

River Severn to River Thames Transfer (STT)

Strategic regional water resource solution

Environmental Assessment Report:

Natural Capital

July 2021





Severn to Thames Transfer Scheme SRO

Appendix B3.7 Natural Capital (including terrestrial habitats)
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Report for United Utilities on behalf of the Severn Thames
Transfer Programme

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Appendix B.3.7 Natural Capital

1 Natural Capital Impacts

1.1 Introduction

This document presents the natural capital assessment of the STT Scheme based on the data and approach outlined in Appendix B.2.7.

This document should be read in conjunction with the Appendix B.2.7 Natural Capital Evidence Report and Appendix B1.4 Environment Assessment Methodology which provide details of the approach undertaken and data used.

1.2 Background to the STT SRO Scheme

In total, there are eight different STT Scheme source support elements at a variety of different capacities that comprise the STT System, as outlined in **Table 1.1**.

Table 1-1 STT Source Support and Interconnector Elements

Element Ref	Element ID	Name
1a	VyrnwyRelease_45	Vyrnwy Reservoir release (45 Mld)
1b	VyrnwyRelease_75	Vyrnwy Reservoir release (75 Mld)
2a	MiddleVyrnwyBypass_80	River Vyrnwy Mitigation - Vyrnwy Bypass release (80 Mld)
2b	MiddleVyrnwyBypass_155	River Vyrnwy Mitigation - Vyrnwy Bypass release (155 Mld)
2c	VyrnwyBypass_180	River Vyrnwy Mitigation - Vyrnwy Bypass release (180 Mld)
3	ShrewsburyRedeployment_25	River Vyrnwy Mitigation - Shrewsbury Redeployment (25 Mld)
4	Mythe_15	Mythe abstraction reduction (15 Mld)
5a	NetheridgePipelineDeerhurst_35	Netheridge WwTW discharge diversion (35 Mld) - Deerhurst Pipeline
5b	NetheridgePipelineCotswold_35	Netheridge WwTW discharge diversion (35 Mld) - Cotswold Canals
6	Minworth_115	Minworth WwTW discharge diversion (115 Mld)
7a	DeerhurstPipeline_300	Pipeline conveyance, Deerhurst to Culham (300 Mld)
7b	DeerhurstPipeline_400	Pipeline conveyance, Deerhurst to Culham (400 Mld)
7c	DeerhurstPipeline_500	Pipeline conveyance, Deerhurst to Culham (500 Mld)
8	CotswoldCanals_300	Canal conveyance, including piping to Culham (300 Mld)

A total of four STT Scheme groups have been identified, comprising different groupings of the source support options listed in **Table 1-1**. Two groups relate to utilising the pipeline conveyance as the Interconnector and two utilising the canal conveyance as the Interconnector. Which STT source support elements have been identified in the groups as well as the order in which these sources become operational was determined through modelling undertaken by Jacobs. This modelling considered a number of factors including cost and resilience. Further details on the modelling undertaken and justification for the choice of the STT source support elements is provided in Jacob's work.

It is understood that the Minworth source support element could be made available as a water source to the Grand Union Canal (GUC) Strategic Resource Option (SRO). In the event that this source support element is chosen as part of the GUC then the Minworth source support element would not be available for the STT Scheme system. In consequence, for each of the conveyance alternatives one grouping includes for a number of source support elements including Minworth and the other grouping excludes the Minworth source support element.

A summary of the elements that form each of the four STT Scheme options that have been assessed as part of the STT SRO are identified in **Table 1-2**. The Natural Capital assessments have been undertaken for these STT Scheme option groups.

Table 1-2 STT SRO Scheme option groupings

Group		Elements included
Pipeline Conveyance Groupings	Group 1 (without Minworth)	<ul style="list-style-type: none"> DeerhurstPipeline_300 Mythe_15 VyrnwyRelease_75 NetheridgePipelineDeerhurst_35 ShrewsburyRedeployment_25 MiddleVyrnwyBypass_80
	Group 2 (with Minworth)	<ul style="list-style-type: none"> DeerhurstPipeline_300 Mythe_15 VyrnwyRelease_75 NetheridgePipelineDeerhurst_35 ShrewsburyRedeployment_25 MiddleVyrnwyBypass_80 Minworth_115
Canal Conveyance Groupings	Group 3 (without Minworth)	<ul style="list-style-type: none"> CotswoldCanals_300 Mythe_15 NetheridgePipelineCotswold_35 VyrnwyRelease_75 ShrewsburyRedeployment_25 MiddleVyrnwyBypass_80
	Group 4 (with Minworth)	<ul style="list-style-type: none"> CotswoldCanals_300 Mythe_15 NetheridgePipelineCotswold_35 VyrnwyRelease_75 ShrewsburyRedeployment_25 MiddleVyrnwyBypass_80 Minworth_115

1.3 Introduction to Natural Capital Assessment

The following tables present the natural capital and ecosystem service losses and gains resulting from each of the proposed STT Scheme groups through construction and estimated (at this gate) biodiversity enhancement and habitat creation opportunity areas for each proposed grouping (i.e. Biodiversity Net Gain (BNG)). These groups are shown in **Table 1-2**.

Ecosystem service loss is calculated based on the area of natural capital stock lost through implementation of each STT element compared to the baseline (see associated **Appendix B.2.7** for natural capital baseline values for each STT Scheme element).

The following should be read in conjunction with the Natural Capital Assessment methodology as described in **Appendix B.2.7** Natural Capital Evidence Report and **Appendix B1.4** Environment Assessment Methodology. Detailed breakdown of the assessment input data and results can be found in **B3.7 Natural Capital Annex** (Workbooks 1-9).

The tables below present:

1. Change related to construction of the options without any BNG mitigation in place.
2. Change related to construction of the options assuming incorporation of BNG mitigation (i.e. habitat creation) within option design. The proposed BNG mitigation measures which underpin this assessment are described in **Appendix B.3.8 BNG and Carbon** and associated **B3.8 BNG Annexes**.

Note: this comparison, i.e. with and without BNG mitigation, is not the same as comparing construction and operational effects. At this stage it is not possible to determine all of the effects of the operation of the scheme as there is insufficient detail. This information will be generated as the development of the scheme progresses, and it will be used in a subsequent consideration of the impact of the scheme upon natural capital stocks.

These **Tables 1-2 to 1-6** provide overall assessment of the STT Scheme groupings for each of the key ecosystem services (i.e. Biodiversity and habitats; climate regulation; natural habitat regulation; tourism

and recreation and; air quality). **Table 2-1** then provides the final overall natural capital account for each group.

Only habitat creation BNG mitigation measures are included in the Natural Capital Assessment as these represent a permanent change in extent of natural capital stock. Other BNG mitigation measures include habitat improvement (e.g. from poor to moderate status): these are described in **Appendix B.3.8**. It should be noted that has not been possible to monetise the benefits of habitat condition improvement as there is not enough information available on how ecosystem service provision is affected by changes to habitat quality.

Gate 2: *The assessment at Gate 2 will seek to include an assessment of changes to ecosystem service provision from habitat improvement measures.*

1.4 Biodiversity and Habitat

The change in biodiversity and habitat ecosystem services resulting from the four STT Scheme groups, with and without mitigation, is presented in **Table 1-3**. This has been based on the outputs of the BNG assessment as presented in **Appendix B3.8**. The assessment shows that there is some loss to urban and freshwater habitats that will not be mitigated through the currently proposed BNG uplift. This is reflective of the Defra Biodiversity Metric which requires a net gain in overall habitat units rather than a net gain for each habitat type.

Within the current version of the Defra River Metric mitigation/compensation for 10% BNG cannot to be calculated for river habitat loss due to errors in the multipliers of the River Metric 2.0 and therefore are not included within the BNG assessment. Therefore, a bespoke solution would need to be agreed with the regulators to mitigate for freshwater habitat losses; however, version 3.0 is due for release in 2021 and is likely to resolve this issue.

Table 1-3 Summary of biodiversity and habitat ecosystem service changes with and without BNG uplift for each STT Scheme group*

Group	Summary	Habitat change (without BNG uplift)	Habitat change (with BNG uplift)
Pipeline Conveyance Groupings			
1 (without Minworth)	Majority of habitat lost is farmland, which provides relatively little biodiversity benefit compared to freshwater and woodland habitats. Potential habitat creation areas consist of farmland, heathland and woodland to compensate losses in biodiversity.	-10.43 Ha urban -430.55 Ha farmland -0.018 Ha freshwater -0.73 Ha woodland	-10.43 Ha urban -0.018 Ha freshwater 60 Ha farmland (traditional orchard) 1 Ha heathland 53 Ha woodland
2 (with Minworth)	Further increases in urban and farmland habitats lost. Potential habitat creation areas consist of farmland, heathland and woodland to compensate losses in biodiversity.	-30.33 Ha urban -495.48 Ha farmland -0.018 Ha freshwater -0.73 Ha woodland	-30.33 Ha urban -0.018 Ha freshwater 70 Ha farmland 1 Ha heathland 63 Ha woodland
Canal Conveyance Groupings			
3 (without Minworth)	Majority of habitat lost is urban and farmland, which provides relatively little biodiversity benefit compared to freshwater and woodland habitats. Habitat creation areas for Cotswold Canals have not yet been calculated, resulting in an under-representation of BNG uplift.	-73.20 Ha urban -370.27 Ha farmland -2.24 heathland -6.54 Ha freshwater -10.48 Ha woodland	-73.20 Ha urban -6.54 Ha freshwater 1 Ha farmland (traditional orchard) 1 Ha heathland 3 Ha woodland
4 (with Minworth)	10 Ha woodland creation area provides the largest increase to biodiversity from previous groups. Uplift still under-represented due to lack of habitat creation area from Cotswold Canals element.	-93.10 Ha urban -435.19 Ha farmland -2.24 Ha heathland -6.54 Ha freshwater -10.48 Ha woodland	-93.10 Ha urban -6.54 Ha freshwater 2 Ha farmland (traditional orchard) 1 Ha heathland 13 Ha woodland

*Note: Habitats that make up the 10% minimum uplift are based on the BNG assessment (see B2.8 and B3.8). These have been assessed via the Defra Biodiversity metric 2.0 which provides for an assessment of which combination of habitats (and condition improvement) will result in the greatest BNG uplift.

1.5 Climate regulation

The change in climate regulation services resulting from the four STT Scheme groups, with and without mitigation, is presented in **Table 1-4**.

Table 1-4 Summary of climate regulation ecosystem service changes with and without BNG uplift for each STT Scheme group

Group	Summary	Carbon value (£/year) (without BNG)	Carbon value (£/year) (with BNG)
Pipeline Conveyance Groupings			
1 (without Minworth)	Carbon sequestration from BNG uplift far outweighs that lost through construction. Largest contributor to this is the 50 Ha of woodland to be created as uplift for the Deerhurst element.	-£9,011	£18,358
2 (with Minworth)	Further increase in carbon value under BNG uplift scenario from Minworth woodland habitat creation	-£9,742	£21,334
Canal Conveyance Groupings			
3 (without Minworth)	Uplift considerably outweighs stocks lost. Majority of benefit (~£22k) derived from Cotswold Canal woodland habitat creation.	-£7,652	£25,755
4 (with Minworth)	Further increase in carbon value under BNG uplift scenario from Minworth woodland habitat creation	-£8,382	£28,730

1.6 Natural Hazard Regulation

The change in natural hazard (flood) regulation services resulting from the four STT Scheme groups, with and without mitigation, is presented in **Table 1-5**.

Table 1-5 Summary of flood regulation ecosystem service changes with and without BNG uplift for each STT Scheme group

Group	Summary	Flood regulation value (£/year) (without BNG uplift)	Flood regulation value (£/year) (with BNG uplift)
Pipeline Conveyance Groupings			
1 (without Minworth)	Only the Deerhurst pipeline element construction zone will have any disbenefits to flood regulation, however the benefits to flood regulation from planned habitat creation areas are expected to outweigh these.	-£91	£8,050
2 (with Minworth)	No further losses to hazard regulation but gains from additional BNG uplift.	-£91	£9,200
Canal Conveyance Groupings			
3 (without Minworth)	Only the Cotswold canals element construction zone will have and disbenefits to flood regulation, however the benefits to flood regulation from planned habitat creation areas are expected to outweigh these. Stocks lost are much larger than Deerhurst pipeline option	-£3868	£10,925
4 (with Minworth)	No further losses to hazard regulation but gains from additional BNG uplift.	-£3868	£12,075

1.7 Water Purification

The change in water purification services resulting from the four STT Scheme groups, with and without mitigation, is presented in **Table 1-6**. At this stage, only a qualitative assessment has been undertaken.

Table 1-6 Summary of water purification ecosystem service changes with and without BNG uplift for each STT Scheme group*

Group	Summary	Impact without BNG	Impact with BNG
Pipeline Conveyance Groupings			
1 (without Minworth)	Increased dilution of pollutants in the Severn due to reduced abstraction at both Mythe and Shrewsbury, and increased flow from Vyrnwy reservoir plus potential further purification services provided as part of BNG benefits. Small disbenefit to WFD status due to discharge of treated water from Netheridge WwTW.	+ve / -ve	+ve
2 (with Minworth)	As for Group 2, with additional potential minor dilution benefits to the River Tame downstream of Minworth Wastewater Treatment Works related to increased flow under very low flow conditions.	+ve / -ve	+ve
Canal Conveyance Groupings			
3 (without Minworth)	Increased dilution of pollutants in the Severn due to reduced abstraction at both Mythe and Shrewsbury, and increased flow from Vyrnwy reservoir. Slight disbenefit due to influx of treated water from Netheridge WwTW which has been identified as having a potential WFD deterioration impact. Natural asset enhancement provided as part of BNG benefits and habitat enhancement/creation.	+ve / -ve	+ve
4 (with Minworth)	No change from previous option.	+ve / -ve	+ve

*Water quality impacts are described in Appendix B3.2

1.8 Tourism and Recreation

Table 1.6 presents potential change in recreation value as a result of closure of existing recreation sites during construction. It is not anticipated that the options will require permanent loss of any recreation sites, therefore the values included are just applicable to the construction period. As these are given in £/year in the OrVAL tool, it has been assumed that each affected recreation site will be closed for one year due to construction. This is a 'worst-case' assumption as in reality, access to many sites may be unaffected by construction and any closures are likely to be shorter than one year.

1.9 Air Quality Regulation

The change in air quality regulation services resulting from the four STT Scheme groups, with and without mitigation, is presented in **Table 1-7**.

Table 1-6 Summary of tourism and recreation ecosystem service changes with and without BNG uplift for each STT Scheme group

Group	Summary	Recreation (without BNG, during construction)	Recreation (with BNG – qualitative only*)
Pipeline Conveyance Groupings			
1 (without Minworth)	Figures represent the worst-case-scenario revenue impact where affected recreation sites close down entirely, with potential resulting impacts on physical health and well-being. In reality the majority will be able to remain operational throughout construction. Impacts on recreation from BNG uplift are not possible to quantify until definitive uplift sites have been selected	-£1,393,240	Provision of additional woodland habitat as part of required BNG uplift may improve tourism and recreation if visitor facilities are included in woodland scheme design (e.g. footpaths, information boards).
2 (with Minworth)		-£1,878,318	
Canal Conveyance Groupings			
3 (without Minworth)	Figures represent the worst-case-scenario revenue impact where affected recreation sites close down entirely, with potential resulting impacts on physical health and well-being. In reality the majority will be able to remain operational throughout construction. Impacts on recreation from BNG uplift are not possible to quantify until definitive uplift sites have been selected.	-£2,757,557	Provision of additional woodland habitat as part of required BNG uplift may improve tourism and recreation if visitor facilities are included in woodland scheme design (e.g. footpaths, information boards).
4 (with Minworth)		-£3,242,635	

* It has not been possible to monetise the recreation and tourism benefits of the scheme with BNG uplift as the details of the habitat creation opportunities have not been agreed, therefore these cannot be assessed using the ORVAL tool. It is unknown whether new habitat creation sites will provide additional recreation facilities as public access is unknown.

At Gate 2 the BNG opportunities will be developed further and benefits to recreation will be assessed and monetised.

Table 1-7 Summary of air quality regulation ecosystem service changes with and without BNG uplift for each STT Scheme group

Group	Summary	Air quality regulation value (£/year) (without BNG uplift)	Air quality regulation value (£/year) (with BNG uplift)
Pipeline Conveyance Groupings			
1 (without Minworth)	No construction work occurs within Air Quality Management Areas. Locations for uplift have yet to be finalised so impacts on these areas are as of yet unknown.	£0	N/A
2 (with Minworth)	4.33 Ha of urban habitat will be lost within an AQMA. The air quality regulation value of this land is 0 so no stocks are lost. Locations for uplift have yet to be finalised so impacts on these areas are as of yet unknown.	£0	N/A
Canal Conveyance Groupings			
3 (without Minworth)	No construction work occurs within Air Quality Management Areas. Locations for uplift have yet to be finalised so impacts on these areas are as of yet unknown.	£0	N/A
4 (with Minworth)	4.33 Ha of urban habitat will be lost within an AQMA. The air quality regulation value of this land is 0 so no stocks are lost. Locations for uplift have yet to be finalised so impacts on these areas are as of yet unknown.	£0	N/A

2 Natural Capital Summary

Table 2-1 summarises the total change in ecosystem service benefits for each of the four STT Scheme groups. This does not include recreation and tourism impacts as these are applicable during the construction period only, and there is a high level of uncertainty around the impacts of construction on access to local recreation sites.

Table 2-1 Summary of overall natural capital impacts of each STT Scheme grouping

Group	Summary	Overall ecosystem service change (without BNG) (£/year ¹)	Overall ecosystem service change (with BNG) (£/year)
Pipeline Conveyance Groupings			
1 (without Minworth)	Overall a considerably less destructive option. Group 3 causes fewer stock losses than Group 1 of Cotswold Canals options, however BNG provides less additional value as less habitat creation is required to compensate.	-£9,102	£26,408
2 (with Minworth)		-£9,833	£30,534
Canal Conveyance Groupings			
3 (without Minworth)	Much larger impact on ecosystem service, larger BNG uplift planned as a result of this.	-£11,520	£36,680
4 (with Minworth)		-£12,250	£40,805

The results show that without mitigation, the Pipeline Conveyance Scheme groupings have a smaller overall loss in ecosystem service provision compared to the Cotswold Canal option.

However, due to the larger option footprint, the Cotswold Canal Conveyance Scheme groupings will require a greater habitat uplift to achieve BNG requirements, and this may lead to a greater increase in natural capital stock and a higher value of ecosystem service provision once BNG mitigation measures are considered.

Gate 2: It will be important at Gate 2 to confirm the BNG measures that are to be included in the option design so that the natural capital benefits of these can be better understood, refined and quantified. This will include terrestrial and river habitat mitigation. A full list of Gate 2 recommendations and next steps are included in B2.7.

¹ This includes a temporary loss of recreation benefit during the construction period only.



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