to habitat clearance associated with construction. The percentage change is -10.42%. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost.	Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid woodland habitat, in particular BAP Priority Habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required.	0	-	0	0
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	Very low risk of transfer of INNS as the treated source water is likely to be entirely free of INNS. Construction phase risk of INNS is also considered to be very low.	N/A	0	0	0	0

	To meet WED objectives relating to biodiversity.	0	-	0	-	The WED Phase 1 assessment results show there would be a low risks for ecology during construction due to the construction and repairs of tunnels, and low risks during operation due to the draining of pipelines into local watercourses for maintenance.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction or operation.	0	0	0	0
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	--	0	0	The option crosses grade 2 and 3 agricultural land with disturbance to these soils during construction. During operation, dependent on the depth of the pipeline and agricultural operations, it would be possible to continue using the land for agricultural purposes, therefore there is unlikely to be any loss of land quality from the transfer pipeline. The location of the pumping station is currently unknown. However, it is likely that this land, if agricultural, will not be reinstated as it is a permanent structure, therefore this land would be permanently lost. The option is within 500m of Drift Cottage historic landfill site with potential to disturb contaminated material during construction.	Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land permanently taken or temporarily disturbed. Ground will be reinstated therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. There will be permanent loss as a result of the pumping station although this is a relatively small area so neutral effects identified.	0	-	0	0
Water	To reduce or manage flood risk, taking climate change into account.	0	--	0	0	The majority of the option is within Flood Zone 1 with multiple sections which pass through Flood Zones 2 and 3 and in close proximity to flood defences, and may have an impact on construction. Impacts on operation unlikely given the pipeline is buried. The pipeline is unlikely to increase the risk of flooding. The required pumping station will increase hardstanding in the area which might increase flood risk however the effects are anticipated to be minimal.	Measures to reduce the impact on flooding during the construction phase. Flood risk during construction may still occur so short term flood risk effects may remain. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	0	The transfer pipeline crosses watercourses therefore potential for impacts on water quality during the construction phase. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To enhance or maintain groundwater quality and resources.	0	--	0	0	The option is located within two SPZs (zones 1 and 2) and intersects with two WFD Groundwater Bodies (Broadland Rivers Chalk and Crag, and Waveney and East Suffolk Chalk and Crag) with potential for impacts on water quality during the construction phase.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WED objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	0	The WFD Phase 1 assessment results show there would be a low level of effect during construction due to the repairs to, and construction of tunnels, and a low risk of impacts during operation due to drainage of pipelines into local watercourses for maintenance.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	The option will transfer water from an area of surplus to one of deficit and does not require further abstraction therefore supports resilience of water supplies during potential future drought scenarios.	N/A	0	0	+	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA nor are there any within 2km. Construction likely to have a temporary impact on air quality.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	0	0	0

Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	Effects during construction of the option due to resource use and emissions, and effects during the operational phase as the option requires a pumping station.	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. As the electricity grid is decarbonised, greener energy will be available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	0	0	Water levels not predicted to be significantly affected therefore unlikely to affect resilience of the local environment to climate change.	N/A	0	0	0	0
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	--	0	0	Option overlaps one NCA (with 0.03% proportion of NCA affected): South Norfolk and High Suffolk Claylands. Negative effects during construction likely as excavation will be required for the transfer pipeline. Construction will also result in permanent loss of woodland with impacts on landscape character. There will be minimal new above ground infrastructure. The pumping station is a relatively small-scale structure and is therefore unlikely to change the landscape character of the area or affect visual amenity during operation.	Re-routing of the pipeline to minimise damage and disruption to woodland, including Ancient Woodland, or utilise directional drilling or other trenchless techniques to reduce construction effects. Best practice measures to be implemented to minimise effects during construction including although temporary effects during construction may remain. Land reinstated upon completion so with mitigation, no residual effects are likely to remain during operation.	0	-	0	0
Historic Environment	To conserve/Protect and enhance the historic environment including the significance of designated and non-designated cultural heritage (including archaeology and built heritage), including any contribution made to that significance by setting.	0	---	0	-	The option intersects with one grade II listed structure and Halesworth Conservation Area. Furthermore, it is within 500 metres of a number of listed buildings. Construction may affect the setting of these historic assets, however this is likely to be temporary as the pipeline will be buried. There is potential for the excavation of the pipeline to impact buried archaeology if present. There will be minimal new above ground infrastructure, which may have minimal effects on the settings of heritage assets during operation.	Preferred mitigation for the listed building and conservation area is to re-route the pipeline; however, if this is not possible then careful construction and reinstatement to its original condition with no detrimental effect on the character, appearance, or design of the listed building or conservation area should be implemented. Best practice measures to be implemented to minimise setting effects for other heritage assets during construction. Further work likely to be required to determine significance of effect, depending on the presence or absence of buried archaeology. Residual effects may remain due to potential loss of archaeological remains.	0	--	0	-
Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	+	-	0	0	The pipeline is within 500m of an allotment, four bowling greens, playing fields, a town park, places of worship, two cemeteries, tennis courts, Metfield Common, and seven national cycle routes. There is no direct land take from these areas. There is likely to be a temporary disturbance to users of these sites and the local community during construction. This option may contribute to the local economy through employment opportunities during the construction phase. During operation, it is unlikely to contribute to the local economy. IMD deciles along the pipeline route vary from four to eight.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction and land will be reinstated. However, temporary effects are likely to still occur during construction.	+	-	0	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	0	0	There are no shellfish waters or bathing waters within 500m of the option location. The movement of water from one point to another increases the risks of disease transmission. All potable water transfers have been treated and are isolated from contamination, therefore it is highly unlikely that this option would affect disease transmission during operation.	N/A	0	0	0	0

	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	--	0	0	The proposed pipeline route will cross three National Cycle Network routes. There may be temporary disturbance on users of these, as well as other walking and cycling routes, and other public rights of way during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. There could be potential to enhance the cycleways as part of the works (e.g. during re-instatement).	0	0	0	0
	Maintain and enhance tourism and recreation	0	--	0	0	The pipeline route is within 500m of an allotment, four bowling greens, playing fields, a town park, places of worship, two cemeteries, tennis courts, Metfield Common, seven national cycle routes and crosses open spaces, watercourses and habitat areas/woodland that could be used for recreation. Therefore there may be some temporary effects on recreation, angling and other water-based activities during the construction phase.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0
Material Assets	Minimise resource use and waste production	0	-	0	0	New infrastructure is required for this option which will use materials and generate waste and excavated material.	Seek opportunities to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	0
	Avoid negative effects on built assets and infrastructure	0	--	0	0	The option crosses railway lines, a major road and three National Cycle Network routes. Likely to be temporary effects during construction due to disruption for users. It is assumed that trenchless techniques will be used for pipelines which cross railway lines and major roads. During the construction phase, there is likely to be some disruption to the local traffic network from the increase in the volume of traffic due to deliveries of construction material for the pipeline. During the operational phase, there is unlikely to be any disturbance to the transport network.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-TRA-023
Option Name	Broome to Barsham Transfer
Water company	Essex & Suffolk
Option Description	The transfer of raw water from Broome WTW The transfer of raw water from Broome WTW to Barsham WTW - connecting to a new service reservoir. The transfer pipeline is approximately 6.04km long and has an outside diameter of 225mm.
WRZ	Northern Central

Option selected in the following plans:

- Central Preferred
- Least Cost
- Best Value
- Best Environment
- High PCC
- North Suffolk Reservoir
- Habs Regs SR

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
	To protect designated sites and their qualifying features.	0	--	0	-	There are no designated sites within 500m of the option. No direct impacts are anticipated to designated sites. Potential indirect impacts to Broadland RAMSAR, Broadland SPA, The Broads SAC, Broome Heath LNR, Broome Heath Pit SSSI, and Geldeston Meadows SSSI, designated sites within 2km, due to construction effects from where the pipeline crosses/interacts with hydrological links of rivers/waterbodies to the designated sites, and from any other forms of indirect disturbance during construction, such as noise, vibration and dust. The option is entirely located within SSSI Impact Risk Zones, resulting in potential indirect effects to surrounding SSSI through disturbance during the construction phase. There is no ancient woodland within the study area. Potential indirect effects to habitats and wildlife within these woodlands through disturbance during the construction phase. All construction effects for this option are considered temporary, however mitigation will still need to be put in place where appropriate to reduce/minimise these effects. During operation, indirect effects may arise through localised and periodic maintenance works, any works during operation will have to consider designated sites and their qualifying features. The HRA ToLS identified three Natura 2000 sites that could be affected, Broadland SPA (UK9009253) (approx. 1.5km north), Broadland Ramsar (UK110100)(approx. 1.5km north), and The Broads SAC (UK0013577) (approx. 1.5km north). Potential LSEs were concluded for all three sites, due to non-physical disturbance, biological disturbances , toxic contamination, and non-toxic contamination. No operational effects are expected.	Best practice methods to be implemented to minimise disturbance effects. Trenchless techniques to be used where appropriate. Ecology surveys required at future design stages to determine effects and mitigation required.	0	-	0	0

Biodiversity, flora and fauna	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	--	0	-	The pipeline passes adjacent to and through parcels of BAP Priority Habitat (mainly coastal and floodplain grazing marsh, and some small areas of deciduous woodland), specifically along the western half of its route. Whilst this could result in some permanent habitat loss, any direct effects during construction are likely to be temporary and localised within the immediate vicinity of the pipeline. Potential indirect effects to adjacent and surrounding areas of priority habitat through disturbance from construction activities, potentially effecting any present protected species, as well as other wildlife. There are also numerous areas of woodland at varying levels of proximity within the study area that could be indirectly affected during the construction phase. Although some vegetation clearance might be required during construction, no significant direct effects are anticipated. During operation, no significant effects are anticipated, however indirect effects may arise through localised and periodic maintenance works. Where possible, these should be minimised through appropriate mitigation. The option is expected to cause the loss of BNG units predominately due to habitat clearance associated with construction. The percentage change is -42.41% which whilst high only corresponds with 23,03 units of habitat lost. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost. NCA assessment found that the option will likely cause the temporary and permanent loss of stocks during construction, resulting in -£450.06. However, best practice mitigation and reinstatement/compensation of habitat means that most Natural Capital stocks post construction will have no to little change.	Best practice methods are assumed to be implemented to minimise disturbance effects and habitat loss including refining pipeline alignment or using trenchless techniques to avoid priority habitat. Habitat to be reinstated on completion, or if unavoidable compensatory habitat to be considered to replace damaged or lost habitat. Ecology surveys will be required at future design stages to determine effects and mitigation required.		--	0	0
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	-	0	0	There is a low risk of transfer/movement of invasive or non-native species during option construction as the proposed pipeline runs adjacent to and/or crosses several waterbodies. During operation, maintenance works are likely to be localised, and so with appropriate mitigation in place the risk of spreading INNS should be minimal.	Best practice methods to be implemented.	0	0	0	0
	To meet WFD objectives relating to biodiversity.	0	-	0	-	The WFD Phase 1 assessment identified four WFD waterbodies. The assessment results show there would be no effects for ecology during construction or operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction. Best practice mitigation should also be applied during operational maintenance activities to avoid impacts.	0	0	0	0
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	-	0	0	The option crosses Grade 2, Grade 3, and Grade 4 agricultural land. Given the nature of the proposed option, these soils will be directly disturbed during construction. Effects are likely to be temporary as land will be reinstated post-construction, therefore there should be no land permanently lost. Depending on the depth of the pipeline and agricultural operations, it is likely that the land will be able to continue to be used for agricultural purposes during operation of the pipeline, except for localised and periodic maintenance works. There are no authorised or historical landfill sites within 500m of the option.	Reduce damage to agricultural land through design to reduce the option footprint and the construction working area to reduce the amount of land temporarily disturbed. Ground will be reinstated, therefore long term residual effects on agricultural soils as a result of pipeline construction are unlikely. Best practice techniques to prevent disturbance of any potentially contaminated material during construction.	0	-	0	0

Water	To reduce or manage flood risk, taking climate change into account.	0	--	0	0	For most of the pipeline route, specifically in the western half, the option passes through and/or runs adjacent to large areas of Flood Zone 2 and 3, as well as flood alert/warning areas. The pipeline crosses several main rivers and crosses and/or runs adjacent to numerous smaller watercourses. Given that the pipeline is buried, impacts during operation to the asset from flooding are considered unlikely. The pipeline itself is also unlikely to increase the future risk of flooding in the area. During construction however, the proximity of the option to these flood zones could pose a risk in relation to construction machinery and other assets, as well as to temporary stores of cut and fill material, and any poorly consolidated surface material immediately following construction completion. This could influence susceptibility to erosion, and increase transportation and deposition of sediments during a flood event, potentially having knock-on effects downstream and within surrounding areas of land. Risk of these effects could be minimised/reduced through appropriate mitigation.	Appropriate measures to be put in place to reduce the impact of flooding during the construction phase. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. FRA to be undertaken and above ground infrastructure to be designed to be flood resilient. Floodplain compensation may be required. With mitigation, flood risk will be minimised/reduced.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	-	0	0	The transfer pipeline crosses several main rivers, as well as numerous watercourses, therefore there is potential for impacts on water quality during the construction phase. Directional drilling or other trenchless techniques will be used where the pipeline crosses watercourses, and so there should be little, if any, impact to water flows and quantity. Any impacts on water quality will be temporary. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To enhance or maintain groundwater quality and resources.	0	-	0	0	The option is located within SPZ1 and SPZ2, as well as the Broadland Rivers Chalk & Crag Groundwater body, with potential for impacts on water quality and resources during the construction phase through contamination/pollution, as well as from potential disturbances to the local hydrological system, as a result of construction activities. No effects are anticipated during operation.	Best practice construction methods and pollution prevention measures to be implemented, With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	-	Four waterbodies were considered during the WFD Phase 1 assessment: Broome Beck, Waveney (Starston Brook - Ellingham Mill), Waveney (Ellingham Mill - Burgh St. Peter), Waveney (Ellingham Mill - Burgh St. Peter) and Broadland Rivers Chalk & Crag. The assessment determined that the option would have a low level of effect on all four waterbodies during construction due to trenching and laying of pipelines, and a low level of effect on all four waterbodies during operation due to draining of pipelines for maintenance.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	-	The option will transfer water from an area of surplus to a new service reservoir, thus improving the resilience of local water supplies during potential future drought scenarios. This could, however, have a detrimental effect to the resilience of natural systems during operation if drought conditions coincide with consistently high-rates of transfer.	N/A	0	0	+	-
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	The option is not within an AQMA, nor are there any within 2km. Construction is likely to have a temporary impact on air quality in surrounding local areas through emissions from combustion engines associated with machinery and HGVs, congestion and traffic associated with diversions and road closures, and dust generated by construction activities. No impacts anticipated during operation apart from those potentially arising from very localised maintenance works.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0

Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	--	0	-	Given the scale of the option, a large quantity of materials will be required to construct the pipeline, and construction activities will also generate emissions through significant machinery movements associated with required earthworks, HGV movements transporting materials, as well as other plant emissions from actual construction of the pipeline itself. During operation, energy will be required to pump water through the pipeline, and any maintenance and/or replacement works will also produce operational carbon emissions.	Investigate use of renewables during construction and operation for energy supply and use of materials with lower embodied carbon. Carbon assessment could help identify areas for carbon savings or alternative materials. As the electricity grid is decarbonised, greener energy will be more available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	+	0	Water levels not predicted to be significantly affected, therefore the option is unlikely to affect resilience of the local environment to climate change. In addition, the option will transfer water from an area of surplus to a service reservoir, potentially reducing the need for water abstractions at the Barsham WTW, thus leaving more water in the natural system.	N/A	0	0	+	0
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	-	0	0	The option overlaps with both The Broads National Park and The Broads NCA. Negative effects during construction are likely as activities may temporarily impact the setting and landscape character of these areas through excavation works, and any noise, vibrations, or dust that might be generated. In addition, increased traffic as a result of material deliveries required for construction, or through increased traffic associated with diversions and road closures, could also temporarily effect the setting and landscape character of these areas. Permanent impacts could arise if there is any loss of woodland or other distinctive aspects that may contribute to the areas landscape character. There are no AONBs within 2km of the option. The Suffolk Coast and Heaths NCA partly encroaches within 2km of the option, and as a result potential temporary indirect effects could occur during construction. During operation negative effects are unlikely as any maintenance works are anticipated to be localised and less intrusive then the original construction works for the pipeline. There will be no new above ground infrastructure, and so the pipeline will not affect visual amenity during operation.	Best practice measures to be implemented to minimise effects during construction, however temporary effects may remain. Land should be reinstated upon completion. With mitigation, minor negative effects are likely to remain during construction.	0	-	0	0

Historic Environment	To conserve/protect and enhance historic environment and heritage assets, and their setting, including archaeologically important sites.	0	--	0	0	The option is within 500m of a number of listed buildings. Ellingham Mill Conservation Area partly intersects with the edge of the 500m buffer around the option. Whilst construction may affect the setting of these historic sights, specifically those closest to the option, any effects or disturbances are likely to be temporary, and not significant. Construction activities could cause minor and temporary disruption, such as from noise and dust, or through increased road traffic as a result of construction deliveries and/or diversions and road closures. There is potential for the excavation of the pipeline to impact buried archaeology if present. During operation, the pipeline will be buried, and there will be no new above ground infrastructure, and so there should be no effects on the setting of heritage assets during operation.	Best practice measures to be implemented to minimise setting effects for other heritage assets during construction. Further work likely to be required to determine significance of effect. Any loss of archaeological remains could cause residual effects to remain.	0	-	0	0
Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	0	-	0	0	The pipeline crosses The Broads National Park, and is within 500m of 2 religious grounds (St Bartholomew's and Holy Trinity Church), 1 religious building, 1 area of common land (High Common (East Suffolk)), 1 primary road (A143), and also part of the National Cycle Network. There is likely to be temporary disturbance to users of these sites and the local community during construction. The option may contribute to the local economy through employment opportunities during the construction phase. During operation, it is unlikely to contribute to the local economy.	Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction. Any disturbed land should be reinstated, and route alignment to be amended or trenchless techniques to be used to avoid direct impacts on property and community assets. However, temporary effects are likely to still occur.	0	-	0	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	+	0	There are no shellfish waters or official bathing waters within 500m of the option location. The movement of water from one point to another increases the risks of disease transmission. The option involves the transfer of raw water from Broome WTW to Barsham WTW - connecting to a new service reservoir. Any water intended for human consumption will be treated and kept isolated to prevent contamination, therefore it is highly unlikely that this option will affect disease transmissions during operation. In addition, the pipeline will help to increase water efficiency and increase resilience of water supplies and natural systems to droughts, thus helping to secure resilient water supplies for the health and wellbeing of customers.	N/A	0	0	+	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	-	0	0	The proposed pipeline route will come into close contact with part of the National Cycle Network at its westerly end, as well as potentially coming near to and/or crossing other walking and cycling routes, and other public rights of way in the area. Potential negative effects during construction through temporary disturbance to users of these, through for example, noise, vibration and dust generated by construction activities. As well as potential temporary barriers to access. During operation there is anticipated no negative effects apart from those coming from localised and periodic maintenance works.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. There could be potential to enhance the cycleways as part of the works (e.g. during re-instatement).	0	-	0	0

	Maintain and enhance tourism and recreation	0	-	0	0	The pipeline route crosses The Broads National Park, as well as areas of open space, watercourses and habitat areas/woodland that could be used for recreation. There are also numerous listed buildings in the area that, although unlikely, could attract visitors. There may, therefore be some temporary effects on recreation, angling and other outdoor-based activities during the construction phase. During operation the pipeline is not anticipated to contribute to maintaining or enhancing tourism and recreation in the local area.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0
Material Assets	Minimise resource use and waste production	0	---	0	-	The option involves the implementation of new infrastructure, and therefore will require the consumption of materials, as well as generate waste and excavated material. Given the scale of the pipeline proposed, resource use and waste production is likely to be high. In addition, the pipeline will also require energy to pump water during operation, and any future maintenance or replacement works will require additional resources.	Seek opportunities to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	--	0	0
	Avoid negative effects on built assets and infrastructure	0	-	0	0	The route follows roads to reduce environmental impact where possible, however this approach will have temporary negative effects during construction to sections of Low Road and the B1062, causing disruption to users. Any diversions and/or road closures are likely to cause some disruption to the local traffic network, as well as from an increase in volume of traffic associated with deliveries of construction materials. There are no railway lines within 500m of the proposed route. There is one section of the National Cycle Network in close proximity to the western end of the pipeline, however any effects should be minor and temporary in nature. During the operational phase, there is unlikely to be any disturbance to the transport network. Any maintenance will be localised and periodic, thus having temporary, and relatively minor effects on small areas.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	-	0	0

Assessment Cover Information	
WRE Option ID	ESW-UVC-001
Option Name	Langford UV (Crypto)
Water company	Essex & Suffolk
Option Description	Additional ultraviolet treatment contactors to treat for cryptosporidium for the full WTW flow capacity of 57Ml/d. The option assumes the need for inline pumping, on site power supply and transformer, additional standby power generation and fuel storage.
WRZ	ESWEssex

Option selected in the following plans:

- Central Preferred
- Least Cost
- Best Value
- High PCC
- North Suffolk Reservoir
- Habs Regs SR

SEA Topic	SEA Objective	Construction Effects		Operational Effects		Comment	Mitigation	Residual Construction Effects		Residual Operational Effects	
		+	-	+	-			+	-	+	-
	To protect designated sites and their qualifying features.	0	--	0	0	There are no designated sites within 500m of the option, and so no direct effects are anticipated to any designated sites. There are however, three parcels of Ancient Woodland that fall within 2km of the option. These sites could be indirectly effected from construction related disturbances such as noise, vibration and dust. This could have a negative effect on any qualifying features and other present wildlife, however effects are anticipated to be minor given the distance to the option. Additionally the option is entirely located within SSSI Impact Risk Zones, resulting in potential indirect effects to surrounding SSSI through disturbance during the construction phase. No operational effects are anticipated. The HRA ToLS identified three Natura 2000 sites that could be affected; Essex Estuaries SAC (UK0013690) (approx. 2.5km), Blackwater Estuary Ramsar (UK11007) (approx. 2.5km) and Blackwater Estuary SPA (UK9009245) (approx. 2.5km). LSE identified for all three sites, due to potential for toxic contamination, non-toxic contamination and physical damage during construction, and potential for non-physical disturbance and biological disturbances on Blackwater Estuary Ramsar and Blackwater Estuary SPA during construction. No operational effects are anticipated.	Best practice methods to be implemented to minimise disturbance effects.	0	-	0	0

Biodiversity, flora and fauna	To deliver BNG, protect biodiversity, priority species and vulnerable habitats such as chalk rivers.	0	0	0	0	Although there are no pacels of woodland impacted within 500m of the option, there are three areas of Ancient Woodland within 2km of the option. Additionally, there are also several areas of BAP Priority Habitat within 500m of the option (Coastal and floodplain grazing marsh, and Deciduous woodland). Whilst there will be no permanent loss of woodland or Priority Habitat, and so no direct effects are anticipated, there is potential for indirect effects to adjacent and surrounding areas through disturbance from construction activities, potentially effecting any present protected species, as well as other wildlife in the area. During operation, no significant effects are anticipated, as the option is wholly within an existing site. The option is expected to cause the loss of BNG units predominately due to habitat clearance associated with construction. The percentage change is -100% however the total habitat unit change is -0.10 and thus this is not considered to be significant. Note: Ancient Woodland has been excluded from calculations as this habitat is classed as irreplaceable once lost. The Natural Capital Assessment concluded the option would result in -£302.80.	Best practice methods are assumed to be implemented to minimise disturbance effects. Ecology surveys might be required at a later stage to determine effects and appropriate mitigation.	0	0	0	0
	To avoid spreading and, where required, manage invasive and non-native species (INNS).	0	0	0	0	There is a no risk of transfer/movement of invasive or non-native species during option construction or operation, as the option is a water treatment option which does not involve the movement of raw water.	Best practice methods to be implemented. With appropriate mitigation in place there is considered to be no risk of spreading INNS.	0	0	0	0
	To meet WFD objectives relating to biodiversity.	0	0	0	0	Two WFD waterbodies identified. The WFD Phase 1 assessment results show there would be no effects for ecology during construction or operation.	Best practice construction methods and pollution prevention measures to be implemented. This includes the use of directional drilling or other trenchless techniques where the pipeline crosses watercourses. In the short term there is potential for effects. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
Soil	To protect and enhance the functionality and quality of soils, including the protection of high-grade agricultural land, and geodiversity.	0	0	0	0	The option is situated on non-agricultural land within the existing Langford WTW site. There are areas of Grade 3, and Grade 4, agricultural land adjacent to the site and within 500m. No effects are anticipated to these soils. Additionally, there are no authorised or historic landfill sites within 500m of the option. There is one historic landfill site within 2km, however given the distance from, and the nature of, the option, no effects are expected.	Any disturbed land to be reinstated where possible. Best practice techniques to prevent disturbance of any potentially contaminated material that may be present on the site during construction.	0	0	0	0

Water	To reduce or manage flood risk, taking climate change into account.	0	-	0	0	The option is surrounded by adjacent areas of Flood Zone 2 and 3, as well as Flood Alert and Flood Warning areas. The option footprint does not interact with these areas, and so there is considered to be minimal flood risk to the option during operation. Depending on the size of the area required for the construction site, there could be a temporary flood risk during construction. Construction machinery and other site assets, as well as any stored materials could be a risk during a flood event. With appropriate mitigation this risk is considered minimal. The option is not anticipated to contribute to reducing or managing flood risk. There are some small areas benefiting from flood defences within 500m of the option, however the option will not interact with any existing flood defences, and so no negative effects are anticipated.	Appropriate measures to be put in place to reduce the risk of flooding during the construction phase. FRA to be undertaken, and any above ground infrastructure to be designed to be flood resilient. With mitigation, flood risk will be minimised/reduced.	0	-	0	0
	To enhance or maintain surface water quality, flows and quantity.	0	0	0	0	The option is not anticipated to have any effect on surface water quality, flows and quantity. It involves the provision of additional ultraviolet treatment contactors to treat for cryptosporidium prior to being deposited into the clean water storage tanks within the existing Langford WTW site.	Best practice construction methods and pollution prevention measures to be implemented.	0	0	0	0
	To enhance or maintain groundwater quality and resources.	0	0	0	0	The option is also not anticipated to have any effect on groundwater quality and resources.	Best practice construction methods and pollution prevention measures to be implemented.	0	0	0	0
	To meet WFD objectives and support the achievement of environmental objectives set out in River Basin Management Plans.	0	-	0	-	Two waterbodies were considered during the WFD Phase 1 assessment: Blackwater (Combined Essex) and Essex Gravels. The assessment determined that the option would have a low level of effect on both waterbodies during construction, due to construction of tunnels and construction of below ground structures. A low level of effect was determined on both waterbodies during operation, due to draining of pipelines for maintenance and the presence of new underground structures.	Best practice construction methods and pollution prevention measures to be implemented. With mitigation, no effects are predicted as a result of construction.	0	0	0	0
	To increase water efficiency and increase resilience of water supplies and natural systems to droughts.	0	0	+	0	The option will provide additional ultraviolet treatment contactors to treat for cryptosporidium when the WTW is at full flow capacity (57Ml/d). These contactors will be located on the outlet from the Granular Activated Contactors, prior to being deposited in the clean water storage tanks. As a result, the option will be able to treat water for cryptosporidium at greater flow capacity, thus helping to increase water efficiency. This could reduce the need for water abstractions elsewhere within the system, thus helping to increase resilience of water supplies and natural systems to droughts.	N/A	0	0	+	0
Air	To reduce and minimise air emissions during construction and operation.	0	-	0	0	There are no Air Quality Management Areas (AQMA's) within 2km of the option. There is, however, a small amount of housing within the vicinity of the WTW. No negative effects on air quality are anticipated during operation. There is potential for minor negative effects to local air quality during construction, however these effects (if any) will be temporary, and can be reduced/minimised through appropriate mitigation.	Best practice mitigation measures to be implemented during construction, however short term air quality effects may remain.	0	-	0	0

Climatic Factors	To minimise/reduce embodied and operational carbon emissions	0	-	0	-	Materials will be required to construct the option, and construction activities will also generate emissions through machinery movements and/or HGV movements for transporting materials, as well as other plant associated emissions. During operation, energy will be required to pump and treat water.	Investigate use of renewables during construction and operation for energy supply, and use of materials with lower embodied carbon. Carbon assessment could help identify areas for carbon savings or alternative materials. As the electricity grid is decarbonised, greener energy will be more available. Although carbon emissions could be reduced through mitigation, negative effects in the short and medium term will likely remain.	0	-	0	-
	To introduce climate mitigation where required and improve the climate resilience of assets and natural systems.	0	0	+	0	Water levels are not anticipated to be affected, therefore the option is unlikely to negatively effect the resilience of the local environment to climate change. In addition, the option will provide additional ultraviolet treatment contactors to treat for cryptosporidium when the WTW is at full flow capacity (57Ml/d). As a result, the option will be able to treat water for cryptosporidium at greater flow capacity, thus helping to increase water efficiency. This could reduce the need for water abstractions elsewhere within the system, thus helping to increase the climate resilience of water assets and natural systems.	N/A	0	0	+	0
Landscape	To conserve, protect and enhance landscape and townscape character and visual amenity.	0	-	0	0	The option is entirely located within the Northern Thames Basin National Character Area (NCA), and is also within 2km of the Greater Thames Estuary and the South Suffolk and North Essex Clayland NCAs. Additionally, there are three areas of Ancient Woodland within 2km. Some new above ground infrastructure will be built, however this will be within the existing Langford WTW site, and thus no negative effects are anticipated as a result. There is potential for construction related disturbances to temporarily effect landscape character and visual amenity, but any effects are likely to be minimal. No negative effects are anticipated during operation.	Best practice measures to be implemented to minimise disturbance effects during construction, however temporary effects may remain.	0	-	0	0
Historic Environment	To conserve/protect and enhance historic environment and heritage assets, and their setting, including archaeologically important sites.	0	-	0	0	The option is entirely within Chelmer and Blackwater Navigation Conservation Area, and is within 500m of Langford Conservation Area. There is one Scheduled Monument within 500m of the option (Pumping station), as well as three Grade II Listed Buildings (Bridge Cottages; Fords Farmhouse; Orchard Cottage). There is potential for any excavation works to unearth buried archaeology, but with appropriate mitigation there should be no negative effects. No significant effects to the historic environment are anticipated as a result of the option. There is potential for minor and temporary effects to the setting of these heritage assets during construction. No effects anticipated during operation.	Best practice measures to be implemented to minimise setting effects on heritage assets during construction. Any loss of archaeological remains could cause residual effects to remain.	0	-	0	0

Population and Human Health	To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing.	0	0	+	0	Whilst there may be some minor and temporary negative effects during construction, the option is considered to have no detrimental effect to the health and wellbeing of the local community. It could, however, provide employment opportunities within the local area during both construction and operation, thus helping to improve economic and social wellbeing.	Best practice mitigation measures e.g. noise management to be implemented to minimise disturbance during construction.	0	0	+	0
	To secure resilient water supplies for the health and wellbeing of customers.	0	0	+	0	There are no Shellfish Classification Zones or Bathing Water Monitoring Sites within 500m of the option. The option will provide additional ultraviolet treatment contactors to treat for cryptosporidium when the WTW is at full flow capacity (57Ml/d). These contactors will be located on the outlet from the Granular Activated Contactors, prior to being deposited in the clean water storage tanks. As a result, the option will be able to treat water for cryptosporidium at a greater flow capacity, thus helping to increase water efficiency. This will help to secure resilient water supplies for the health and wellbeing of customers.	N/A	0	0	+	0
	To increase access and connect customers to the natural environment, provide education or information resources for the public.	0	-	0	0	The option does not propose any opportunities of associated environmental and recreational benefits. It could also negatively effect users of the local environment during construction.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. There could be potential to enhance the cycleways as part of the works (e.g. during re-instatement).	0	-	0	-
	Maintain and enhance tourism and recreation	0	-	0	0	There is one Important Building (Museum of Power) within 500m of the option. No direct effects are anticipated, however there could be indirect effects resulting from construction disturbances such as noise, vibration, and dust. This could have a temporary impact on tourism within the local area. Additionally, construction disturbances could have a temporary effect on any users of nearby recreation sites. No effects are anticipated during operation. There is no National Trail or National Cycle Network within 500m of the option, however there are two sections of the NCN within 2km of the option.	Best practice mitigation measures e.g. noise management to be implemented to minimise effects during construction. Direct land take of recreational sites to be avoided where possible and land to be reinstated. However, temporary effects are likely to still occur during construction.	0	-	0	0
	Minimise resource use and waste production	0	-	0	-	Materials will be required to construct the option, and construction activities will also consume fuel through machinery movements and/or HGV movements for transporting materials, as well as other plant activities. Additionally, there may be some waste generated through construction, e.g. if there is any demolition and/or excavation works. During operation, energy will be required to pump and treat water.	Seek opportunities to implement sustainable design measures (design to reduce footprint, selection of materials) and reuse excavated material to reduce the impact, however it is likely that negative effects will remain.	0	-	0	-

Material Assets	Avoid negative effects on built assets and infrastructure	0	-	0	0	No direct negative effects are anticipated on built assets and infrastructure as the option is entirely within the existing Langford WTW site. There is potential for negative effects to some surrounding buildings and heritage assets, however these are anticipated to be minor and temporary during construction. No effects anticipated during operation.	Best practice measures including a Traffic Management Plan to be implemented to minimise disturbance during construction. However, temporary effects are likely to still occur.	0	0	0	0