



United Utilities Water

Habitats Regulations Assessment of the Water Resource Management Plan 2024

Information to support an assessment under Regulation 63
of the *Conservation of Habitats and Species Regulations*
2017



Report for



Main contributors



Issued by



Approved by



WSP

Canon Court West

Abbey Lawn

Shrewsbury SY2 5DE

United Kingdom

Tel +44 (0) 1743 342 000

Doc Ref. 806845-WOOD-ZZ-XX-RP-OE-00006_S3_P14b

x:\uk\gbwwk300-war\shared\projects\806845 uu wrmp24 environmental appraisal\delivery\d design_technical\reports\hra\hra report\sept24 final\806845-wood-zz-xx-rp-oe-00006_s3_p14b uu wrmp hra - nov24 final [redacted].docx

Copyright and non-disclosure notice

The contents and layout of this report are subject to copyright owned by WSP save to the extent that copyright has been legally assigned by us to another party or is used by WSP under licence. To the extent that we own the copyright in this report, it may not be copied or used without our prior written agreement for any purpose other than the purpose indicated in this report. The methodology (if any) contained in this report is provided to you in confidence and must not be disclosed or copied to third parties without the prior written agreement of WSP. Disclosure of that information may constitute an actionable breach of confidence or may otherwise prejudice our commercial interests. Any third party who obtains access to this report by any means will, in any event, be subject to the Third Party Disclaimer set out below.

Third party disclaimer

Any disclosure of this report to a third party is subject to this disclaimer. The report was prepared by WSP at the instruction of, and for use by, our client named on the front of the report. It does not in any way constitute advice to any third party who is able to access it by any means. WSP excludes to the fullest extent lawfully permitted all liability whatsoever for any loss or damage howsoever arising from reliance on the contents of this report. We do not however exclude our liability (if any) for personal injury or death resulting from our negligence, for fraud or any other matter in relation to which we cannot legally exclude liability.

Management systems

This document has been produced in full compliance with our management systems, which have been certified to ISO 9001, ISO 14001 and ISO 45001 by Lloyd's Register.

Document revisions

No.	Details	Date
1	Draft for UUW Review	17/08/21
2	Draft for UUW Review	26/09/21
3	Draft for UUW Review	27/09/21
4	Issued for consultee review	29/09/21
5	Draft Final for UUW Review	02/06/23
6a	Publication (unredacted)	20/06/23
7a	Draft for UU	05/02/24
8a	Updated Final (unredacted)	12/02/24
9a	Updated Final (unredacted)	26/06/24
10	Draft for UU	24/09/24
11a	Draft for UU	08/10/24
12a	Final Draft (unredacted)	10/10/24
13a	Final Draft (unredacted)	18/11/24
14b	Publication Version	29/11/24

Contents

1.	Introduction	8
1.1	United Utilities Water's Water Resources Management Plan 2024	8
1.2	Habitats Regulations Assessment	9
1.3	This Report	10
2.	U UW's WRMP24	11
2.1	Water Resources Planning	11
2.2	U UW's WRMP24	14
	Supply-side options	15
	Demand-side options	16
	Drought Plan options	18
2.3	Relationship with the WRW Regional Plan and SROs	20
	Regional Plan	20
	Strategic Resource Options	22
3.	Approach to HRA	24
3.1	Key Guidance	24
3.2	Application of HRA to WRMPs	25
	Process Overview	25
	Key Challenges and Assumptions	27
3.3	HRA of the Preferred Options	31
	Geographical Scope	31
	Data Collection	32
	Preferred Options Assessment	36
3.4	Plan-Level In Combination Assessments	38
4.	Preferred Options Screening	41
4.1	Demand-side options	41
4.2	Supply-side options	42
4.3	Screening Stage In Combination Assessment	45
4.4	Drought Option Screening	45
4.5	Screening Conclusions	45
5.	Appropriate Assessment – Mersey Estuary SPA / Ramsar	47
5.1	Screening Summary	47
5.2	European site summaries	47
	Site overviews	47
	Interest Features and Conservation Objectives	47
	Condition, Pressures and Threats	49
5.3	Option summary, key pathways, and incorporated measures	49
	Option summary	49
	Summary of main pathways for potential effects	50

	Incorporated measures	51
5.4	Assessment of Effects – Operation	51
	Anticipated environmental changes from operation	51
	Assessment of effects – freshwater inputs to the Mersey Estuary and effects on qualifying bird species	55
5.5	Assessment of Effects – Construction	59
	Other projects ‘in combination’	60
	Residual uncertainties and mitigation	63
5.6	Assessment Summary	63
6.	Appropriate Assessment – Liverpool Bay SPA; Mersey Narrows and North Wirral Foreshore SPA / Ramsar	64
6.1	Screening Summary	64
6.2	Assessment of Effects	65
	Mersey Narrows and North Wirral Foreshore SPA / Ramsar	65
	Liverpool Bay SPA	66
7.	Strategic In Combination Assessment	68
7.1	Between-option ‘in combination’ effects	68
7.2	‘In combination’ effects with other UUW Plans	68
	NWT SRO	68
	Drought Plan	68
	Drainage and Wastewater Management Plan (DWMP)	69
7.3	Between-company ‘in combination’ effects	69
	WRMPs	69
	Drought Plans	69
7.4	In combination effects with other plans and programmes	70
	Effects with other strategic plans and water resource demand	70
	Effects with major projects	70
	Minor projects	71
	Effects with strategic development pressure	71
8.	Demand-Side Options	72
8.1	Screening Summary	72
8.2	Appropriate Assessment	72
9.	Conclusions	73
9.1	Overview	73
9.2	Screening	73
9.3	Appropriate Assessments	74
9.4	Conclusion	74
	Table 2.1 Final WRMP supply-side options	15
	Table 2.2 Preferred demand-side options – Strategic WRZ	16
	Table 2.3 Preferred demand-side options – Carlisle WRZ	17
	Table 2.4 Preferred demand-side options – North Eden WRZ	18

Table 2.5	Options in the 2022 Drought Plan	18
Table 4.1	Summary of screening criteria	42
Table 4.2	Option screening summary – WR076 SWN_River Bollin	43
Table 4.3	European sites that may be affected by Drought Plan and WRMP options	45
Table 5.1	Maximum impact of option at different flows with HOF at Q98	53
Table 5.2	Mersey Estuary SSSI units in the upper estuary	56
Table 5.3	National Infrastructure Projects that may affect the Mersey estuary	61
Table 9.1	Summary of options and sites requiring ‘appropriate assessment’	73
Table 9.2	Summary of HRA conclusions, key uncertainties and additional investigations that may be required	75

Figure 2.1	Environmental assessments into option and plan development	13
------------	--	----

Bibliography		77
--------------	--	----

Appendix A	European sites considered by the HRA process
Appendix B	Notes on Effect Pathways
Appendix C	Standard Mitigation and Avoidance Measures
Appendix D	Assessment of Reserve Options

1. Introduction

Water Resource Management Plans set out how water supply-demand balances and water supply security will be maintained over the next 25 years and beyond. These plans are subject to the provisions of the *Conservation of Habitats and Species Regulations 2017* (as amended).

1.1 United Utilities Water's Water Resources Management Plan 2024

- 1.1.1 The Water Act 2003 requires that all water companies in England Wales prepare and maintain Water Resources Management Plans (WRMPs). These plans set out how public water supply (PWS) will be maintained over a minimum of 25 years in a way that is economically, socially and environmentally sustainable. The WRMPs must be revised every five years.
- 1.1.2 United Utilities Water (Uuw) has finalised its Water Resources Management Plan 2024 (WRMP24). The WRMP24 sets out a long-term, best value and sustainable plan for water supplies in the North West. The WRMP24 plans for an adequate supply to meet demand from 2025 to 2050 and beyond, and a supply system that is resilient to drought. WRMPs are reviewed on a rolling five-year basis, with Uuw's most recent plan being published in 2019.
- 1.1.3 As part of the preparation of WRMP24, Uuw published its Draft Water Resources Management Plan 2024 (Draft WRMP24) for consultation between the 7th December 2022 and 15th March 2023, following submission to Defra. The Draft WRMP24 set out Uuw's proposals to ensure continued delivery of a secure and reliable supply of water from 2025 to 2050, looking beyond out to the year 2100.
- 1.1.4 Taking into account the responses received to the consultation on the Draft WRMP24 from regulators, stakeholders and the public, further engagement and environmental assessment, Uuw selected its preferred plan for WRMP24. A Revised Draft Water Resources Management Plan 2024 (Revised Draft WRMP24 or rdWRMP24) was prepared and submitted to the Secretary of State for review and approval (21 June 2023).
- 1.1.5 The Secretary of State subsequently requested further information on the Revised Draft WRMP (December 2023)¹, which was provided by Uuw alongside updated environmental reports (February 2024); however, modelling of some options demonstrated issues with Water Framework Directive (WFD) compliance, and so Defra's 'Direction to Publish' letter² indicated that amendments to the preferred options were required.
- 1.1.6 Uuw's WRMP24 has been developed within a regional water resources planning framework covering all or part of the operational areas of Dŵr Cymru Welsh Water (DCWW), Hafren Dyfrdwy (HD), Severn Trent Water (STW), South Staffordshire Water (SSW) and United Utilities Water (Uuw)³ that is managed by Water Resources West

¹ Letter from Defra Deputy Director – Water Sector Delivery to UU (no reference) dated December 2023.

² Letter from Defra Deputy Director (Floods and Water) to UU (no reference) dated 06 September 2024.

³ Hafren Dyfrdwy operates in mid-Wales and borders the WRW Regional Plan area; no Hafren Dyfrdwy water resources zones are included in the regional plan and so Hafren Dyfrdwy is an associate rather than core member of WRW.

(WRW). WRW is currently preparing a Regional Plan⁴ for the period 2025 to 2085 that will address long-term regional and inter-regional, multi-sectoral water resources management pressures and will draw on water resource options from the member water companies' WRMP24s, as well as the Strategic Resource Options (SROs) being taken forward by the companies.

1.2 Habitats Regulations Assessment

- 1.2.1 Water company WRMPs are subject to the provisions of the *Conservation of Habitats and Species Regulations 2017* (as amended) (the 'Habitats Regulations')⁵.
- 1.2.2 Regulations 63 and 64 transposed the provisions of Articles 6(3) and 6(4) of Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the 'Habitats Directive') as they related to plans or projects in England Wales.
- 1.2.3 Regulation 63 states that if a plan or project is “(a) *is likely to have a significant effect on a European site⁶ or a European offshore marine site⁷ (either alone or in combination with other plans or projects); and (b) is not directly connected with or necessary to the management of the site*” then the competent authority must “...*make an appropriate assessment of the implications for the site in view of that site’s conservation objectives*” before the giving consent or authorisation. The plan or project can only be given effect if it can be concluded (following an ‘appropriate assessment’) that it “...*will not adversely affect the integrity*” of a site, unless the provisions of Regulation 64 are met.
- 1.2.4 This assessment process is known as Habitats Regulations Assessment (HRA)⁸. An HRA determines whether there will be any ‘likely significant effects’ (LSE) on any European site

⁴ EA (2020) *Water Resources National Framework: Appendix 2: Regional planning*.

⁵ The 2017 Regulations have been amended by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 to reflect the UK’s exit from the EU, although these largely carried forward the provisions and terminology of the 2017 Regulations and do not fundamentally alter their interpretation. This report therefore primarily refers to the 2017 Regulations and (where appropriate for clarity) the relevant provisions of the Habitats Directive.

⁶ As noted, the 2019 amendment to the Habitats Regulations largely carried forward the provisions and terminology of the 2017 Regulations, and so the term ‘European site’ is currently retained and for all practical purposes the definition is essentially unchanged. European sites are therefore: any Special Area of Conservation (SAC) from the point at which the European Commission and the UK Government agreed the site as a ‘Site of Community Importance’ (SCI) (if this was before 31 Jan 2020); any classified Special Protection Area (SPA); and any candidate SAC (cSAC). However, the term is also commonly used when referring to potential SPAs (pSPAs), to which the provisions of Article 4(4) of Directive 2009/147/EC (the ‘new wild birds directive’) are applied; and to possible SACs (pSACs) and listed Ramsar Sites, to which the provisions of the Habitats Regulations are applied a matter of Government policy (NPPF para. 187; TAN5 para. 5.1.3) when considering development proposals that may affect them. “European site” is therefore used in this document in its broadest sense, as an umbrella term for all of the above designated sites. Note, it is likely that this term will be supplanted at some point in the future although an appropriate UK-wide alternative has not yet been agreed (e.g. the NPPF in England has adopted the term ‘Habitats sites’ to refer collectively to those sites defined by Regulation 8; the *Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019* does not offer a direct alternative to “European site” but uses the term ‘National Site Network’ in place of ‘Natura 2000’).

⁷ ‘European offshore marine sites’ are defined by Regulation 18 of The Conservation of Offshore Marine Habitats and Species Regulations 2017; these regulations cover waters (and hence sites) over 12 nautical miles from the coast.

⁸ The term ‘Appropriate Assessment’ has been historically used to describe the process of assessment; however, the process is more typically referred to as ‘Habitats Regulations Assessment’ (HRA), with the term ‘Appropriate Assessment’ limited to a specific stage within the process.

as a result of a plan's implementation (either on its own or 'in combination' with other plans or projects)⁹ and, if so, whether there will be any 'adverse effects on site integrity'¹⁰.

1.3 This Report

- 1.3.1 UUW has a statutory duty to prepare a WRMP and is therefore the Competent Authority for the HRA of that plan. UUW has appointed WSP Environment & Infrastructure UK Ltd (formerly Wood Group UK Limited) and Ricardo Energy and Environment (Ricardo) to assist with its assessment of WRMP24 against Regulations 63 and (if required) 64.
- 1.3.2 As noted, the Secretary of State requested further information on the rdWRMP24 which is being provided by UUW. **This updated HRA report accompanies UUW's Final WRMP document, and summarises the assessment of UUW's preferred options against the requirements of the Habitats Regulations, with consultee comments on the rdWRMP24 and its HRA addressed as appropriate.**
- 1.3.3 The report is structured as follows:
- **Section 2** provides a brief summary of the WRMP and the preferred options;
 - **Section 3** sets out the approach to HRA of WRMP24, including the key issues for these strategic plans (**Section 3**);
 - **Section 4** documents the 'screening' of the preferred options;
 - **Sections 5 – 8** provide 'appropriate assessments' for those European sites where significant effects could not be excluded, including option-specific 'in combination' assessments;
 - **Section 9** summarises the plan-level 'in combination' assessment;
 - **Section 10** summarises the assessment for the demand-side options; and
 - **Section 11** sets out the proposed conclusion of the HRA of UUW's WRMP24 (assuming that the adopted version of the WRMP reflects the submitted WRMP, and subject to any additional data gathering that may be required to resolve residual uncertainties).
- 1.3.4 The report necessarily focuses on the assessment of the preferred options; the iterative HRA-related processes used to inform the development of the plan (including the feasible options assessments) are documented separately for clarity. In addition, the assessment is of the WRMP only and not the WRW Regional Plan (although it will contribute to the HRA of the Regional Plan).
- 1.3.5 Note that the HRA draws on the environmental data and assessments undertaken within other assessments, particularly in relation to operational effects and the hydrological zone of influence. These include:
- the Water Framework Directive (WFD) assessment
 - NWT SRO Gate 2: Assessment of options involving groundwater abstractions
 - NWT SRO Gate 2: Assessment of options involving surface water abstractions
- 1.3.6 This HRA report should therefore be read in conjunction with these reports.

⁹ Also referred to as the 'test of significance'.

¹⁰ Also referred to as the 'integrity test'.

2. UUW's WRMP24

The WRMP process identifies potential deficits between the water available for supply and the projected demand. UUW has identified one 'supply-side' option and 33 'demand-side' options to resolve predicted deficits in its supply area.

2.1 Water Resources Planning

- 2.1.1 The WRMP process establishes supply and demand balances for each Water Resource Zone¹¹ (WRZ) operated by the water company, identifying potential deficits between the water available for supply and the projected demand. Each supply-demand balance calculation is structured around a consistent central set of planning assumptions and is used to identify WRZs in deficit over the plan period. Options are then proposed to resolve these deficits.
- 2.1.2 The supply-demand balance calculations are based on deployable output (DO) and demand forecasts. The estimation of DO is based on:
- abstraction volumes allowed under current statutory licences, as impacted by actual source yield;
 - any future reductions in abstraction expected under environmental improvement regimes; and
 - predicted future demand for water based on government data for population and housing growth plans (including Local Plans) and information on major infrastructure schemes likely to have high water demand.
- 2.1.3 It should be noted that various licence review arrangements and protocols are implemented at the start of each WRMP cycle, which take account of the Environment Agency's or Natural Resources Wales' requirements through the Water Industry National Environment Programme (WINEP) and National Environment Programme (NEP) respectively. This review process (and WINEP) is undertaken in conjunction with Natural England, which identifies protected sites (including European sites) to the EA where it believes abstraction-related issues are affecting the achievement of favourable conservation status.
- 2.1.4 This review is important to the development of the supply/DO forecast at the start of the WRMP process, and is consequently reflected in Section 5.4 ('Developing Your Supply Forecast') of the Water Resource Planning Guideline (2020 draft and 2023 published versions) which outlines the requirements for sustainable abstraction taking into account existing statutory requirements and environmental destination.

¹¹ Section 4.4. of the Water Resources Planning Guideline (WRPG) defines a water resource zone as "an area within which the abstraction and distribution of water to meet demand is largely self-contained (with the exception of agreed bulk transfers)".

2.1.5 Demand forecasts are completed in accordance with the *Water Resources Planning Guideline*¹²) and consider (*inter alia*):

- Estimates of baseline demand from:
 - ▶ household customers;
 - ▶ non-household customers;
 - ▶ water leaks;
 - ▶ any other losses or uses of water such as water taken unbilled.
- Future demands which will be subject to many influences, including:
 - housing development and population changes, including changes in occupancy;
 - the impact of prolonged high demand;
 - changes in water use behaviour and distribution of demand (in both household and non-household users);
 - metering and smart metering;
 - changes in government policy and expectations, for example water efficiency standards in new homes and water labelling;
 - changing water efficiency and sustainable water use practices;
 - changing design standards of devices that use water such as more efficient washing machines;
 - changes in technology and practices for leakage detection and repair;
 - a changing climate;
 - weather patterns;
 - potential changes in demand from the energy sector as it moves to low *carbon* technology.

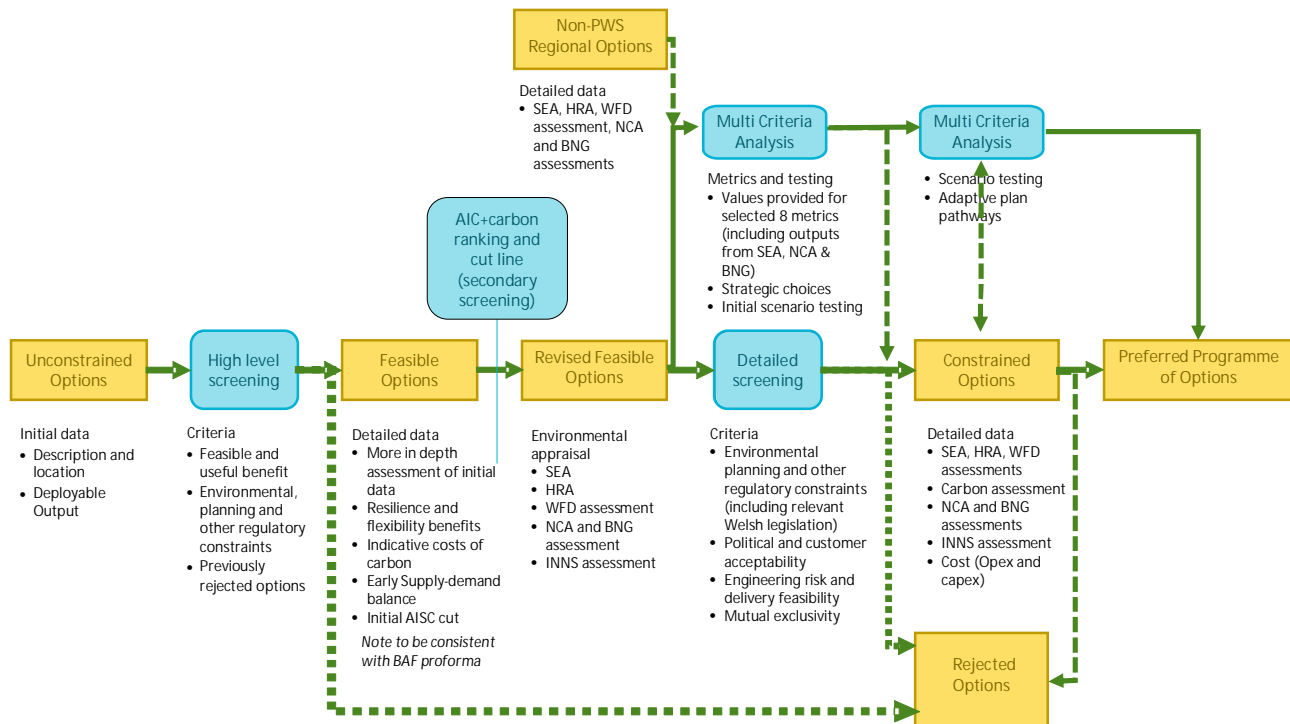
2.1.6 The supply forecast informs the supply-demand balance calculations for the planning period, which is in effect the ‘predicted future baseline’ for water resources in a supply area. The water company then develops ‘options’ for resolving any predicted deficits in the supply-demand balance, which are then tested against various metrics to determine the ‘preferred plan’. Note that all references to WRMP ‘options’ in the WRPG are made in the commonly-accepted sense, i.e. explicit interventions proposed by the WRMP to increase water supply or reduce consumption (e.g. Section 1.1), not a broad ‘catch all’ for ongoing water company operations such as those existing abstractions that will form part of the ‘predicted future baseline’.

2.1.7 The WRMP process initially identifies as many potential deficit solutions as possible (the ‘unconstrained list’ of options) irrespective of cost or technical merit. These are then refined to identify ‘feasible options’ and subsequently the ‘preferred options’ for meeting any supply-demand deficits. All zones with deficits are subject to a decision-making process using a Multi-Criteria Analysis (MCA), and other methods where appropriate, to identify a preferred plan (comprising ‘preferred options’) to address the

¹² UK Government (2022). Water resources planning guideline [online.]. Available at: <https://www.gov.uk/government/publications/water-resources-planning-guideline/water-resources-planning-guideline>. [Accessed April 2022].

supply demand deficit. The decision-making method factors in multiple costs and benefits and considers the interaction between zones to establish a best value plan for the region (and individual company). This staged filtering process allows various assessments, including HRA, to inform the plan development (see **Figure 2.1**).

Figure 2.1 Environmental assessments into option and plan development



2.1.8 WRMP options are typically characterised as **supply-side** (measures that increase supply, such as new abstractions) or **demand-side** (measures which reduce consumption post-treatment, such as metering or leakage detection and reduction). HRAs generally focus on supply-side options¹³ and their potential effects; these options would typically involve one or more of the following:

- development of new surface or groundwater sources, or desalination of sea water ('new water');
- modification of an existing licence to alter the operational and network regimes (e.g. additional abstraction; changes in timing of abstractions; etc);
- use of 'spare water' from existing licensed sources through operational adjustments or capital works (e.g. new treatment facilities);
- re-instatement of existing, mothballed sources (with or without current licences);
- capital works to the distribution network (e.g. to improve resilience);
- transferring water from adjacent water companies or third-parties with a supply / demand surplus; or

¹³ 'Demand management' options (i.e. options designed to reduce treated water use such as metering or provision of water butts) are generally considered unlikely to have any significant or adverse effects on any European sites (see Section 3.2).

- Strategic Resource Options¹⁴ involving multiple companies and sources.

2.2 UUW's WRMP24

- 2.2.1 UUW supplies water to ~7.3 million customers in the north-west of England. The supply area includes three PWS WRZs¹⁵:
- Carlisle WRZ;
 - North Eden WRZ;
 - Strategic WRZ.
- 2.2.2 As part of the WRMP development process, UUW initially identified feasible supply-side and demand-side options to resolve deficits, improve network resilience and make water available for transfer. These options were subject to a staged filtering process (which included a high-level consideration of the HRA-related risks associated with each option) designed to establish the best-value plan for UUW taking into account the regional plan requirements.
- 2.2.3 UUW's proposed best-value plan is focussed on delivering three strategic choices:
- Achieve government targets to halve leakage and reduce customer consumption to 110 litres per person per day by 2050.
 - Support national planning by developing large-scale water transfers that are adaptable and flexible to the changing needs of other regions.
 - In line with customer preferences, improve the level of service for temporary use bans (TUBs), halving the expected frequency of occurrence to 1 in 40 years (5% annual chance). Concurrently, UUW will improve the frequency of implementing drought orders and drought permits to 1 in 50 years (2% annual chance).
- 2.2.4 UUW's demand forecast shows a very small increase of around 0.7% across the 25-year planning horizon, excluding the impacts of demand management programmes, and so the leakage reduction and water efficiency measures and TUBs measures will increase resilience in the supply.
- 2.2.5 UUW reviewed its best value plan for WRMP24 following consultation on the Draft WRMP24, and again following consultation on the Revised Draft WRMP24. The number of supply options has been significantly reduced owing to, in particular, decreased water transfer needs (following the final regional planning reconciliation round).
- 2.2.6 The Draft WRMP24 included a total of 168 Ml/d of exports to STW and Water Resources South East (WRSE) from UUW's SRZ, starting with a 75 Ml/d transfer in 2031. Seven supply options were included in preferred plan to support these transfers. Transfers to WRSE are not selected in the Final WRMP24 (linked to WRSE companies lowering their demand projections following consultation feedback), hence fewer supply options are required in WRMP24. When combined with updates to the demand management measures, this also means that improving UUW's level of service for temporary use bans (TUBs) is no longer reliant on the dual-purposing of water transfer support options.

¹⁴ There are six Strategic Resource Options (SROs) being taken forward by the companies (the Severn Thames transfer, Grand Union Canal transfer, Minworth Effluent Reuse, Severn Trent Sources, Vyrnwy Reservoir Source, United Utilities Sources).

¹⁵ A fourth WRZ, Barepot WRZ, supplies non-potable water to an industrial customer only.

- 2.2.7 The final WRMP24 therefore proposes:
- one supply options to provide 25MI/d of additional resource.
 - 33 customer, distribution and production options to provide some 282MI/d.
- 2.2.8 These options are summarised in **Table 2.1** and **Tables 2.2 – 2.5**. The WRMP24 also assumes delivery of an environmental destination scenario by 2050. This scenario will continue to take shape over time.
- 2.2.9 Further to comments received from regulators on the Draft WRMP24, the plan also includes drought permit options taken from UUW’s Drought Plan.

Supply-side options

- 2.2.10 The preferred portfolio supply-side option (including intended yield and approximate year by which the option would be required) is summarised in **Table 2.1**.
- 2.2.11 UUW has also identified four ‘reserve’ or ‘alternative’ options that might be used if the preferred option is shown (through project level HRA) to have unavoidable adverse effects on a European site; these are identified and discussed separately in **Appendix D** for clarity.

Table 2.1 Final WRMP supply-side options

Option Ref	Option Name	Summary	Yield (MI/d)	Year selected
WR076	SWN_River Bollin		25	2033

Demand-side options

2.2.12 The demand side options are summarised in **Tables 2.2 – 2.4**. Whilst their application and requirements are slightly different in each WRZ, they essentially comprise the following generic option types:

- Physical amendments to the network:
 - ▶ District Metered Area (DMA) optimisation (reducing the size of DMAs through network interventions to improve the detection of smaller leaks);
 - ▶ Flow regulators (installation of flow restrictors and pressure reducing valves);
 - ▶ In-pipe repairs and lining technologies (typically non-invasive);
 - ▶ Mains rehabilitation/renewal/replacement (typically invasive);
 - ▶ Permanent network sensors (installation of acoustic loggers within assets);
 - ▶ Pressure management (reduces leakages);
 - ▶ Enhanced metering of households (smart meters);
 - ▶ Upgrade existing household meters to smart meters;
 - ▶ Non-household (NHH) smart meters;
 - ▶ Upstream tile optimisation (installation of larger meters ‘upstream’ in the supply network to improve monitoring of network losses).
- Water efficiency support:
 - ▶ Free water efficiency audits for households;
 - ▶ Free water efficiency devices (internal or external) for households;
 - ▶ Government intervention (water labelling, standards);
 - ▶ Non-household water efficiency programmes;
 - ▶ Rainwater harvesting and water reuse (new builds).

2.2.13 It is assumed that these will be employed at various times across the planning period.

2.2.14 It should be noted that the ‘**demand side**’ measures are not geographically specific at the WRMP level, and could be applied anywhere within UJW’s network. Location-specific information on the measures is not available without specific investigations, which would form part of the package (for example, the location and severity of most leakages is not known).

Table 2.2 Preferred demand-side options – Strategic WRZ

Option Ref	Option Name	Year
WR502c	LEA-SRZ5_Permanent network sensors	2035
WR510	LEA-SRZ15_In-pipe repairs and lining technologies	2026
WR658c	WSD-SRZ10_Free water efficiency devices (inside/internal)	2026
WR661c	WUA-SRZ15_Free water efficiency visits (households)	2026

Option Ref	Option Name	Year
WR677c	WUA-SRZ10_Non-household water efficiency programme	2026
WR694f	WSA-SRZ15_Government intervention (e.g. water labelling)	2026
WR659c	WER-SRZ15_Free water efficiency devices (outside/external)	2026
WR516h1	LEA-SRZ10_Mains rehabilitation/renewal/replacement	2026
WR516h2	LEA-SRZ25_Mains rehabilitation/renewal/replacement	2037
WR511g	LEA-SRZ5_Pressure management	2049
WR520c	LEA-SRZ5_DMA optimisation	2030
WR524d	LEA-SRZ10_Upstream tile optimisation	2027
WR619c	EMT-SRZ10_Replace existing household meters with smart meters	2026
WR603e	EMT-SRZ15_Enhanced metering of households on single supplies (smart meters)	2026
WR615c	EMT-SRZ5_Replace existing non-household meters with smart meters	2026

Table 2.3 Preferred demand-side options – Carlisle WRZ

Option Ref	Option Name	Year
WR619a	EMT-CRZ10_Replace existing household meters with smart meters	2026
WR658a	WSD-CRZ10_Free water efficiency devices (inside/internal)	2026
WR661a	WUA-CRZ15_Free water efficiency visits (households)	2028
WR677a	WUA-CRZ10_Non-household water efficiency programme	2026
WR685a	WER-CRZ5_Rainwater harvesting and water reuse (new builds)	2026
WR694d	WSA-CRZ15_Government intervention (e.g. water labelling)	2026
WR659a	WER-CRZ15_Free water efficiency devices (outside/external)	2048
WR669b	ISD-CRZ15_Flow regulators	2026
WR516a1	LEA-CRZ15_Mains rehabilitation/renewal/replacement	2038
WR502a	LEA-CRZ10_Permanent network sensors	2029
WR511a	LEA-CRZ5_Pressure management	2026
WR520a	LEA-CRZ5_DMA optimisation	2027
WR603a	EMT-CRZ5_Enhanced metering of households on single supplies (smart meters)	2026
WR615a	EMT-CRZ5_Replace existing non-household meters with smart meters	2026

Table 2.4 Preferred demand-side options – North Eden WRZ

Option Ref	Option Name	Year
WR603b	EMT-NERZ5_Enhanced metering of households on single supplies (smart meters)	2026
WR694e	WSA-NERZ15_Government intervention (e.g. water labelling)	2026
WR619b	EMT-NERZ10_Replace existing household meters with smart meters	2026
WR615b	EMT-NERZ5_Replace existing non-household meters with smart meters	2026

Drought Plan options

2.2.15 The options in the 2022 Drought Plan¹⁶ are listed in **Table 2.5**. It should be noted that the HRA of the Drought Plan¹⁷ concluded that it would have no likely significant effects, alone or in combination, on any European sites (i.e. all options were screened out).

Table 2.5 Options in the 2022 Drought Plan

Option	Resource Zone	Option Type	Summary
	CRZ	Supply side	
	SRZ	Drought permit	
	SRZ	Drought permit	
	SRZ	Drought permit	
	SRZ	Drought permit	
	SRZ	Drought permit	
	SRZ	Drought permit	
	SRZ	Drought permit	
	SRZ	Drought permit	

¹⁶ https://www.unitedutilities.com/globalassets/z_corporate-site/about-us-pdfs/final-drought-plan-2022/final-drought-plan-2022.pdf

¹⁷ https://www.unitedutilities.com/globalassets/z_corporate-site/about-us-pdfs/water-resources/uu-revised-draft-dp-hra-300721.pdf

Option	Resource Zone	Option Type	Summary
	SRZ	Drought permit	
	SRZ	Drought permit	
	SRZ	Drought permit	
	NERZ	Drought permit	
	NERZ	Drought permit	
	NERZ	Drought permit	
Drought publicity	All zones	Demand side	Increased water efficiency messages via increased customer communications
Enhanced leakage detection and repair	All zones	Demand side	Enhanced leakage detection and repair activities targeted to appropriate areas and where greatest savings can be achieved.
Campaign for voluntary water use restraint	All zones	Demand side	Voluntary water use restrictions (applying to the general use of a hosepipe for domestic purposes) and statutory water use restrictions as set out in Section 76 of the Water Industry Act 1991 (as amended by Section 36 of the Flood and Water Management Act 2010)
Temporary Use Ban (TUB)	All zones	Demand side	Implemented when “experiencing, or may experience, a serious shortage of water for distribution”. Due to the level of connectivity a TUB would be applied across each of the WRZs rather than locally.
Ordinary Drought Order (Non-Essential Use Ban)	All zones	Demand side	Drought order to ban non-essential uses of water (as set out in the Drought Direction 2016)
Pressure management	All zones	Demand side	Reducing the pressure in certain parts of UU’s water network to help reduce demand.
Drought publicity	All zones	Demand side	Increased water efficiency messages via increased customer communications

CRZ – Carlisle Resource Zone
 SRZ – Strategic Resource Zone
 NERZ – North Eden Resource Zone

2.3 Relationship with the WRW Regional Plan and SROs

Regional Plan

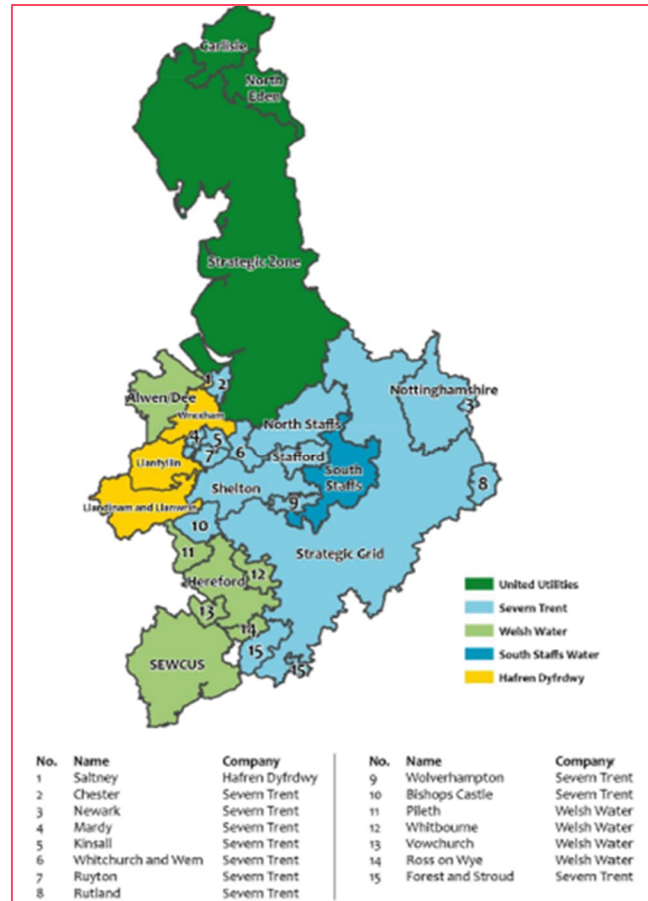
2.3.1 The Water Resources West (WRW) Regional Plan covers the management of water resources in the North West of England, the West Midlands and the cross-border catchments with Wales. It includes all or part of the operational areas of Dŵr Cymru Welsh Water (DCWW), Hafren Dyfrdwy¹⁸, Severn Trent Water (STW), South Staffordshire Water (SSW) and UuW (see figure to right).

2.3.2 These five companies, like all water companies in England Wales, are required¹⁹ to prepare, maintain and publish a WRMP.

2.3.3 WRW is taking an integrated approach to preparing the Regional Plan and the WRMPs and aims to provide a Regional Plan that is multi-sector and takes account of the water supply needs of non-public water supply (non-PWS) abstractors as well as public water supplies. WRW member water companies have used a regionally consistent set of methodologies to reflect local, regional and national needs into the development of the plans.

2.3.4 Each water company is leading development of the WRMP and relevant aspects of the regional plan in the parts of their area included with WRW as a single piece of work. This has necessitated a high degree of integration and fostered greater collaboration between companies and stakeholders.

2.3.5 The WRW Regional Plan covers the period 2025 to 2085 and addresses long-term regional and inter-regional, multi-sectoral water resources management pressures and draws on water resource options from the member water companies' WRMP24s, as well as the Strategic Resource Options²⁰ (SROs) being taken forward by the companies.



¹⁸ Hafren Dyfrdwy combined the water service area of Dee Valley Water and Severn Trent lying in Wales from 1st July 2018.

¹⁹ Section 37 and 37A of Water Industry Act 1991, as amended by the Water Act 2003 and the Water Act 2014.

²⁰ The Strategic Water Resource Options (SROs) programme has been initiated by Ofwat to provide at least 1500Ml/d of water to areas of England facing a water deficit. The SRO Programme includes 17 schemes which will be funded and assessed during AMP7 to determine the right portfolio of projects to be selected by Regional Plans ready for implementation in AMP8. Schemes are evaluated at a series of decision points ('Gates').

- 2.3.6 In March 2020, WRW published its Initial Resource Position²¹. This identified that by 2050, an estimated 166 million litres per day of additional water would be needed for public water supplies, and in the region of an additional 41 million litres per day needed for other abstractors. In an update²² (published in February 2021) to its resource position, WRW noted that the need maybe greater than previously estimated. WRW published its Emerging Regional Plan²³ in January 2022. This updated the forecast, taking into account a commitment to achieve a 50% reduction in leakage from the public water supply network by 2050 and a per capita consumption reduction to 110 litres/person/day. The updated WRW forecast identified that 215MI/d of new water would be needed to meet public supply demand by 2031 and that an additional 63MI/d would be needed by 2050, for non-public water supply sectors.
- 2.3.7 On 14th November 2022, WRW published its Draft Regional Plan²⁴ for consultation which closed on 20th February 2023. The Draft Regional Plan identified that by 2050, the WRW region would need an additional 221 MI/d to meet public water supply needs and 97 MI/d to meet the needs of other sectors. To meet this demand, whilst also reflecting the needs of other regions, WRW's draft best value plan included:
- action to reduce daily water demand by over 900 million litres across the whole region. This included the Government introducing water labelling to save 280 MI/d;
 - STW delivering a large number of supply options to offset abstraction reduction for environmental improvement;
 - U UW developing new water resources in the North West to support water transfers and provide benefit to customers in the North West, by reducing the frequency of temporary use bans (hosepipe bans);
 - DCWW upgrading the network in South-East Wales and recovering losses from a water treatment works; and
 - a range of options to take water resources towards WRW's environmental destination. This includes improving water quality and improving habitats.
- 2.3.8 Following the close of consultation on the Draft Regional Plan in February 2023, WRW has in conjunction with other regional groups completed a further round of supply demand reconciliation, reflecting post consultation changes and is now producing its Final Regional Plan for publication.
- 2.3.9 The final regional planning reconciliation round reconciled three pathways related to water trading:
- **Preferred pathway:** Includes Minworth Reuse SRO raw water flow augmentation to support the Grand Union Canal (GUC) Transfer SRO, selected from 2031 (50 MI/d in 2031 increasing to 100 in 2040) – note, Minworth Reuse SRO and GUC SRO are options in the STW WRMP.

²¹ WRW (2020) *Initial Resource Position, March 2020*. Available from <https://waterresourceswest.co.uk/s/WRW-Initial-Resource-Position.pdf> [Accessed August 2022].

²² WRW (2021) *Update on our Resource Position, February 2021*. Available from <https://waterresourceswest.co.uk/s/WRW-Update-on-Resource-Position-February-2021-web.pdf> [Accessed March 2022].

²³ WRW (2022) *Emerging Regional Plan, January 2022*. Available from: <https://static1.squarespace.com/static/5e67889204d86850e1fdcece/t/61e5a4e237970d62de92fa10/1642439906757/WRW+Emerging+Regional+Plan+Executive+Summary.pdf>

²⁴ WRW (2022) *Draft Regional Plan*. Available from <https://static1.squarespace.com/static/5e67889204d86850e1fdcece/t/6374bcc4bc2d9e543adfc90a/1668594894637/Draft+Regional+Plan+v1.1.pdf> [Accessed May 2023].

- **WRSE higher demand scenario:** GUC with Minworth support selected from 2031 (50 MI/d in 2031 increasing to 100 in 2040); Severn Thames Transfer (STT) SRO (500 MI/d pipeline with support) selected from 2050.
- **WRSE no SESRO (South East Strategic Reservoir Option) scenario:** GUC with Minworth support selected from 2031 (50 MI/d in 2031 increasing to 100 in 2040); STT SRO (500 MI/d pipeline with support) selected from 2039.

2.3.10 UUW's final WRMP24 is consistent with the reconciled regional preferred pathway, aside from a delay to the 25 MI/d transfer to Severn Trent Water from 2031 to 2033.

Strategic Resource Options

2.3.11 Two SROs are associated to some extent with the UUW supply area, the North-West Transfer (NWT) SRO and the Severn-Thames Transfer (STT) SRO.

2.3.12 UUW's final WRMP24 is consistent with the reconciled regional preferred pathway, aside from a delay to the 25 MI/d transfer to Severn Trent Water from 2031 to 2033. Under this pathway the NWT SRO only requires the supply-side option that is in the final WRMP24 (i.e. this version of the NWT SRO is essentially the same as the final WRMP24), and the STT SRO is not deployed.

2.3.13 However, under the 'WRSE higher demand' and 'No SESRO' scenarios, additional water from [REDACTED] would be transferred to the Water Resources South East (WRSE) region via the STT SRO, requiring further sources of supply (from the constrained list of UUW WRMP24 options) to maintain supply resilience to UUW customers; the 'WRSE higher demand' and 'No SESRO' scenarios would require an additional four or five supply-side options respectively (i.e. five or six options in total). In these scenarios the NWT SRO would comprise two principal components:

- new sources to offset water transferred out of region from [REDACTED] as part of the STT SRO; and
- enabling works on the [REDACTED] to allow treated water from regional UU sources to be transferred by pumping into the [REDACTED] to maintain customer supplies (for transfer volumes greater than 75MI/d).

2.3.14 It should be noted that there remains considerable uncertainty over the 'WRSE higher demand' and 'WRSE no SESRO' scenarios as these are dependent on confirmation from other water companies (who are managing future uncertainties relating to demand, climate change and environmental destination) and the reliability or acceptability of other large-scale options.

2.3.15 Importantly, decisions relating to implementation of these scenarios are also external to UUW's own decision making, including RAPID's gated decision-making process in respect of STT. Currently, STT is not part of any other water company WRMP24 preferred plan and so **the NWT SRO scenario is fundamentally the same as the final WRMP24 (i.e. one option).**

2.3.16 Consequently, the NWT SRO as it might be delivered under 'WRSE higher demand' and 'WRSE no SESRO' scenarios is dependent on selection of STT in future planning cycles by other water companies and is not a 'plan' or 'programme' that can be meaningfully assessed for in combination effects at this point (since substantial components of the assessment would be speculative, and the additional SRO options would not be required until 2043 at the earliest).

2.3.17 Note that the NWT SRO is currently being assessed as part of RAPID's gated process for SROs; this includes environmental compliance. The environmental compliance

assessments, and the supporting investigations, are ongoing with the outcomes available to inform the RAPID Gate 3 submission in 2026.

3. Approach to HRA

The nature of the WRMP (a long-term strategic plan with specific projects) presents challenges for a 'strategic' or plan-level HRA and it is therefore important to understand how the WRMP is developed and hence how it might consequently affect European sites.

3.1 Key Guidance

- 3.1.1 The key guidance document for HRA of WRMPs is **UKWIR (2021). *Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans*. UK Water Industry Research Limited, London.**
- 3.1.2 Other relevant guidance and case-practice includes:
- Regulators' Alliance for Progressing Infrastructure Development (2022). Strategic regional water resource solutions guidance for Gate 2.
 - Defra (2021). *Policy paper: Changes to the Habitats Regulations 2017* [online]. Available at: <https://www.gov.uk/government/publications/changes-to-the-habitats-regulations-2017/changes-to-the-habitats-regulations-2017> [Accessed March 2021].
 - UK Government (2019). *Appropriate assessment: Guidance on the use of Habitats Regulations Assessment* [online]. Available at: <https://www.gov.uk/guidance/appropriate-assessment> [Accessed March 2021].
 - Tyldesley, D. & Chapman, C. (2021). *The Habitats Regulations Assessment Handbook* [online]. DTA Publications Limited. Available at: <https://www.dtapublications.co.uk/handbook/>. [Accessed March 2021].
 - UK Government (2023). Water resources planning guideline [online]. Available at: <https://www.gov.uk/government/publications/water-resources-planning-guideline/water-resources-planning-guideline> [Accessed April 2023].
 - Natural England (2020). *Guidance on how to use Natural England's Conservation Advice Packages in Environmental Assessments*. Natural England, Peterborough.
 - European Commission (2018). *Managing Natura 2000 sites - The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC*. European Union, 1-86.
 - Defra (2012). *The Habitats and Wild Birds Directives in England its seas: Core guidance for developers, regulators & land/marine managers* [online]. Available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/82706/habitats-simplify-guide-draft-20121211.pdf. [Accessed March 2021].
 - PINS Note 05/2018: *Consideration of avoidance and reduction measures in Habitats Regulations Assessment: People over Wind*, Peter Sweetman v Coillte Teoranta. [withdrawn].
 - SNH (2019). SNH Guidance Note: *The handling of mitigation in Habitats Regulations Appraisal – the People Over Wind CJEU judgement* [online]. Scottish Natural Heritage. Available at: <https://www.nature.scot/sites/default/files/2019-08/Guidance%20Note%20-%20The%20handling%20of%20mitigation%20in%20Habitats%20Regulations%20App>

raisal%20-%20the%20People%20Over%20Wind%20CJEU%20judgement.pdf.
[Accessed March 2021].

3.2 Application of HRA to WRMPs

Process Overview

- 3.2.1 European Commission guidance²⁵ and established case-practice suggests a four-stage process for addressing Articles 6(3) and 6(4), and hence Regulations 63 and 64 (see **Box 1**), although not all stages will necessarily be required:

²⁵ *Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC* (EC 2002).

Box 1 – Stages of HRA

Stage 1 – Screening or ‘Test of significance’

This stage identifies the likely effects of a project or plan on a European site, either alone or ‘in combination’ with other projects or plans, and considers whether these effects are likely to be significant. The ‘screening’ test or ‘test of significance’ is a low bar, intended as a trigger rather than a threshold test: a plan should be considered ‘likely’ to have an effect if the competent authority is unable (on the basis of objective information) to exclude the possibility that the plan or project could have significant effects on any European site, either alone or in combination with other plans or projects; an effect will be ‘significant’ simply if it could undermine the site’s conservation objectives. Note that mitigation measures should not be taken into account at the ‘screening’ stage, in accordance with the People over Wind (Court of Justice of the European Union (ECJ) Case C-323/17); this reinforces the idea of screening as a ‘low bar’ and makes ‘appropriate assessments’ more common.

Stage 2 – Appropriate Assessment (including the ‘Integrity test’)

An ‘appropriate assessment’ (if required) involves a closer examination of the plan or project where the effects on relevant European sites are significant or uncertain, to determine whether any sites will be subject to ‘adverse effects on integrity’ if the plan or project is given effect. The scope of any ‘appropriate assessment’ stage is not set, and the assessments will not be extremely detailed in every case (particularly if mitigation is clearly available, achievable, and likely to be effective). The assessments must be ‘appropriate’ to the effects and proposal being considered, and sufficient to ensure that there is no reasonable doubt that adverse effects on site integrity will not occur (or sufficient for those effects to be appropriately quantified should Stages 3 and 4 be required).

Stage 3 – Assessment of Alternative Solutions

Where adverse effects remain after the inclusion of mitigation, Stage 3 examines alternative ways of achieving the objectives of the project or plan that avoid adverse impacts on the integrity of European sites. A plan or project that has adverse effects on the integrity of a European site cannot be permitted if alternative solutions are available, except for imperative reasons of overriding public interest (IROPI; see Stage 4).

Stage 4 – Assessment Where No Alternative Solutions Exist and Where Adverse Impacts Remain

This stage assesses compensatory measures where it is deemed that there are no alternatives that have no or lesser adverse effects on European sites, and the project or plan should proceed for imperative reasons of overriding public interest (IROPI). The EC guidance does not deal with the assessment of IROPI, although the IROPI need to be sufficient to override the adverse effects on European site integrity, taking into account the compensatory measures that can be secured (which must ensure the overall coherence of the ‘national site network’).

- 3.2.2 The stages in Box 1 (if required) are used to ensure compliance with the Habitats Regulations and so principally reflect the stepwise legislative tests applied to the final, submitted project or plan; **there is no statutory requirement for HRA (or its specific stages) to be completed for draft plans or similar developmental stages.**
- 3.2.3 Consequently there is flexibility for the HRA process to be run in a manner that provides maximum benefit for plan-development and sound decision-making, whilst still ultimately meeting the legislative tests.
- 3.2.4 In practice, HRAs of WRMPs usually have two functional components: they informally guide each water company as it considers which water resource options will be included in the published plan; and subsequently provide a formal assessment of the published WRMP against Regulation 63. A degree of separation between these functions is therefore sometimes necessary, and the rigid application of the stages in Box 1 to the

emerging or interim stages of strategic plans²⁶ is not always appropriate, reducing the clarity and usefulness of the HRA as a plan-shaping process for both plan-makers and consultees. For WRMPs this is especially true for the assessment of the emerging feasible options and the application of the ‘People over Wind’ (PoW)²⁷ case.

3.2.5 Therefore, whilst the principles of HRA have been applied to the emerging WRMP and the feasible options, **the specific tests associated with Regulation 63 are applied to the preferred programme of options only**. The overarching HRA *process* for the WRMP has therefore included the following key steps:

- An initial ‘**risk review**’ of the **supply-side**²⁸ **feasible options**, to assist UUW’s selection of constrained options (i.e. ‘HRA as a process’). The review of the feasible options applied the normal principles and practices associated with ‘HRA screening’ but also took account of the deliverability of the options including potential mitigation opportunities²⁹ (for clarity, this review process is not documented in this report since the scope of some options has changed in response to the review).
- The **assessment of the preferred programme of options** against the provisions of Regulation 63, comprising formal ‘screening’ and an ‘appropriate assessment’ designed to meet the legislative tests (this report).

Key Challenges and Assumptions

3.2.6 The fundamental nature of the WRMP (a long-term strategic plan with specific projects) presents a number of distinct challenges for a ‘strategic’ or plan-level HRA and it is therefore important to understand how the WRMP is developed, its objectives, and hence how it might consequently affect European sites.

Uncertainty and plan-level mitigation

3.2.7 HRAs of plans and strategies typically have to deal with a degree of uncertainty; very often, it is not possible to provide a detailed assessment of the effects of a proposal as many aspects simply cannot be fully defined at the strategy-level in the planning hierarchy. This is particularly true for options that will only be required over longer-term

²⁶ Particularly those (such as WRMPs) where the guideline HRA stages do not map easily on to the agreed or statutory stages in the plan development process.

²⁷ *People Over Wind and Sweetman v Coillte Teoranta (C-323/17)*

²⁸ Demand-side options designed to reduce treated water use (such as metering, provision of water butts or leakage reduction options) are not systematically reviewed at this stage as they are invariably generic and geographically unspecified activities or groups of actions that cannot negatively affect any European sites (or be meaningfully assessed at the strategy level). Since they will form part of the adopted WRMP they are formally subject to Regulation 63 as part of the final HRA, but this is typically a simple screening exercise or ‘down-the-line’ deferral, depending on the nature of the option.

²⁹ Applying a PoW-compliant ‘screening’ assessment to the feasible options would have little value for plan-development since mitigation opportunities, including effective and well-established measures for marginal effects, would be ignored. All options with ‘likely significant effects’ would therefore be treated equally, with no distinction between options that would (from an HRA perspective) be easily achievable in practice and those that would be extremely challenging or impossible. The review of the feasible options is not therefore intended to be, or replicate, a formal and fully compliant ‘HRA screening’ or be a ‘draft HRA’ or similar. It takes a broad view of the ‘HRA-related risk’ associated with an option that captures both the risk to UUW and the delivery of the WRMP within the statutory timescales (for example, the data collection required to definitively demonstrate that an option is acceptable might not be achievable in the time available for delivery of the WRMP) and the risks of the option to European site integrity (i.e. where adverse effects would appear to be an unavoidable outcome of the option as presented). The terminology intentionally reflects a typical RAG risk assessment to provide clarity for UUW and to avoid the perception of premature assessment conclusions.

planning horizons, which are inevitably less defined than options that are required in the near term.

- 3.2.8 Where the available information is fundamentally insufficient to complete a meaningful appropriate assessment, then case-practice (both for WRMPs and strategic plans in general) suggests some assessment may be deferred ‘down the line’ to a lower planning tier provided that certain criteria are met.
- 3.2.9 This is usually only appropriate where there is sufficient certainty that the proposal can (with the implementation of established scheme-level measures that are known to be effective) avoid adverse effects on the integrity of European sites; and/or if appropriate investigation schemes are identified to resolve the uncertainty and commitments are made within the plan to not pursue an option if adverse effects are identified through these investigations.
- 3.2.10 Case-practice in WRMP HRAs³⁰ and the WRPG indicates that it may be acceptable to include Preferred Programme options with residual uncertainties provided that:
- there is sufficient flexibility within the terms of the WRMP to ensure adverse effects can be avoided at the project level (e.g. the plan does not dictate specific pipeline routes or yields that cannot be deviated from); and/or
 - the option is not required within the first five years of the plan period, so allowing time for additional investigations to be completed; and
 - the uncertainty that this creates is mitigated at the plan-level by the inclusion of alternative options which:
 - ▶ will meet the required demand / deficit should the Preferred Programme option prove to have an unavoidable risk of adverse effects on the European sites in question; **and**
 - ▶ will not themselves have any adverse effect on any European sites.
- 3.2.11 Note, this is not intended to provide a mechanism for the inclusion of options where there appears to be no reasonable way of avoiding adverse effects. It should be noted that this flexibility is perhaps desirable in any case, since it is possible that a ‘no adverse effect’ option might be subsequently proven to have adverse effects when brought to the design stage. This approach allows for the WRMP to be compliant with the Habitats Regulations, since certainty over outcomes for the plan as a whole is provided.
- 3.2.12 However, it is important to note that some uncertainties will remain (particularly with regard to ‘in combination’ effects) and for some options it will only be possible to fully assess any potential effects at the pre-project planning stage, when certain specific details are known; for example: construction techniques; site specific survey information; the precise timing of implementation; or the status of other projects that may operate ‘in combination’. In addition, it may be several years before an option is employed, during which time other factors may alter the baseline or the likely effects of the option.

WRMP development parameters and relevance to HRA

- 3.2.13 The modelling underpinning the WRMP development and option selection process incorporates several assumptions that influence and are relevant to the scope of the HRA.

³⁰ For example, in relation to UU’s WRMP14.

Existing Consents / Licences

- 3.2.14 UU reviews its plan annually in accordance with Section 37(A) of the Water Industry Act 1991 to determine whether there have been any ‘material change of circumstances’ that might require amendments to the plan, which would include (in accordance with the Water Resource Planning Guideline (WRPG)) “*a change that could cause significant adverse effects on the environment*”. The determination of material changes since WRMP19 (and its HRA) is also a fundamental aspect of the water resources planning process.
- 3.2.15 Regulation 9 of the Habitats Regulations requires that “...*a competent authority, in exercising any of its functions, must have regard to the requirements of the Directives so far as they may be affected by the exercise of those functions*”.
- 3.2.16 For existing abstraction licences and their consideration in WRMPs and associated HRAs, the requirements of Reg. 9 are met by the Environment Agency, Natural Resources Wales and the water companies through the licence review arrangements and protocols that are implemented at the start of each WRMP cycle, which also take account of the Environment Agency’s or Natural Resources Wales’ requirements through the Water Industry National Environment Programme (WINEP) and National Environment Programme (NEP) respectively.
- 3.2.17 This review process (and WINEP) is undertaken in conjunction with Natural England, which identifies protected sites (including European sites) to the EA where it believes abstraction-related issues are affecting the achievement of favourable conservation status.
- 3.2.18 This review is important to the development of the supply forecast at the start of the WRMP process and is consequently reflected in Section 5.4 (*‘Developing Your Supply Forecast’*) of the Water Resource Planning Guideline (2020 draft and 2023 published versions), which outlines the requirements for sustainable abstraction taking into account existing statutory requirements and environmental destination. Existing abstractions for which there is uncertainty over impact on designated sites are identified for investigation through the WINEP; any required licence amendments are factored into the supply-deficit calculations, and the EA or NRW will have confirmed those licences that are considered valid for the planning period when the WRMP modelling is undertaken. The sustainability reductions and WINEP investigations related to UUW’s existing licences are detailed in the ‘Environmental Destination’ technical annex to the WRMP.
- 3.2.19 The supply forecast informs the supply-demand balance calculations for the planning period, which is in effect the ‘predicted future baseline’ for water resources in a supply area. The water company then develops ‘options’³¹ for resolving any predicted deficits in the supply-demand balance, which are then tested against various metrics to determine the ‘preferred plan’.
- 3.2.20 Consideration of the existing consenting regime in relation to European sites is noted in the WRPG (2020 draft and 2023 published versions) solely in relation to the development of the supply forecast (WRPG Section 5.4), and not in those sections of the guidance that explicitly consider the application of HRA to the WRMP; and whilst the 2023 guidelines refer to “*Your plan, including any options within it...*” in relation to the Habitats Regulations, all references to HRA (as both a process and legislative test) are explicitly and/or implicitly linked to the options identified by the WRMP. Similarly, the UKWIR guidance on SEA/HRA, which was updated for the WRMP24 planning cycle (with the EA

³¹ Note that all references to WRMP ‘options’ in the WRPG are made in the commonly-accepted sense, i.e. explicit interventions proposed by the WRMP to increase water supply or reduce consumption (e.g. WRPG Section 1.1), not a broad ‘catch all’ for ongoing water company operations such as those existing abstractions that will form part of the ‘predicted future baseline’.

and NE included on the steering group for that update) focuses entirely on assessing the effects of options proposed by the plan, not the ongoing impacts of existing consents (the WRPG references UKWIR as supporting guidance in Section 1.7 and the Annex).

- 3.2.21 Consequently, the WRMP HRA addresses Regulation 63 of the Habitats Regulations and necessarily focuses on the assessment of the additional effects that the WRMP introduces over the predicted future baseline (i.e. the supply forecast determined at the start of the WRMP process that takes account of the agreed sustainability reductions and any that are reasonably anticipated).
- 3.2.22 Therefore, the HRA of the WRMP is necessarily a forward looking assessment of the specific options (feasible and preferred) proposed by the WRMP to resolve deficits; it does not (and cannot) re-litigate the existing licences agreed for the planning period (and hence the WRMP supply-demand baseline) since there has to be a starting point / basis for the WRMP (i.e. the modelling / optioneering process cannot start with the assumption that no current consents are reliable; and the HRA of the WRMP does not and cannot determine the licensing baseline from which the supply-demand balance is calculated).
- 3.2.23 In some instances, when considering water that may be available from existing sources, consultees have indicated that consideration of ‘recent actual’ abstraction is more appropriate than the currently licenced maximum, particularly for waterbodies that are considered ‘over-licensed’; it is understood that these licences have been identified to UUW during the plan-development process and factored into the supply-demand balance calculations.

Regional Growth

- 3.2.24 The WRMP supply-demand balance modelling takes account of predicted local and regional growth when identifying risk areas and potential solutions, based (*inter alia*) on Local Plans and population growth models. Likewise, the modelling accounts for climate change. ‘In combination’ effects with population growth that may be related to land-use plans are therefore inherently considered and accounted for as part of the WRMP option development process (i.e. an option that does not account for local growth is not a solution) and this can be relied on by the HRA; the HRA considers the potential for ‘in combination’ effects with specific proposals within Local Plans (and similar), such as major site allocations, but does not (and cannot) attempt to model an alternative ‘population growth’ scenario to somehow test against specific options.

In combination effects with SROs

- 3.2.25 With regard to schemes involving multiple water companies (particularly some SROs) the assessment will necessarily focus on those European sites directly exposed to the activities proposed and managed by UUW, rather than sites that will only be affected by those scheme elements proposed and managed by other water companies; i.e. when undertaking the ‘in combination’ assessment of a scheme that appears in multiple plans the effects from source/donor will be considered distinct from supply/beneficiary.
- 3.2.26 For example, the source/donor plan will only consider the implications of the abstraction (etc.) on relevant European sites and water bodies within its catchment (and downstream catchments where relevant), and the supply/beneficiary plan would consider any implications on European sites / water bodies from the application of the supplied water

within its catchment/s³². This approach is intended to ensure unnecessary duplication is avoided, and pragmatism will be applied to address indirect, downstream effects and effects on functional habitat.

- 3.2.27 In addition, as noted in **Section 2.3**, there remains considerable uncertainty whether the ‘WRSE higher demand’ or ‘WRSE no SESRO’ scenarios will be required proceed, as it is dependent on confirmation from other water companies and the reliability or acceptability of other large-scale options. Importantly, decisions relating to implementation of the scenarios are also external to UJW’s own decision making, including RAPID’s gated decision-making process in respect of STT.
- 3.2.28 Currently, STT is not part of any other water company revised draft WRMP24 preferred plan and so the NWT SRO scenario is fundamentally the same as the final WRMP24 (i.e. one option).
- 3.2.29 Consequently, the NWT SRO as it might be delivered under ‘WRSE higher demand’ and ‘WRSE no SESRO’ scenarios is dependent on selection of STT in future planning cycles by other water companies and is not a ‘plan’ or ‘programme’ that can be meaningfully assessed for in combination effects at this point (since substantial components of the assessment would be speculative, and the additional SRO options would not be required until 2043 at the earliest). Note that any such in combination effects will be addressed by the forthcoming SRO Gate 3 investigations (this includes additional groundwater modelling, water quality, ecological and hydrological monitoring and fish pass assessments) and in future WRMP cycles.

3.3 HRA of the Preferred Options

Geographical Scope

- 3.3.1 ‘Arbitrary’ buffers are not generally appropriate for HRA. However, as distance is a strong determinant of the scale and likelihood of effects, the application of a suitably precautionary study area (based on a thorough understanding of both the options and European site interest features) has some important advantages due to the number of options and the benefits of a consistent approach:
- using buffers allows the systematic identification of European sites using GIS, so minimising the risk of sites or features being overlooked;
 - it ensures that sites for which there are no reasonable impact pathways can be quickly and transparently excluded from any further screening or assessment; and
 - when assessing multiple options it provides a consistent point of reference for consultees following the assessment process, and the ‘screening’ can therefore focus on the assessment of effects, rather than on explaining why certain sites may or may not have been considered in relation to a particular option.
- 3.3.2 Professional experience and case-practice relating to typical water industry schemes demonstrates that environmental changes associated with construction in terrestrial environments are rarely notable more than 2km from a source, and the UKWIR (2021) guidance includes accepted ‘zones of influence’ for certain aspects (for example, noise impacts would almost never be significant over 1km from the source). Operational effects can extend further, depending on the scale and nature of the option, and so an

³² Note: for the Severn Thames transfer we would expect the in-combination assessment of impacts on the Severn to feature in both WRW and WRSEs plans. This is due to the complex interaction of releases and abstractions particular to this scheme.

intentionally precautionary overarching assessment scope has been used as a starting point for the assessment; this includes:

- All European sites that are within 20km of any operational facilities or new infrastructure required to deliver each option (including temporary infrastructure)). This is an intentionally large buffer that can also reliably capture the vast majority of possible interactions with ‘mobile species’ in terrestrial environments.
- All European sites that are downstream of any operational facilities or new infrastructure required to deliver each option (including temporary infrastructure)), or upstream sites that support migratory fish (no distance thresholds). This reflects the potential for hydrological impacts to operate over greater distances, and to address the potential for catchment-scale in combination effects from operation.

3.3.3 These parameters are used as a starting point for identifying potentially exposed sites. It is not a ‘hard buffer’ and in some instances it may be appropriate to consider more distant sites³³; however, unless otherwise noted, sites over 20km from the options that are not hydrologically linked and which do not support wide-ranging mobile species are typically considered sufficiently remote such that any environmental changes will be effectively nil, and so there will be ‘no effects’ on sites beyond this distance (and so no possibility of ‘in combination’ effects).

3.3.4 The European sites and interest features considered potentially exposed to the outcomes of the WRMP are listed in **Appendix A**.

Data Collection

European site data collection and conservation objectives

3.3.5 The screening and appropriate assessment stages take account of the baseline condition of the European sites and their interest features³⁴, including (where reported) data on

- the site boundaries and the boundaries of the component SSSIs;
- the conservation objectives;
- information on the attributes of the European sites that contribute to and define their integrity;
- the condition, vulnerabilities and sensitivities of the sites and their interest features, including known pressures and threats;
- the approximate locations of the interest features within each site (if reported); and
- designated or non-designated ‘functional habitats’ (if identified).

3.3.6 These data were derived from:

³³ For example, where an option is likely to directly affect the marine environment (e.g. through desalination schemes) and so potentially result in environmental changes that could coincide with areas used by wide-ranging marine species; however, wide-ranging marine / marine dependent species associated with marine sites that are not directly connected to the hydrological zone of influence are not typically considered to be both sensitive and exposed to the effects of the options.

³⁴ The interest features are taken to be the qualifying features; and other within-site features that may be relevant to site integrity, particularly ‘typical species’ (for SACs) and within-site supporting habitats for SPAs. ‘Functional land’ would not usually be considered an interest feature of the site (although it may be important to the integrity of some interest features).

- the most recent JNCC-hosted GIS datasets;
- the Standard Data forms for SACs and SPAs and Information Sheets for Ramsar sites;
- Article 12 and 17 reporting;
- the published site Conservation Objectives;
- Supplementary Advice to the conservation objectives (SACO) where available³⁵;
- Site Improvement Plans (SIPs);
- Core Management Plans (Wales); and
- the supporting Site of Special Scientific Interest's favourable condition tables where relevant and where no SACOs applicable to the features are available.

3.3.7 Note:

- For SPAs, the qualifying features are taken as those identified on the most recent JNCC datasets and citations where these post-date the 2nd SPA Review (i.e. it will be assumed that any amendments suggested by the SPA review have been made) unless otherwise identified to us by NE or NRW; any site-specific issues relating to the SPA Review can be addressed in the screening and appropriate assessment of the preferred options (see below).
- The conservation objectives for Ramsar sites are taken to be the same as for the corresponding SACs / SPAs (where sites overlap); SSSI Definition of Favourable Condition Tables (FCTs) will be used for those features not covered by SAC/SPA designations.

3.3.8 Where possible the site data are used to identify other features that may be relevant to site integrity, particularly '**typical species**' (for SACs), within-site **supporting habitats**, and designated or non-designated '**functional habitats**'.

3.3.9 A '**typical species**' is broadly described by EC guidance as being any species (or community of species) which is particularly *characteristic* of, confined to, and/or dependent upon the qualifying Annex I habitat feature at a particular site. This may include those species which:

- are critical to the composition or structure of an Annex I habitat (e.g. constant species identified by the National Vegetation Classification (NVC) community classification);
- exert a critical positive influence on the Annex I habitat's structure or function (e.g. a bioturbator (mixer of soil/sediment), grazer, surface borer or predator);
- are consistently associated with, and dependent upon, the Annex I habitat feature for specific ecological needs (e.g. feeding, sheltering), completion of life-cycle stages (e.g. egg-laying) and/or during certain seasons/times; or
- are particularly distinctive or representative of the Annex I habitat feature at a particular site.

³⁵ NE has published '*Supplementary advice on conserving and restoring site features*' for most European sites in England which describe in more detail the range of ecological attributes which are most likely to contribute to a site's overall integrity, and the targets each qualifying feature needs to achieve in order for the site's conservation objectives to be met.

- 3.3.10 Within-site **supporting habitats** are those which support the population(s) of the qualifying species and which are therefore critical to the integrity of the feature.
- 3.3.11 ‘**Functional habitats**’ are generally taken to be habitats or features outside a European site boundary that are important or critical to the functional integrity of the site habitats and / or its interest features. These might include, for example:
- ‘buffer’ areas around a site (e.g. dense scrub areas preventing public access; areas of land that reduce the effects of agricultural run-off; etc.);
 - specific features or habitats relied on by mobile species during their lifecycle (e.g. high-tide roosts for waders; significant maternity colonies for bats known to hibernate within an SAC; areas that are critical for foraging or migration; etc).
- 3.3.12 **Conservation Objectives** benchmark Favourable Conservation Status (FCS) for each feature. Guidance³⁶ from the UK Statutory Nature Conservation Bodies (SNCBs) provides a broad characterisation of FCS, stating that it “*relates to the long-term distribution and abundance of the populations of species in their natural range, and for habitats to the long-term natural distribution, structure and functions as well as the long-term survival of its typical species in their natural range. It describes a situation in which individual habitats and species are maintaining themselves at all relevant geographical scales and with good prospects to continue to do so in the future*”.
- 3.3.13 The conservation objectives for European sites in England have been revised by Natural England in recent years to improve the consistency of assessment and reporting. As a result, the high-level conservation objectives for all sites are effectively the same:
- 3.3.14 For SACs in England:
- *With regard to the SAC and the natural habitats and/or species for which the site has been designated (the ‘Qualifying Features’...), and subject to natural change; ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring [as applicable to each site];*
 - ▶ *The extent and distribution of the qualifying natural habitats;*
 - ▶ *The extent and distribution of the habitats of qualifying species;*
 - ▶ *The structure and function (including typical species) of the qualifying natural habitats;*
 - ▶ *The structure and function of the habitats of qualifying species;*
 - ▶ *The supporting processes on which the qualifying natural habitats rely;*
 - ▶ *The supporting processes on which the habitats of qualifying species rely;*
 - ▶ *The populations of qualifying species; and,*
 - ▶ *The distribution of qualifying species within the site.*
- 3.3.15 For SPAs in England:
- *With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified (the ‘Qualifying Features’...), and subject to natural*

³⁶ JNCC (2018). *Favourable Conservation Status: UK Statutory Nature Conservation Bodies Common Statement* [online]. Available at: <https://data.jncc.gov.uk/data/b9c7f55f-ed9d-4d3c-b484-c21758cec4fe/FCS18-InterAgency-Statement.pdf>. [Accessed March 2022].

change; ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring:

- ▶ *The extent and distribution of the habitats of the qualifying features;*
- ▶ *The structure and function of the habitats of the qualifying features;*
- ▶ *The supporting processes on which the habitats of the qualifying features rely;*
- ▶ *The population of each of the qualifying features; and*
- ▶ *The distribution of the qualifying features within the site.*

3.3.16 NE has published ‘*Supplementary advice on conserving and restoring site features*’ for most sites, which describe in more detail the range of ecological attributes which are most likely to contribute to a site’s overall integrity, and the minimum targets each qualifying feature needs to achieve in order to meet the site’s conservation objectives. These are considered at the screening and appropriate assessment stages, as necessary.

3.3.17 In Wales, the Regulation 37 advice and Core Management Plans for the SACs and SPAs set out conservation objectives that benchmark Favourable Conservation Status (FCS) for each feature. For the Welsh European sites the conservation objectives comprise a ‘vision’ for the feature (the key component of the objective) and (where relevant) performance indicators by which the objectives may be measured. These are used and referred to as necessary within the assessment but are not generally reproduced in this report.

3.3.18 The conservation objectives for Ramsar sites are taken to be the same as for the corresponding SACs / SPAs (where sites overlap); where Ramsar sites do not coincide with an SAC or SPA, or where the Ramsar features are not ecologically coincident with SAC or SPA features, the conservation objectives and definitions of favourable condition for the underlying SSSIs are used.

3.3.19 **The conservation objectives are considered at both screening and appropriate assessment stages, but are not explicitly reproduced in this report** as (a) they are freely available online and (b) the narrative nature of many of the conservation objectives can be challenging to co-opt in a clear and concise manner; the assessments therefore focus on the key conservation objectives that might be undermined by an option, rather than attempting to exhaustively document the assessment of an option against all conservation objectives for all features. Information on the sensitivities of the interest features also informs the assessment.

Water resources baseline data

3.3.20 Information on the water resources baseline in the region is drawn from other assessment reports (e.g. the WFD), UUW (e.g. groundwater (GW) and surface water (SW) abstraction locations, source operational parameters, WRZ operation, emergency or drought plan operations) and the EA (Public Water Supply (PWS) and other GW/ SW abstractions, C Catchment Abstraction Management Strategy (CAMS) or Abstraction Licensing Strategy (ALS) documentation).

3.3.21 Note, unless otherwise stated by the EA during the options development process, it is assumed that the relevant CAMS / ALS documents are correct and reliable, and that there is ‘water available’ where this is confirmed by the CAMS / ALS (or independently by the EA).

Option data

- 3.3.22 Information on the preferred options is provided by UUW. This includes an outline of how the option will function, including the intended outcomes (design yields/capacities); and the scheme delivery requirements, including the type and indicative location of any permanent or temporary infrastructure.
- 3.3.23 It should be noted that the location of some scheme aspects cannot always be established at the WRMP level: whilst some elements may be clear (for example, new plant will often be located within or close to existing water company assets) the exact routes of pipelines (etc.) cannot be finalised at this stage. In most instances an indicative design route is provided for option costing purposes, which has been informed by the feasible options review process at the stage (i.e. in most cases direct impacts on designated sites would be avoided if possible). However, it should be recognised that the options are not fixed proposals for delivery that cannot be deviated from, and there will be many aspects (particularly relating to construction) that cannot be defined at the strategy level ahead of scheme-specific investigations (e.g. the location of any temporary enabling works; precise locations for additional materials storage; etc.).

Preferred Options Assessment

Overview

- 3.3.24 For each option (or group of options, as appropriate), the assessment comprises:
- a 'screening' to identify those options that cannot have significant effects due to the fundamental nature of the option (this might include, for example, options that are designed to reduce demand but which do not involve any direct physical changes, such as education programmes to reduce water use);
 - a 'screening' of European sites within the study area to identify those sites and features where there will self-evidently be 'no effect', 'no likely significant effects', or positive effects due to the option³⁷, and those where significant effects are likely or uncertain; and
 - an 'appropriate assessment' of any European sites where significant effects cannot be excluded (this may include 'down-the-line' deferral of some options in accordance with established HRA practice, where appropriate).
- 3.3.25 As noted, the conservation objectives (and any associated supplementary advice or targets) are considered at both screening and appropriate assessment stages, but are not explicitly reproduced in this report.

General Assumptions

- 3.3.26 Most environmental changes associated with construction and operation will have an inherent range over which they naturally attenuate³⁸, and many interest features will have little or no sensitivity to the likely magnitude of the environmental changes expected as the

³⁷ Note, for options with 'no effects' or positive effects there is no possibility of 'in combination' effects.

³⁸ For example, construction noise will almost invariably be indistinguishable from background levels over 600m from the source due to natural attenuation alone; several studies have demonstrated that visual disturbance of wading birds by construction plant or personnel is inconsequential over ~500m.

result of an option. Broad or universal assumptions that can be robustly applied to the assessments of the individual options or interest features are set out in **Appendix B**.

3.3.27 In addition:

- It is assumed that all normal licensing, consenting and management procedures will be employed at option delivery and throughout operation, and that established best-practice avoidance and mitigation measures will be employed throughout scheme design and construction to safeguard environmental receptors, including European site interest features. The HRA will not therefore assess speculative or hypothetical effects based on assumptions of non-compliance (e.g. accidental spillages of treatment chemicals from a new WTW).
- Guidance from the EA suggests that significant direct effects on groundwater dependent terrestrial ecosystems (GWDTEs) from drawdown associated with abstraction are unlikely for European sites over 5 km from the abstraction (*National EA guidance: Habitats Directive Stage 2 Review: Water Resources Authorisations – Practical Advice for Agency Water Resources Staff*).

Screening

3.3.28 The screening identifies possible effects on European sites based on:

- the anticipated operation of each option and predicted hydrological zone of influence;
- the anticipated scope of any construction or enabling works required for each option;
- the European site interest features and their sensitivities; and
- the exposure of the site or features to the likely effects of the option (i.e. presence of reasonable impact pathways, taking into account species mobility and the likelihood of functional habitats being affected³⁹).

3.3.29 The screening therefore identifies:

- those European sites where significant effects are considered likely as the result of an option;
- those European sites where significant effects are considered uncertain as the result of an option;
- those European sites where significant effects were considered unlikely (alone) as the result of an option (but where in combination effects might still be possible); and
- those options that will have no effects on any European sites due to their nature or location (and hence no possibility of 'in combination' effects).

3.3.30 The 'low-bar' principle is used for the screening of the preferred options⁴⁰; in general, unless the possibility of significant effects can be simply and self-evidently excluded then an 'appropriate assessment' is completed (rather than a more detailed 'secondary screening' or similar). This applies to the options alone and in combination (i.e. unless it is evident that there will be 'no effects' from any options the possibility of 'in combination'

³⁹ With regard to functional habitat, it should be noted that field investigations would not be undertaken for a plan-level assessment except in very exceptional circumstances, and so specific areas of 'functional habitat' may not be identifiable for assessment at the plan level unless explicitly noted in the site documentation.

⁴⁰ The low-bar nature of the screening test is characterised in case-law (*C-258/11 - Sweetman and Others*) as 'should we bother to check?' – i.e. is a closer examination of possible effects required (i.e. appropriate assessment) or can effects self-evidently be excluded as nil or entirely nugatory?

effects is not excluded and these are taken forward to ‘appropriate assessment’). This approach simplifies the overall assessment and ensures procedural clarity.

- 3.3.31 The ‘low bar’ approach is consistent with the ‘People Over Wind’⁴¹ case law, which requires that mitigation not be considered at screening. Historically, HRAs of plans typically assumed that established best-practice avoidance and mitigation measures (see **Appendix C**) would be employed at the project level to safeguard environmental receptors, including European site interest features, and accounted for this at the screening stage. However, it is arguable that an assumption such as this, albeit in relation to a lower-tier project that would itself be subject to HRA, might constitute an ‘avoidance measure’ that the WRMP is effectively relying on to ensure that significant effects do not occur.
- 3.3.32 In this instance, therefore, mitigation measures (including the established best-practice avoidance and mitigation measures noted in **Appendix C**) are not taken into account at screening, but are instead introduced at the ‘appropriate assessment’ stage (if required).

Appropriate Assessments

- 3.3.33 The ‘appropriate assessments’ are an extension of the assessment processes undertaken at the screening stage, with significant effects (or areas of uncertainty) examined to determine whether there will be any adverse effects on the integrity of any European sites taking into account the conservation objectives.
- 3.3.34 The presentation of the assessments depends on the nature of the options and European sites that might be exposed to effects. In this case the assessments are ‘European site led’ (i.e. each assessment section relates to a specific European site), rather than being ‘option by option’; this tends to simplify the ‘in combination’ assessment and minimises repetition of information relating to the interest features / sensitivities (etc.) of the sites.
- 3.3.35 Shared evidence applicable to multiple sites or features (for example, in relation to birds and construction noise) are provided in appendices to reduce repetition.
- 3.3.36 The appropriate assessments are ‘appropriate’ to the nature of the WRMP as a strategic plan, the option under consideration, and the scale and likelihood of any effects; for example, exhaustive examination of feature sensitivities, targets, and possible effect pathways is not undertaken for options that would have previously been ‘screened out with mitigation’ if there is a high degree of confidence in the mitigation measures. The assessments include inter-option ‘in combination’ assessments.

3.4 Plan-Level In Combination Assessments

- 3.4.1 HRA requires that the effects of other projects, plans or programmes be considered for effects on European sites ‘in combination’ with the WRMP. There is limited guidance on the precise scope of ‘in combination’ assessments for strategies, particularly with respect to the levels within the planning hierarchy at which ‘in combination’ effects should be considered, although guidance is provided by the ACWG.
- 3.4.2 Broadly, it is considered that the UUW WRMP could have the following in combination effects:

⁴¹ Case C 323/17 Court of Justice of the European Union: *People Over Wind*

- Within-plan effects, i.e. separate options within the WRMP affecting the same European site(s); these are addressed as part of the Option assessment process outlined above.
- Between-plan abstraction effects, i.e. effects with other abstractions, in association with or driven by other plans (for example, other water company WRMPs);
- Other between-plan effects, i.e. 'in combination' with non-abstraction activities promoted by other plans – for example, with flood risk management plans.
- Between-project effects, i.e. effects of a specific option with other specific projects and developments.

3.4.3 In undertaking the 'in combination' assessment it is important to note the following:

- The WRMP development process explicitly accounts for land-use plans, growth forecasts and population projections when determining future treatment and water management requirements.
- The detailed examination of non-water company consents for 'in combination' effects can only be undertaken by the EA or NRW through their permitting procedures.
- Likely water resource demands of known major projects are also taken into account during the development of the WRMPs, unless otherwise noted.

3.4.4 Therefore:

- It is considered that (for the HRA) potential 'in combination' effects in respect of water-resource demands associated with known plans or projects will not occur since these demands are explicitly considered when developing the WRMP and its associated and related plans (including the SROs). The main exception to this is other water company WRMPs, which are developed concurrently.
- With regard to other strategic plans, the list of plans included within the SEA of the emerging UUW WRMP is used as the basis for a high-level 'in combination' assessment. The SEA is used to provide information on themes, policies and objectives of the 'in combination' plans, with the plans themselves examined in more detail as necessary. Plans are obtained from the SEA datasets or internet sources where possible.
- With regard to projects:
 - ▶ The WRMP development process explicitly accounts for the water-resource demands of known major projects (e.g. power station decommissioning; large-scale housing development) during its development, and so these 'in combination' effects are not considered in detail.
 - ▶ Potential 'in combination' effects between individual options and Nationally Significant Infrastructure Projects (NSIPs) identified by The Planning Inspectorate, and other known major projects, are assessed.
 - ▶ It is not possible to produce a definitive list of minor existing or anticipated planning applications within the zone of influence of each proposed option to review possible local 'in combination' effects. The nature of the WRMP and the timescales over which it operates ensure that generating a list of local planning applications at this stage would be of very little value, and this aspect can only be meaningfully undertaken at the scheme-level.

4. Preferred Options Screening

The 'screening' adopts a low-bar approach; in general, unless the possibility of significant effects can be simply and self-evidently excluded then an 'appropriate assessment' is completed (rather than a more detailed 'secondary screening' or similar). This applies to the options alone and in combination.

4.1 Demand-side options

4.1.1 The demand side options are summarised in **Tables 2.3 – 2.5**, Section 2. Whilst their application and requirements are slightly different in each WRZ, they essentially comprise the following generic option types:

- Physical amendments to the network:
 - ▶ District Metered Area (DMA) optimisation (reducing the size of DMAs through network interventions to improve the detection of smaller leaks);
 - ▶ Flow regulators (installation of flow restrictors and pressure reducing valves);
 - ▶ In-pipe repairs and lining technologies (typically non-invasive);
 - ▶ Mains rehabilitation/renewal/replacement (typically invasive);
 - ▶ Permanent network sensors (installation of acoustic loggers within assets);
 - ▶ Pressure management (reduces leakages);
 - ▶ Enhanced metering of households (smart meters);
 - ▶ Upgrade existing household meters to smart meters;
 - ▶ Non-household (NHH) smart meters;
 - ▶ Upstream tile optimisation (installation of larger meters 'upstream' in the supply network to improve monitoring of network losses).
- Water efficiency support:
 - ▶ Free water efficiency audits for households;
 - ▶ Free water efficiency devices (internal or external) for households;
 - ▶ Government intervention (water labelling, standards);
 - ▶ Non-household water efficiency programmes;
 - ▶ Rainwater harvesting and water reuse (new builds).

- 4.1.2 Of these, the ‘water efficiency support’ options cannot have significant effects due to the nature of the option (based on established guidance for similar policies and proposals in strategic planning documents that do not promote development⁴²).
- 4.1.3 The remaining demand-side options are likely to require some form of physical intervention or amendment to the network. The works required for the vast majority of these options will be very minor (e.g. meter installation) with virtually no risk of significant effects on European sites. In some instances effect pathways might be conceivable (for example, a hypothetical leaking pipe might be located in or near a European site), but it is not possible to predict or identify specific locations where such measures might be applied and so effects on specific European sites cannot be identified.
- 4.1.4 Non-specific residual risks such as these can almost always be avoided with established scheme-level mitigation measures and it is very unlikely that significant or significant and adverse effects as the result of a particular demand-side measure would be unavoidable at the scheme level; however, these options are carried forward to an ‘appropriate assessment’ stage for procedural reasons and to avoid potential conflict with the ‘People over Wind’ case.

4.2 Supply-side options

- 4.2.1 The initial ‘alone’ screening assessments for the WRMP option are set out in **Table 4.2** below. In summary, the assessment aims to identify those European site features that are potentially vulnerable to a particular option – i.e. which have features that are both exposed and sensitive to the likely outcomes (see **Table 4.1**), taking into account the baseline for the site including the conservation objectives. Features that are both exposed and sensitive to an environmental change are assumed to be subject to ‘likely significant effects’ unless there is a clear over-riding reason why significant effects cannot occur.

Table 4.1 Summary of screening criteria

LSE?	Notes
0	Sites or features that are not exposed to the effects of an option via any reasonable impact pathways and so there will be ‘no effect’ (hence no risk of ‘in combination’ effects)
No (N)	Sites or features that are potentially exposed and sensitive to the predicted environmental changes, but where effects are not considered significant (alone) due to their scale, nature etc. based on the information within the EARs and other contextual assessment information.
Uncertain (U)	Sites or features where a potential effect is clear and identifiable, which cannot be self-evidently excluded and which require additional consideration through ‘appropriate assessment’ (including options relying on mitigation to ensure significant effects do not occur).
Yes (Y)	Sites or features where significant effects are very likely or certain due to the scale/nature of the option proposals, or the vulnerability and distribution of the interest features on the European site. Adverse effects may be more likely and there is more certainty that (at scheme level) the option would have to rely on specific mitigation or compensation rather than general / simple environmental avoidance measures.

⁴² e.g. Tyldesley, D. & Chapman, C. (2021). The Habitats Regulations Assessment Handbook [online]. DTA Publications Limited. Available at: <https://www.dtapublications.co.uk/handbook/>.

Table 4.2 Option screening summary – WR076 SWN_River Bollin

WR076			
SWN_River Bollin			
Option Summary			
General Assessment Notes			
European sites in scope	Dist (km)*	LSE (alone?)	Notes
Rixton Clay Pits SAC		0	No pathways for operation- or construction-related effects (separated from option by A57 / Ship Canal).
Rostherne Mere Ramsar		0	No pathways for operation- or construction-related effects (up-catchment of abstraction and pipeline route).
Manchester Mosses SAC		0	No pathways for operation- or construction-related effects (hydrologically separated; feature characteristics).
Midland Meres and Mosses Phase 1 Ramsar		0	No pathways for operation- or construction-related effects (up-catchment of abstraction and pipeline route).

European sites in scope	Dist (km)*	LSE (alone?)	Notes
Rochdale Canal SAC		0	No pathways for operation- or construction-related effects (distance; no hydrological connectivity).
Mersey Estuary Ramsar		U	Option may have marginal effect on freshwater inputs to this site from the Bollin.
Mersey Estuary SPA		U	Option may have marginal effect on freshwater inputs to this site from the Bollin.
Mersey Narrows and North Wirral Foreshore SPA		U	No pathways for operation- or construction-related effects on site habitats (distance, attenuation); some site features may periodically utilise the non-designated habitats of the Mersey estuary.
Mersey Narrows and North Wirral Foreshore Ramsar		U	No pathways for operation- or construction-related effects on site habitats (distance, attenuation); some site features may periodically utilise the non-designated habitats of the Mersey estuary.
Liverpool Bay / Bae Lerpwl SPA		U	No pathways for operation- or construction-related effects on site habitats (distance, attenuation); some site features may periodically utilise the non-designated habitats of the Mersey estuary.

4.3 Screening Stage In Combination Assessment

4.3.1 Option WR076 SWN_River Bollin will have no effect on the following sites due to the absence of pathways, and so no possibility of ‘in combination’ effects:

- Rixton Clay Pits SAC
- Rostherne Mere Ramsar
- Manchester Mosses SAC
- Midland Meres and Mosses Phase 1 Ramsar
- Rochdale Canal SAC

4.3.2 Possible ‘in combination’ effects on the Mersey Estuary SPA/Ramsar, Mersey Narrows and North Wirral Foreshore SPA/Ramsar and Liverpool Bay / Bae Lerpwl SPA with other plans and projects are considered through ‘appropriate assessment’ (i.e. no potential ‘in combination’ effects on these sites are screened out).

4.4 Drought Option Screening

4.4.1 The screening of the Drought Options is as per the 2022 Drought Plan HRA⁴³; **this concluded that none of the Drought Plan options would have likely significant effects, alone or in combination.**

4.4.2 With regard to European sites that may be exposed to Drought Plan options and WRMP options, these are as follows:

Table 4.3 European sites that may be affected by Drought Plan and WRMP options

Site	Plan Options and screening conclusions		I/C screening
	Drought Plan 2022	WRMP 2024	
Rochdale Canal SAC	No LSE alone or in combination (no pathways)	WR076 (No effect – no pathways)	No effect

4.4.3 Based on this, **there will be no in combination effects between the Drought Plan and the WRMP options.**

4.5 Screening Conclusions

4.5.1 The screening has concluded that significant effects are either likely or uncertain for the following sites; these are therefore taken forward to an appropriate assessment stage:

- Mersey Estuary SPA

⁴³ https://www.unitedutilities.com/globalassets/z_corporate-site/about-us-pdfs/water-resources/uu-revised-draft-dp-hra-_300721.pdf

- Mersey Estuary Ramsar
- Mersey Narrows and North Wirral Foreshore SPA
- Mersey Narrows and North Wirral Foreshore Ramsar
- Liverpool Bay / Bae Lerpwl SPA

5. Appropriate Assessment – Mersey Estuary SPA / Ramsar

5.1 Screening Summary

- 5.1.1 The **Mersey Estuary SPA** and **Mersey Estuary Ramsar** are largely coincident sites covering the coastal and estuarine habitats of the Mersey Estuary from Runcorn Bridge in the east to Devil's Bank near St. Michael's in the west. The sites are designated for their wintering wildfowl populations.
- 5.1.2 The infrastructure required for Option WR076 SWN_River Bollin is over [REDACTED] (straight-line distance) from the boundary of the Mersey Estuary SPA/Ramsar at its closest point, and further via hydrological pathways (~[REDACTED] via the River Bollin and Manchester Ship Canal to Weaver Sluices; and ~[REDACTED] via the River Bollin and River Mersey).
- 5.1.3 Theoretical pathways for effects exist through:
- potential construction-related impacts on the estuary that will rely on project-level mitigation (and so cannot be 'screened out');
 - reduced freshwater input to the Mersey estuary from the option, affecting the supporting habitats for the SPA / Ramsar qualifying features.

5.2 European site summaries

Site overviews

- 5.2.1 The Mersey Estuary SPA / Ramsar is a large, sheltered estuary with a narrow mouth and wide shallow basin. It has extensive intertidal mud and sandflats on the northern and southern shores of the estuary, distinct areas of rocky shore and areas of saltmarsh which are constantly eroding and accreting. The site also includes an area of reclaimed marshland, salt-marshes, brackish marshes and boulder clay cliffs with freshwater seepages. The Manchester Ship Canal forms part of the southern boundary of the site and separates a series of pools from the main estuary. These pools together with Hale Marsh are important roosting sites for wildfowl and waders at high tide. The sites are underpinned by the Mersey Estuary SSSI and New Ferry SSSI.

Interest Features and Conservation Objectives

Mersey Estuary SPA

- 5.2.2 The **SPA** has the following **qualifying features**:
- Non-breeding:
 - ▶ Common shelduck *Tadorna tadorna*
 - ▶ Eurasian teal *Anas crecca*
 - ▶ Northern pintail *Anas acuta*
 - ▶ European golden plover *Pluvialis apricaria*

- ▶ Common redshank *Tringa totanus*
- ▶ Black-tailed godwit *Limosa limosa islandica*
- ▶ Dunlin *Calidris alpina alpina*
- Waterbird assemblage, including the above species plus Ringed plover *Charadrius hiaticula*, Northern lapwing *Vanellus vanellus*, Eurasian curlew *Numenius arquata*, Eurasian wigeon *Anas penelope*, Grey plover *Pluvialis squatarola*, Great crested grebe *Podiceps cristatus*.

5.2.3 With regard to the within-site **supporting habitats** for the SPA qualifying features, these are taken to be those that support the key behaviours of the nonbreeding/wintering period (moulting, roosting, loafing and feeding), i.e.

- intertidal mud- and sandflats;
- salt- and grazing marshes; and
- associated high-tide roosting sites.

5.2.4 With regard to non-designated ‘**functional habitat**’, reporting by BTO⁴⁴ and Bowland Ecology^{45,46} for NE (NE 2015, NE 2021, NE 2023) identifies several high-tide roost sites outside the boundaries of the designated sites, including at Frodsham Marsh and Woolston Eyes SSSI. In addition, NE (2023) provides maps indicating ‘buffers’ around the SPA for key qualifying species which (when taken with data from the Crop Map of England (CROME)) is used to identify areas of agricultural land that are potentially functionally-linked with the estuary⁴⁷; the buffer associated with the Mersey Estuary is 2km (for pintail only)⁴⁸.

5.2.5 More broadly, wintering birds associated with the site will frequently move between the other SPA and Ramsar sites around the north-west coast, including the Mersey Estuary SPA / Ramsar, the Mersey Narrows and North Wirral Foreshore SPA / Ramsar, the Dee Estuary SPA / Ramsar, Martin Mere SPA / Ramsar, Morecambe Bay and Duddon Estuary SPA, and Morecambe Bay Ramsar.

5.2.6 The overarching **conservation objectives** for the site are essentially as per those outlined in Section 3.3. Qualitative and quantitative targets for the conservation objectives are provided in the supplementary advice⁴⁹ and discussed where relevant in **Sections 5.4 and 5.5** below.

⁴⁴ NE (2015). *Review and analysis of changes in waterbird use of the Mersey Estuary SPA, Mersey Narrows & North Wirral Foreshore pSPA and Ribble & Alt Estuaries SPA*. Report by BTO for Natural England, ref. NERC173.

⁴⁵ NE (2021). *Identification of Functionally Linked Land supporting SPA waterbirds in the North West of England*. Report by Bowland Ecology for Natural England, ref. NECR361. Available at: <https://publications.naturalengland.org.uk/publication/6303434392469504>

⁴⁶ NE (2023). *Identification of Functionally Linked Land supporting SPA waterbirds in the North West of England – Phase 2*. Report by Bowland Ecology for Natural England, ref. NECR483. Available at: <https://publications.naturalengland.org.uk/publication/5359972901453824>

⁴⁷ The report notes that “It can be assumed that any areas with suitable habitat and located inside the buffer line, could be potentially FLL for the species shown in the maps. The maps can be used to infer likely areas of FLL based on habitat and distances travelled, but do not show definitive FLL.”

⁴⁸ The other qualifying non-assemblage features are not generally associated with use of agricultural habitats, with the exception of golden plover.

⁴⁹ Available at: <https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UK9005131>

Mersey Estuary Ramsar

5.2.7 The site meets the following **Ramsar** criteria:

- Criterion 5: The site supports a waterfowl assemblage of international importance.
- Criterion 6: The site supports the following qualifying species/populations:
 - ▶ Common shelduck *Tadorna tadorna*
 - ▶ Eurasian teal *Anas crecca*
 - ▶ Northern pintail *Anas acuta*
 - ▶ Common redshank *Tringa totanus*
 - ▶ Black-tailed godwit *Limosa limosa islandica*
 - ▶ Dunlin *Calidris alpina alpina*

5.2.8 The **supporting habitats** and **functional habitats** for the Ramsar qualifying features are taken to be the habitats for the equivalent SPA features. Qualitative and quantitative targets for the conservation objectives are provided in the supplementary advice for the SPA⁵⁰, which are considered applicable to the Ramsar site also.

Condition, Pressures and Threats

5.2.9 Most of the units of the Mersey Estuary SSSI are in 'favourable' or 'unfavourable recovering' condition (8 of 12; approximately 55% of the SSSI). Four of the units (~45% of the SSSI) are in 'unfavourable no change' or 'unfavourable declining' condition, invariably due to inappropriate management of the saltmarsh (grazing) or due to overall declines in some species (notably pintail) across the estuary (although the reasons for this decline are unclear).

5.2.10 Accordingly the Mersey Estuary SIP identifies the following as a pressures or threats on site integrity:

- Changes in species distributions (there have been large decreases in bird numbers on this SPA compared to local SPAs and regional trends).
- Invasive species (significant increase in population of Canada geese; non-native marine species in Liverpool Docks).
- Public Access/Disturbance (through disturbance of bird populations by terrestrial and marine recreation).

5.2.11 The option will not affect any of these pressures or threats, with the possible exception of the 'changes in species distributions' through hydrological changes.

5.3 Option summary, key pathways, and incorporated measures

Option summary

5.3.1 Option WR076 involves the following construction elements:

⁵⁰ Available at: <https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UK9005131>

- a new river abstraction point on the River Bollin [REDACTED] and associated transfer pumping station;
- a new water quality monitoring point upstream of the proposed abstraction point;
- a new 25MI/d water treatment works (WTW) on [REDACTED];
- a new 25MI/d treated water storage reservoir at the same location;
- a new raw water transfer main (~[REDACTED]) from abstraction point to the new WTW;
- a new potable water supply main (~[REDACTED]) from the WTW to an existing supply main;
- supply network reinforcements (~[REDACTED]) to a connection point on the to the existing [REDACTED] supply main.

5.3.2 With regard to operation, the option has a maximum capacity of 25MI/d. With an average abstraction scenario, the rate of abstraction would peak in July at 22MI/d, with a minimum of 3MI/d in winter. With the '1 in 500 year drought' abstraction scenario, use of the option would be sustained at the maximum rate of 25MI/d for a sustained period through spring, summer and early autumn.

Summary of main pathways for potential effects

Operation

- 5.3.3 The WR076 surface water abstraction is located in the Bollin [REDACTED] WFD surface water body which flows into the downstream Manchester Ship Canal and Mersey (Bollin confluence to Howley Weir) WFD surface water bodies. Upstream of the Bollin confluence, the Mersey and Manchester Ship Canal are combined, but they separate again at the same location as the Bollin confluence (the Bollin enters on the left bank of the canal, while the Mersey flows out from the right bank). Therefore, flow from the Bollin may contribute to both downstream water bodies, and hence the Mersey estuary at either the Weaver Sluices (via the Ship Canal) or via the River Mersey east of Runcorn.
- 5.3.4 There are some hydrological complexities associated with the Ship Canal and the River Mersey⁵¹ but broadly speaking the option is likely to impact flows entering the estuary via the River Mersey main channel, and via the Ship Canal at the Weaver Sluices⁵². Therefore:
- the reductions in non-saline inputs to the Mersey estuary may affect the supporting habitats for the SPA/Ramsar qualifying features; and
 - the reductions in flow volumes in the Bollin or Mersey rivers may affect 'functionally linked' habitats associated with or dependent on flows with the rivers.

Construction

- 5.3.5 Construction works would be required in and near the River Bollin, and in relatively flat and open fields; however, these areas are at least 20km from the closest point of the

⁵¹ The precise proportions of flow entering the River Mersey and the Ship Canal at Bollin Point is not certain and depends to some extent on the operation of the canal.

⁵² Water in the MSC flows in a south-easterly direction towards the River Weaver; most of the flow enters the Mersey estuary at this point (along with flows from the Weaver) via the Weaver Sluices. A relatively small proportion of the flow enters the inner Mersey Estuary further downstream at Eastham Lock (at the western end of the SPA / Ramsar).

SPA/Ramsar. The SPA/Ramsar features may be exposed to construction-related effects through:

- site-derived pollutants (principally oils and other contaminants) entering tributaries of the Mersey estuary, hence affecting their supporting habitats (either within the designated sites, or functionally-associated habitats outside the SPA/Ramsar boundaries); or
- other construction-related impacts on functionally-associated habitats or birds using these habitats (notably temporary displacement etc. due to noise / visual disturbance, etc. or permanent displacement due to habitat loss associated with the new WwTW).

Incorporated measures

- 5.3.6 The precise scope of the **construction** requirements (including location, timing, materials, extent, duration, etc.) cannot be precisely defined at this point; however, the scheme is unexceptional in terms of its scale and location, and the construction requirements will be typical of normal water-industry capital schemes. Established best-practice avoidance measures (see **Appendix C**) will be employed through the project planning and delivery stages.
- 5.3.7 With regard to **operation**, the EA's 2022 'Water Resource Availability and Abstraction Reliability' assessment⁵³ indicates that the catchment is discharge-rich at flows below Q30, with discharges supporting above-natural volumes at low flows, and that water is available for abstraction. However, the modelling for the option assumes that a '**Hands off Flow**' (**HOF**) **would be implemented** at a flow exceedance of Q98; this would reduce the impacts of abstraction as flows approach Q98, and avoid any impact at all from Q98 and below.

5.4 Assessment of Effects – Operation

- 5.4.1 The SPA / Ramsar sites are addressed together in the following sections as the site boundaries and interest features are essentially coincident. The assessment therefore considers the sites and features according to the functional relationships and exposure to option outcomes.

Anticipated environmental changes from operation

Hydrological changes

- 5.4.2 The option has hydrological connectivity with the estuary via the River Mersey main channel, and via the Ship Canal at the Weaver Sluices.
- 5.4.3 It should be noted that the catchment is discharge-rich, meaning that flows are higher than natural at low flows, due to the influence of discharges. The draft Upper Mersey ALS (Environment Agency, 2021) indicates that there is water available for abstraction at the proposed rate.
- 5.4.4 The NWT Gate 3 Checkpoint assessment (WSP, 2024) calculated that, without a HOF, impacts at Q95 could be up to 21% of gauged flow in the River Bollin immediately downstream of the abstraction; with a HOF this would be reduced to 2%. The impacts on

⁵³ Available at: <https://www.data.gov.uk/dataset/b1f5c467-ed41-4e8f-89d7-f79a76645fd6/water-resource-availability-and-abstraction-reliability-cycle-2>

flows in the MSC at its confluence with the Bollin (immediately before the Lower Mersey diverges from the MSC) would be only 2% at Q95 even without a HOF, and reduced to 0.3% with a HOF. At Q98 and below, impacts would be avoided entirely by the HOF.

5.4.5 This change in flow is negligible and would not be distinguishable from influences of canal operation and the divergence of the Lower Mersey and MSC. Therefore, no impacts on biological or physico-chemical elements would be expected in either of these water bodies. A full assessment across the Flow Duration Curve is available in WSP (2024, NWT Priority Action 3 Checkpoint Report).

5.4.6 As a guide, the consequent impact of the option on freshwater volumes entering the Mersey estuary relative to **gauged flows**⁵⁴ is summarised in **Table 5.1**. The total flow is calculated for a hypothetical location downstream of the confluence of the Mersey, Bollin and the Ship Canal (MSC) at Bollin Point, based on the furthest downstream gauges on the principal tributaries, i.e.:

- Irwell at Adelphi Weir;
- Irk at Collyhurst Weir;
- Medlock at London Road;
- Mersey at Ashton Weir;
- Glaze Brook at Little Woolden Hall;
- Sinderland Brook at Partington;
- Bollin at Bollington Mill.

5.4.7 However it should be noted:

- that the impact summarised in **Table 5.1** is at least 22km upstream of the closest points of the Mersey Estuary SPA / Ramsar (~22km from Bollin Point to the Weaver Sluices via the MSC; and ~26km to the SPA/Ramsar west of Runcorn Bridge via the River Mersey); and
- there are substantial additional ungauged inputs of non-saline water to the upper Mersey estuary prior to the SPA/Ramsar boundary (e.g. the River Weaver on the MSC; Sankey Brook Warrington WWTW on the River Mersey; the Ditton Brook near Widnes⁵⁵).

5.4.8 The magnitude of change in freshwater inputs to the Mersey estuary is therefore extremely small and arguably inconsequential at the SPA/Ramsar boundary, and well within the natural variability for the estuary.

⁵⁴ Note, there are a number of notable ungauged flows that enter the estuary also.

⁵⁵ Based on gauged flows on the rivers Dane, Weaver and Wincham Brook, the discharge of the Weaver to the Mersey estuary is between 20 – 30% of the flows noted in Table 5.1; the discharge of Sankey Brook is around 5 – 6% of the flows noted in Table 5.1.

Table 5.1 Maximum impact of option at different flows with HOF at Q98

Aspect	Q95	Q70	Q50
Total flow at D/S terminus of Mersey/MSD at conf. with Bollin (MI/d)	1145	1729	2481
Flow change %	0.3%	0.8%	0.5%

Changes to the physio-chemical environment

- 5.4.9 The effect of reduced freshwater input to the estuary on key physio-chemical parameters cannot be precisely quantified without the development or adaptation of bespoke models of the tidal flows and mixing in the estuary. However, it is evident that the magnitude of change in freshwater inputs will be extremely small, and the consequent effects on the intertidal areas of the SPA / Ramsar inconsequential.
- 5.4.10 The freshwater flow into the Mersey estuary is relatively small for the estuary's size in any case (Ridgeway *et al.* 2012), with estimates of typical freshwater input being around 66m³/s compared to the tidal influx into the Narrows of 2000m³/s during a spring tide (Pye *et al.* 2002). The Mersey is therefore considered a well-mixed estuary due to high tidal current velocities, relatively low freshwater input and high degree of turbulent mixing. It should also be noted that the catchment is considered discharge-rich – i.e. 'naturalised' flows (principally at low flows) would be lower than current flow volumes. The small reductions in freshwater input due to the options (in relation to inputs from the River Mersey catchment, and to the estuary catchment as a whole) are therefore likely to have very limited effects that will not be measurable outside the upper estuary, and almost certainly not detectable at the SPA/Ramsar boundary.
- 5.4.11 Monitoring (RPS 2011) indicates that salinities within the Inner Mersey Estuary range from 16.9 Practical Salinity Units (PSU) to 32.9 PSU, depending on the tidal cycle and seasonal inputs from freshwater sources. The invertebrate fauna of the estuary are therefore adapted to wide variations in salinity, and the small reductions in freshwater input associated with the WRMP option will not result in salinity changes that are outside of this normal range.
- 5.4.12 With regard to water quality, assessments have been undertaken at relevant locations downstream of the proposed surface water abstractions for the WFD assessment (see Appendix D of the WFD report). It should be noted that these assessments relate to the tributary rivers upstream of the SPA/Ramsar, but have some relevance for the estuary.
- 5.4.13 Invariably, comparison of the baseline and predicted concentrations of physio-chemical parameters demonstrates that the abstractions would not result in a change in status on either the source river or the downstream Mersey. The risk to water quality (in the context of the WFD) is shown from this assessment to be negligible, and it is noted that the Mersey Estuary SPA/Ramsar have not been identified as sites that are in unfavourable condition due to excessive nutrients (such that 'nutrient neutrality'⁵⁶ is being deployed or considered as mitigation in recent NE advice to LPAs⁵⁷). This would suggest that the

⁵⁶ Poor water quality due to nutrient enrichment from elevated nitrogen and phosphorus levels is one of the primary reasons for European sites being in unfavourable condition, and substantial reductions are needed to achieve favourable conservation status. 'Nutrient neutrality' is a mitigation approach that potentially allows new developments to be approved provided that there is no net increase in nutrient loading within the catchments of the affected European site.

⁵⁷ Letter from NE to LPA Chief Executives and Heads of Planning, 16 March 2022; Re. Advice for development proposals with the potential to affect water quality resulting in adverse nutrient impacts on habitats sites.

marginal reduction in freshwater input to the estuary will not have potentially notable effects on estuarine water quality.

- 5.4.14 The WFD assessment also recognises that there is an ongoing programme of water quality improvements in the Irwell catchment, including to waste water treatment works and combined sewer overflows. The primary purpose of these works is to improve water quality (particularly dissolved oxygen) in the heavily managed freshwater reaches of the River Mersey and Manchester Ship Canal, and is driven by the protection of the Ship Canal for cyprinid fish under the WFD (previously under the Freshwater Fish Directive). They are not therefore related to or driven by the conservation objectives for the SPA/Ramsar.
- 5.4.15 Notwithstanding this, the implementation of WR076 would not negate or offset the incidental benefits of the Irwell water quality improvements on the estuary waterbody. This conclusion is supported by detailed water quality modelling undertaken using existing SAGIS-SIMCAT and ICM models, to assess the impact of surface water abstractions proposed by the NWT schemes on water quality in the Irwell and Bollin, and for the Mersey catchment cumulatively⁵⁸ (noting that these models are based on early iterations of the NWT scheme with several surface water abstractions in the Mersey catchment, rather than the final WRMP (i.e. one option (WR076) only)).
- 5.4.16 The models indicate that the cumulative impacts of the potential surface water abstractions that may be employed for the NWT will be modest: for both the No NWT Abstraction and All Years (Phase 3) NWT abstraction scenarios, these show only a small impact on the water quality entering the MSC. In all scenarios, there is no deterioration in FIS (Fundamental Intermittent Standards) exceedances at the bottom end of the Mersey, Irwell or Bollin. The impact on DO (10%iles) is low, with only a reduction of -0.01 mg/l seen at the bottom end of the River Mersey. These small changes are considered inconsequential.
- 5.4.17 Given that the impacts associated with the Bollin abstraction (WR076) alone will be substantially less than that modelled for the NWT, with the location of maximum impact located some distance upstream of the SPA/Ramsar boundary, it can be reasonably concluded that Option WR076 will have no significant effects on water quality in the Mersey Estuary (either in relation to the current baseline, or a predicted future baseline with the Irwell improvements in place⁵⁹).
- 5.4.18 With regard to geomorphology, the fluvial supply of sediment to the estuary is small compared to the supply of sediment from offshore sources, and the Ship Canal acts as a notable sediment trap for fluvial sediments from the catchment. The estuary as whole is accreting, although the channels within the upper estuary are highly dynamic, frequently undergoing substantive re-orientation in response to both river flows and (more usually) tidal processes on decadal timescales. The small change in freshwater volumes will not substantially alter this; minor changes to sediment deposition may occur as this is related to salinity, but this will be within the range of natural variation for the estuary and will in

⁵⁸ WSP (2023). *United Utilities North West Transfer Strategic Resource Option: Surface Water Quality Modelling. Phase 3 report*. Report by WSP for UU, ref. 62282744-0008-V02.

⁵⁹ This is relevant as impacts are often interpreted in the context of longer-term indirectly related improvements for which there is sufficient surety over delivery. It should be noted that this is consistent with the 'Dutch Nitrogen' case; this essentially concluded (*inter alia*) that an appropriate assessment could not take into account conservation measures, preventive measures, or measures that are not part of the proposal if the expected benefits of those measures are not certain at the time of that assessment. This is not the case for the improvements to the Ship Canal, which are backed by an agreed strategy and included in UU's Business Plan. A similar example is found in air quality assessments that are consistent with IAQM guidance (IAQM 2020), where (for example) minor impacts on NO_x are set in the context of the predicted long-term decline that will result from the transition to electric vehicles.

any case occur outside the SPA/Ramsar site based on the distance downstream from the location of maximum impact.

Assessment of effects – freshwater inputs to the Mersey Estuary and effects on qualifying bird species

Context

- 5.4.19 Several studies have suggested that the number and densities of wintering waterbirds around estuarine freshwater channels are consistently greater than across associated mudflats, and that several bird species show significant preferences for freshwater flow areas over mudflats (e.g. Ravenscroft *et al.* (1997), Ravenscroft (1998, 1999), Ravenscroft & Beardall (2002) & Ravenscroft & Emes (2004)), although other studies have indicated that deeply incised channels associated with large volume inflows (such as the Mersey main channel) are less attractive to birds (Ravenscroft & Beardall, 2002).
- 5.4.20 There are a number of possible mechanisms for this. Correlations between freshwater flow and particle size (e.g. Ravenscroft & Emes (2004)), and substrate particle size distribution and invertebrate distribution have been recognised (e.g. Goss-Custard *et al.* (1991), Colwell and Landrum (1993), Yates *et al.* (1993)). Freshwater flow, salinity and invertebrate distribution have also been correlated (Kelly (2001)).
- 5.4.21 These physical relationships between invertebrate distributions and freshwater flows are important since there are numerous studies detailing relationships between overwintering waterbirds and the densities or distributions of their invertebrate prey (e.g. Goss-Custard *et al.* (1991), Colwell (1993), Colwell and Landrum (1993), Yates *et al.* (1993), Dierschke *et al.* (1999), Ravenscroft *et al.* (2002, 2004)). Associations between bird densities and particle size (Granadeiro *et al.* 2004) have also been recognised.
- 5.4.22 Possible relationships between birds and freshwater flows were investigated in detail through a series of studies in The Swale SPA/Ramsar and the Medway Estuary and Marshes SPA/Ramsar (RPS 2004a, 2004b, 2004c, 2005a; Humpheryes & Kellett 2003). These studies found few consistent patterns, however; for example:
- Whilst the general relationship of birds and creek corridors (rather than channels) was usually replicated between watercourses and embayments, the species assemblage was variable between creeks and years, suggesting that creek-specific variables may be less important for determining the community composition than environmental or community processes operating in the wider estuary or beyond. Most species (67%) displayed no, or a negative, association with creeks (70% when feeding behaviour only was considered).
 - Latitudinal relationships between creeks and invertebrates were inconsistent, with only a slight tendency for invertebrate biomass to be higher within the creek corridor than the channel or surrounding mudflats.
 - Significant decreases in invertebrate abundance and biomass down longitudinal gradients from the shore (potentially related to greater exposure to tidal processes) were recorded, although bird numbers showed the opposite (i.e. greater numbers towards the sea), perhaps reflecting greater foraging accessibility due to interstitial water, or less disturbance.
 - Furthermore, no significant differences in the usage of creeks by birds were recorded between freshwater creeks and those that were predominantly saline.
- 5.4.23 A broad consensus position appears to be that it is not freshwater flow volumes *per se* that are critical to the bird / intertidal channel relationship, rather the presence of ‘some

flows' within channels to maintain morphology, and that bird distributions are often influenced instead by regional factors (e.g. changes in disturbance levels, reductions in bird populations altering estuary usage, proximity of roost sites), local factors (e.g. the role of creek morphology or substrate penetrability) and small-scale interactions (e.g. inter and intra-specific bird relationships, or prey availability associated with behavioural or physiological responses to intertidal exposure).

- 5.4.24 The SACO advice relating to estuarine sites typically reflects this to some extent, in that the targets only refer to maintaining the 'availability' of freshwater in feeding and resting areas, not specific flow volumes / rates and so on. In particular, the target for hydrology / flow within the intertidal area of the Mersey Estuary is simply “*Maintain the availability of fresh water on mudflats within feeding and resting areas*” (i.e. specific flow regimes are not prescribed), with the SACO noting that “*The target has been set due to a lack of evidence that the feature is being impacted by any anthropogenic activities*”.
- 5.4.25 It should be noted that this relationship relates to smaller freshwater channels, such as those at Ince Banks in the Mersey; as noted, there is some evidence that incised channels associated with large volume inflows (such as the Mersey main channel) are less attractive to birds (Ravenscroft & Beardall, 2002).

Exposure / sensitivity of features and assessment of effects

- 5.4.26 The operation of the option will affect flows in the lower reaches of the Bollin, and the River Mersey and MSC. The principal areas of the SPA/Ramsar exposed to environmental changes associated with the scheme are therefore those SSSI units of the upper estuary that are adjacent to the main channel of the River Mersey or the Weaver Sluices, i.e.:
- the Mersey main channel and adjacent littoral habitats immediately downstream of Runcorn Bridge (SSSI units 001, 003, 004, 006, 007);
 - the mud and sandflats adjacent to Weaver Sluices (i.e. SSSI unit 007).
- 5.4.27 The condition of these SSSI units, and other factors relevant to the exposure of the features, is noted in **Table 5.2**.

Table 5.2 Mersey Estuary SSSI units in the upper estuary

SSSI Unit	Condition	Notes
001 – Mersey North Bank	Unfavourable no change	Includes the main channel of the River Mersey downstream of Runcorn Bridge, and adjacent mud/sand flats including Dungeon Banks and Eastham Sands. Unfavourable no change condition due to declines in teal, wigeon, pintail, golden plover and the assemblage (although these declines are estuary-wide, for reasons that are not clear (the SIP includes requirements for investigations into this)).

SSSI Unit	Condition	Notes
003 – Oglet / Hale	Unfavourable recovering	<p>Includes part of the mud/sand flats of Dungeon Bank and associated saltmarsh near Hale.</p> <p>The condition assessment for the unit notes that “<i>the saltmarsh feature meets targets for extent, zonation, vegetation structure, characteristic saltmarsh species composition and negative indicator species and is assessed as in favourable condition</i> [note, not ‘unfavourable recovering’ as per assessment for the unit]. <i>No other features were included in this assessment</i>”.</p>
004 – Hale Marsh West	Unfavourable no change	<p>Includes areas of mid-upper saltmarsh near the main channel of the Mersey, most of which is above MHW and so will have a low exposure to hydrological changes in the Mersey main channel.</p> <p>The condition assessment for the unit notes that “<i>The saltmarsh feature meets attribute targets for extent, physical structure, zonation, and negative indicators but does not meet attribute targets for sward structure and saltmarsh vegetation composition</i>”. These factors will not be influenced by the option.</p>
006 – Hale Marsh East	Unfavourable no change	<p>Unit primarily comprises upper saltmarsh (with a small low-mid marsh zone), most of which is above MHW and so will have a low exposure to hydrological changes in the Mersey main channel.</p> <p>The condition assessment for the unit notes that “<i>The saltmarsh feature meets attribute targets for extent, zonation, physical structure (creeks and pans) and negative indicators; but does not meet attribute targets for sward structure or positive indicator species</i>”. These factors will not be influenced by the option.</p>
007 – Frodsham Score to Runcorn Bridge	Unfavourable recovering	<p>Includes mud/sand flats north of Frodsham Score and areas of saltmarsh above MHW.</p> <p>The condition assessment for the unit notes “<i>Unit failing on saltmarsh structure and variation of zonation within saltmarsh</i>”, which is associated with the absence of pioneer marsh due to natural channel migration / erosion, and poor sward structure in the upper marsh due to overgrazing. These factors will not be influenced by the option.</p>

5.4.28 NE (2015)⁶⁰ and the Wetland Bird Survey (WeBS) Low Tide Count⁶¹ provide data on the typical distributions of wintering birds at low tide within the Mersey Estuary; in summary, wintering birds in the estuary are strongly associated with the mudflats and saltmarsh on the southern side of the main channel, near Ince Banks, and the sandflats between Runcorn Bridge and Weaver Sluices (particularly teal, dunlin and black-tailed godwit). However, most of these areas will not be particularly exposed or sensitive to the anticipated magnitude of change associated with the option; for example, the saltmarshes at Ince Banks will only be periodically inundated by the highest tides and the principal sources of freshwater to these areas will be local run-off and rainfall rather than water from the Mersey or the MSC.

⁶⁰ See Appendix 4 of NE (2015); available at <http://publications.naturalengland.org.uk/file/486960361845552>

⁶¹ Available at: <https://app.bto.org/webs-reporting/lowtides.jsp>

- 5.4.29 The effects of flow reduction must be looked at in the context of the requirements of the qualifying features of the SPA/Ramsar. Site integrity (based on the conservation objectives) requires, subject to natural change, the maintenance or restoration of
- the extent and distribution of the habitats of the qualifying features;
 - the structure and function of the habitats of the qualifying features;
 - the supporting processes on which the habitats of the qualifying features rely;
 - the population of each of the qualifying features; and,
 - the distribution of the qualifying features within the site.
- 5.4.30 However, it must be recognised that estuaries are naturally dynamic environments and so none of these aspects (with the possible exception of the populations of the qualifying features) have a fixed and specific target from which deviation would always constitute an adverse effect on integrity.
- 5.4.31 The conservation objective target for hydrology/flow within intertidal areas of the Mersey Estuary SPA is “*Maintain the availability of fresh water on mudflats within feeding and resting areas*”, reflecting the position noted above regarding flow volumes (i.e. that ‘some flow’ is important, rather than specific volumes), with the SACO noting that “*The target has been set due to a lack of evidence that the feature is being impacted by any anthropogenic activities*”.
- 5.4.32 The data in **Table 5.1** demonstrate that the impact of the option on non-saline inputs to the estuary will be negligible, and well within normal variation. These changes will have essentially no effect on the supporting habitats of the SPA/Ramsar features, nor the features themselves, and will be inconsequential in relation to tidal turnover.
- 5.4.33 With regard to secondary or consequential effects (e.g. on water quality), the SACO include the following specific targets:
- Dissolved Oxygen: “*Maintain the dissolved oxygen (DO) concentration at levels equating to Good Ecological Status (specifically ≥ 4.0 mg L⁻¹ (at 35 salinity) for 95 % of year) avoiding deterioration from existing levels. This target was set using the Environmental Agency 2019 water body classifications data.*”
 - Nutrients: “*Maintain water quality at mean winter dissolved inorganic nitrogen levels where biological indicators of eutrophication (opportunistic macroalgal and phytoplankton blooms) do not affect the integrity of the site and features, avoiding deterioration from existing levels.*”
- 5.4.34 As noted (Section 5.3) water quality modelling undertaken for the WFD indicates that under a ‘multiple option’ NWT scenario, there is no deterioration in FIS (Fundamental Intermittent Standards) exceedances at the bottom end of the Mersey, Irwell or Bollin. The impact on DO (10%iles) is low, with only a reduction of -0.01 mg/l seen at the bottom end of the Mersey. These small impacts are considered inconsequential. Given that the WRMP only includes one option (the abstraction from the Bollin), with the location of maximum impact located some distance upstream of the SPA/Ramsar boundary, it can be reasonably concluded that the options proposed for the WRMP will have no meaningful effects on water quality in the Mersey Estuary.
- 5.4.35 Consequently, **operation of the option will not alter the within-site supporting habitats for the qualifying features, such that the integrity of the species’ population may be undermined; nor will it prevent the achievement of ‘favourable’ conservation status in those site units that are currently unfavourable.**

- 5.4.36 Functionally-associated habitat is located at Woolston Eyes SSSI, adjacent to the River Mersey. This site comprises four large lagoons (some dry, some with open water) that are used for the disposal of dredgings from the MSC. The SSSI is designated in part for its wintering wildfowl (notably nationally important numbers of wintering gadwall, teal, shoveler and pochard, of which teal is a qualifying feature of the SPA/Ramsar), and the site is being managed to increase its attractiveness to wading birds⁶². However, the site integrity is not dependent on flows within the adjacent River Mersey; whilst some areas of the site may be subject to periodic flooding this is not typically associated with flows in the Mersey since the SSSI is separated by embankments⁶³, and the operation of the option will have essentially no effect on the highest flows in the Mersey. **Consequently birds associated with the SPA/Ramsar will not be exposed to environmental changes from the option operation when using Woolston Eyes SSSI.**

5.5 Assessment of Effects – Construction

- 5.5.1 The SPA/Ramsar features may be exposed to construction-related effects through:
- site-derived pollutants (principally oils and other contaminants) entering tributaries of the Mersey estuary, hence affecting their supporting habitats (either within the designated sites, or functionally-associated habitats outside the SPA/Ramsar boundaries); or
 - other construction-related impacts on functionally-associated habitats or birds using these habitats (notably temporary displacement etc. due to noise / visual disturbance, etc. or permanent displacement due to habitat loss).
- 5.5.2 The precise scope of the **construction** requirements (including location, timing, materials, extent, duration, etc.) cannot be precisely defined at this point; however, the scheme is unexceptional in terms of its scale and location, and the construction requirements will be typical of normal water-industry capital schemes. Consequently there can be a high-degree of confidence that hydrologically-linked supporting habitats will not be adversely affected by **site-derived pollutants** as there are numerous established measures that can be employed through the project planning and delivery stages to prevent pathways being realised (see **Appendix C**).
- 5.5.3 With regard to displacement of qualifying features whilst using functionally-associated habitats, this risk will depend to some extent on site conditions and agricultural practice at or immediately prior to construction, and may require development-specific field surveys. However, it is very unlikely that qualifying features of the SPA/Ramsar site will be substantively exposed to displacement associated with construction of this option that might undermine site integrity based on the available data:
- the nearest known area of functionally-associated habitat (Woolston Eyes SSSI) is over [REDACTED] from the likely construction areas (and so beyond the range that noise or visual disturbance would operate);
 - the likely construction areas are substantially beyond the 2km 'buffer' zone identified by NE (2023) for the Mersey Estuary SPA and over [REDACTED] from the SPA itself (so inherently lower risk than development sites closer to the estuary);

⁶² SSSI condition assessment:

<https://designatedsites.naturalengland.org.uk/SiteFeatureCondition.aspx?SiteCode=S1000106&SiteName=Woolston%20Eyes%20SSSI>

⁶³ This is to be expected, to prevent dredged sediment being re-mobilised into the River Mersey by fluvial flooding.

- the scale of the permanent land-take is relatively small (subject to detailed design, but likely to be [REDACTED], based on initial plans), and the habitats of the construction areas (based on aerial photos) are entirely unexceptional in a local and regional context (so are unlikely to be particularly or disproportionately attractive to the qualifying species relative to identical areas of habitat locally).

5.5.4 Furthermore, any impacts on functionally-associated habitats can be reliably avoided (e.g. through timing construction works) or mitigated (through enhancement of alternative habitats) at the project level.

5.5.5 **Construction of the scheme will therefore have no adverse effects on the integrity of the Mersey Estuary SPA/Ramsar alone.**

Other projects ‘in combination’

Options in other U UW plans

5.5.6 With regard to other U UW plans:

- Currently, STT is not part of any other water company revised draft WRMP24 preferred plan, and therefore the NWT SRO scenario (i.e. one option) is fundamentally the same as the final WRMP24, and so in combination effects cannot occur.
- The NWT SRO as it might be delivered under ‘WRSE higher demand’ and ‘WRSE no SESRO’ scenarios is dependent on selection of STT in future planning cycles by other water companies and so these scenarios are a ‘plan’ or ‘programme’ that can be meaningfully assessed for in combination effects at this point.
- The drought options identified in U UW’s **Drought Plan 2021**⁶⁴ do not affect these European sites.
- The interaction of the WRMP options with specific schemes derived from the emerging **Drainage and Wastewater Management Plan (DWMP)** can only be assessed at the project level due to the generic nature of the DWMP options.

Minor projects

5.5.7 It has not been possible to produce a definitive list of existing (minor) planning applications near each option’s zone of influence and, generating a list at this stage would be of little value. It is possible that there will be ‘in combination’ project-specific construction effects associated with future planning applications, although this can only be assessed at the time of any application. This is consistent with the ACWG guidance on cumulative/in combination assessments.

Major Projects

5.5.8 The Planning Inspectorate’s National Infrastructure Projects database⁶⁵ identifies three major projects with the potential to affect the Mersey Estuary sites; in addition, HS2 is a major construction scheme within the catchment:

⁶⁴ https://www.unitedutilities.com/globalassets/z_corporate-site/about-us-pdfs/water-resources/draft-final-drought-plan-2022.pdf

⁶⁵ <https://infrastructure.planninginspectorate.gov.uk/projects/>

Table 5.3 National Infrastructure Projects that may affect the Mersey estuary

Project	Summary	Status	Effect pathways / HRA conclusions
Hydrodec Oil Re-Refinery Eastham	The construction of a new hazardous waste recovery facility at Power House Road, Eastham, Port Wirral, Merseyside comprising the construction and operation of a waste oil re-refining plant together with associated and ancillary development.	Not submitted (due 2015)	Not yet submitted; no assessment possible
Hynet North West Hydrogen Pipeline	The Hynet North West Hydrogen Pipeline will convey hydrogen from the Stanlow production site to industrial users and to blending points at Partington and Warburton for introduction into the existing gas network. It will also connect with associated hydrogen storage facilities to help balance supply and demand on the pipeline. It is anticipated to consist of approximately 125km of underground high pressure steel pipeline with associated user connection spurs, together with a number of Hydrogen Above Ground Installations along the route of the pipeline.	Not submitted (expected 2023)	Not yet submitted; no assessment possible but in combination effects only likely in relation to construction, and these will be avoidable at the scheme level with mitigation that can be employed for the WRMP options.
Keuper Gas Storage Project	Underground Gas Storage Facility - up to 19 underground caverns, gas processing plant and associated development with capacity to store up to 500 standard million cubic meters (mcm) of natural gas, having an import and export capability of up to 34 mcm per day.	Approved; pre-commencement.	Scheme will discharge brine to the estuary at Runcorn; HRA concluded 'no LSE'
HS2	High speed rail between Crewe and Manchester.	Approved; under construction.	Scheme will involve construction within the Mersey estuary catchment; appears to have been screened out of the HRA process, and in practice there are no potential i/c effects on the Mersey estuary.

Project	Summary	Status	Effect pathways / HRA conclusions
Protos	Protos is an energy and resource hub located near Ellesmere Port in the North West of England. Developed by Peel NRE, it clusters together innovative technologies, connecting energy-intensive businesses with sources of low-carbon energy. Note, this is not an NSIP but essentially a cluster of smaller projects with outline planning permission that are currently being developed, but with uncertain delivery periods for specific plots (similar to a land-use plan industrial allocation), and so identifying and testing specific 'in combination' effects cannot be reasonably completed at this stage (and will depend on the timing and delivery of the SRO options and the remaining Protos plot developments).	Approved; under construction.	This collection of developments received outline planning permission in 2009; the HRA for that concluded 'no LSE' and areas of the site have been built out; in combination effects only likely in relation to future development plots (since existing will form part of the baseline) and potential effects from these can only be determined at the project stage; there are no realistic mechanisms for in combination effects assuming that the individual projects meet any consenting requirements for discharges etc to the estuary.

5.5.9 There is a potential interaction with the Keuper Gas Storage Project, as this will discharge brine to the Ship Canal and hence the Mersey estuary at Runcorn. The effects of this brine discharge were modelled by RPS (2011)⁶⁶ as part of the EIA for the scheme; the HRA of the scheme (ERM 2015)⁶⁷ notes the following:

5.5.10 *"The RPS Environmental Appraisal is based on a simulated mixing zone and salinity resulting from an additional discharge of saturated brine (310 g/l) to the Mersey Estuary via the MSC under low flow (Q75) conditions with a maximum discharge rate of 0.22 m³/s (19,000 m³/day). Modelling of the salinity change during low flow (Q75) conditions indicates the salinity of MSC water discharging to the Mersey at the Weaver Sluices will increase from 4-6 PSU to 11-12 PSU. This is below the natural range of salinity (16.9-32.9 PSU) recorded in the inner Mersey Estuary".*

5.5.11 The HRA therefore concluded that this would not significantly affect the sites as the habitat communities and species living in estuaries are habituated to a range salinities and temperatures and are highly tolerant to fluctuating environmental conditions; and the scheme would not be outside the natural range of salinity. It should also be noted that:

- this assessment assumed the implementation of conditions on operation that would require that brine discharges be reduced to maintain salinities in the normal range when flows at the Weaver Sluices were below Q75;
- the brine discharges will occur for six years only during the solution mining phase, and so is unlikely to overlap substantially with the delivery or operation of the WRMP option (assuming this project is delivered to schedule).

5.5.12 In theory, the WRMP option may marginally reduce flows in the Ship Canal which may affect brine dilution; however, the reduction (and the corresponding effects on salinity) will be negligible; furthermore, the conditions relating to the brine discharge below Q75 will ensure that salinities remain within the predicted range. Adverse in combination effects

⁶⁶Available at: www.kgsp.co.uk/wp-content/uploads/2015/12/6.2-KGSP-ES-Technical-Appendices.pdf

⁶⁷ Available at: <http://www.kgsp.co.uk/wp-content/uploads/2015/12/5.4-KGSP-HRA.pdf>

will not therefore occur with this scheme, even if there is a minor overlap with the options required by 2031.

Residual uncertainties and mitigation

- 5.5.13 There is a very high degree of confidence that the option will have **no adverse effects on the integrity of the Mersey Estuary SPA/Ramsar**, alone or in combination. This is based principally on the very small magnitude of change for the flows into the estuary, in proportion to freshwater flows from the River Mersey catchment and other flows into the estuary, and in relation to the tidal volumes; and on the low sensitivity of the interest features (specifically the habitats used by the qualifying features) to changes in freshwater inputs of this magnitude. Any changes will be negligible and within the range of natural variation for the estuary. Construction-related environmental changes can be self-evidently avoided or mitigated using normal best-practice measures. The option would not prevent the achievement of 'favourable' conservation status in those site units that are currently unfavourable.
- 5.5.14 This conclusion is considered robust for the HRA of the WRMP, and the residual uncertainty associated with this aspect is considered too small to demand the identification of specific plan-level mitigation (i.e. alternative options). However, it is recognised that alternative options have been identified to mitigate minor residual uncertainties in the WFD assessment (see **Appendix D** for the assessment of these).

5.6 Assessment Summary

- 5.6.1 Based on the available hydrological and European site data it can be concluded that the WRMP option will have no adverse effects, alone or in combination, on the **Mersey Estuary SPA / Ramsar**. The maximum effect of the option on flows from the River Mersey catchment into the estuary is very small relative to the overall freshwater inputs to the estuary and the dominating influence of tidal flows.
- 5.6.2 Note, if no adverse effects alone or in combination are expected for the Mersey Estuary SPA / Ramsar, other European sites in the area (i.e. Ribble and Alt Estuaries SPA / Ramsar, the Mersey Narrows and North Wirral Foreshore SPA / Ramsar, the Dee Estuary SPA / Ramsar, Martin Mere SPA / Ramsar, Morecambe Bay and Duddon Estuary SPA, and Morecambe Bay Ramsar) will not be indirectly affected if / when their qualifying feature populations utilise the Mersey Estuary SPA / Ramsar.

6. Appropriate Assessment – Liverpool Bay SPA; Mersey Narrows and North Wirral Foreshore SPA / Ramsar

6.1 Screening Summary

6.1.1 This section focuses on the potential effects on those sites that will not themselves be exposed to environmental changes as a result of the option, but which support mobile species that may utilise areas of other sites that are exposed to environmental changes. This is for clarity and simplicity, as the effect pathways are limited and largely the same.

6.1.2 These sites are:

- Liverpool Bay SPA
- Mersey Narrows and North Wirral Foreshore SPA
- Mersey Narrows and North Wirral Foreshore Ramsar

6.1.3 **Liverpool Bay SPA** is a large marine site extending from low water to approximately 20km offshore in the Eastern Irish Sea between Anglesey and Blackpool. It is principally designated to protect overwintering and foraging areas for **common scoter** and **red throated diver**, but was extended to include areas within the Mersey estuary used for foraging by **common tern** associated with the **Mersey Narrows and North Wirral Foreshore SPA**, areas adjacent to the north Wales coast used by breeding **little tern** associated with the **Dee Estuary SPA**, and marine areas to the east used by wintering **little gull**.

6.1.4 The **Mersey Narrows and North Wirral Foreshore SPA** is a coastal site covering intertidal habitats at Egremont foreshore, man-made lagoons at Seaforth Nature Reserve and the extensive intertidal flats at North Wirral Foreshore; it is designated for its **wintering waders** and also supports **breeding common tern**.

6.1.5 The **Mersey Narrows and North Wirral Foreshore Ramsar** is coincident with the SPA and is largely designated for the same reasons.

6.1.6 No part of the option is located within [REDACTED] of these sites, nor are the sites themselves likely to be affected by the environmental changes associated with the option. However, the mobile features of these sites may be affected when using areas of the Mersey Estuary SPA/Ramsar that are exposed environmental changes as a result of the WRMP options. In particular:

- The wintering bird populations will make use of the other estuary sites.
- Common tern associated with the Mersey Narrows and North Wirral Foreshore SPA forage near the mouth of the Alt estuary and in the Mersey estuary (areas covered by the Liverpool Bay SPA extension).
- Common tern associated with the Liverpool Bay SPA forage near the mouth of the Alt estuary and in the Mersey estuary (areas covered by the Liverpool Bay SPA extension).
- Red-throated diver associated with the Liverpool Bay SPA utilise relatively shallow inshore waters, including some areas within the estuaries, for foraging.

6.1.7 Note:

- Common scoter essentially use offshore areas of the Liverpool Bay SPA that will not be affected by the environmental changes associated with the options, and so are not considered further (i.e. there will be no significant effects, alone or in combination, on this qualifying feature).
- The areas potentially affected by the environmental changes associated with the options are substantially beyond the foraging range of little tern associated with the Dee Estuary SPA (i.e. there will be no significant effects, alone or in combination, on this qualifying feature).

6.1.8 Note, due to the limited scope of the effects, and the overlaps with the assessments for the Mersey Estuary SPA/Ramsar, the assessment structure has been simplified relative to Sections 5 to ensure it remains appropriate to the scale and complexity of the potential effects.

6.2 Assessment of Effects

Mersey Narrows and North Wirral Foreshore SPA / Ramsar

The qualifying features of these sites are:

- Mersey Narrows and North Wirral Foreshore SPA:
 - ▶ Great cormorant *Phalacrocorax carbo* (non-breeding)
 - ▶ Eurasian oystercatcher *Haematopus ostralegus* (non-breeding)
 - ▶ Grey plover *Pluvialis squatarola* (non-breeding)
 - ▶ Sanderling *Calidris alba* (non-breeding)
 - ▶ Bar-tailed godwit *Limosa lapponica* (non-breeding)
 - ▶ Common redshank *Tringa totanus* (non-breeding)
 - ▶ Little gull *Larus minutus* (non-breeding)
 - ▶ Common tern *Sterna hirundo* (non-breeding and breeding)
 - ▶ Red knot *Calidris canutus islandica* (non-breeding)
 - ▶ Dunlin *Calidris alpina alpina* (non-breeding)
 - ▶ Waterbird assemblage (non-breeding)
- Mersey Narrows and North Wirral Foreshore Ramsar
 - ▶ Criterion 4 - supports plant/animal species at a critical stage in their life cycles, or provides refuge (important numbers of non-breeding little gulls and common terns).
 - ▶ Criterion 5 - regularly supports 20,000 or more waterbirds.
 - ▶ Criterion 6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds (Red knot, Bar-tailed godwit).

6.2.1 The site is partly in unfavourable declining condition (2012 assessment), principally due to recreational pressure and disturbance, which is damaging the supporting habitats and displacing bird species elsewhere within the north-west estuaries complex.

- 6.2.2 The site itself is ~6km from the mouth of the Alt estuary (located on the far side of the Crosby Channel) and over 22km downstream of Runcorn Bridge on the Mersey, and so will not be directly affected by any environmental changes associated with the WRMP options (i.e. any environmental changes will be entirely attenuated by the SPA/Ramsar boundary). The only mechanism for effects is therefore if the mobile species of the site rely on habitats that may be exposed to environmental changes during their life cycle.
- 6.2.3 With regard to the **overwintering bird assemblage**, the assessments for the Mersey Estuary SPA/Ramsar demonstrate that the options will not affect the integrity of the habitats of these sites, such that the integrity of the populations of the qualifying species would be adversely affected. Due to the overlaps in species and habitat requirements, this conclusion can be extended to the Mersey Narrows and North Wirral Foreshore SPA/Ramsar also.
- 6.2.4 **Common terns** that nest at the site are known to forage across the Mersey Narrows and near the Alt estuary, and within the inner Mersey estuary also. Their use of the inner Mersey estuary was assessed by the investigations underpinning the extension of the Liverpool Bay SPA into the Mersey estuary⁶⁸, and so the principal foraging areas are relatively well-established. These do not extend into the upper estuary (i.e. into the non-designated areas beyond Runcorn Bridge) and hence will not overlap with the zone of hydrological change (such that it is) that may be associated with Option WR076 (note also, the effect of this option on the physio-chemical characteristics of the Mersey Estuary SPA/Ramsar are considered negligible). This feature will not therefore be affected at all by Option WR076.
- 6.2.5 Based on this, the mobile features of the Mersey Narrows and North Wirral Foreshore SPA/Ramsar will not be exposed to any environmental changes as a result of Option WR076.

Liverpool Bay SPA

- 6.2.6 The qualifying features of this site are:
- Red-throated diver *Gavia stellata* (Non-breeding)
 - Common scoter *Melanitta nigra* (Non-breeding)
 - Little gull *Hydrocoloeus minutus* (Non-breeding)
 - Common tern *Sterna hirundo* (Breeding)
 - Little tern *Sternula albifrons* (Breeding)
- 6.2.7 The site is a marine site and so condition assessments for underpinning SSSIs are not available.
- 6.2.8 The site covers part of the outer Mersey estuary but is substantially outside the likely zone of influence for hydrological changes associated with WR076.
- 6.2.9 The principal pathways for effects are as follows:
- **Common terns** that nest at Seaforth are associated with this SPA and are known to forage within the inner Mersey estuary. Their use of the inner Mersey estuary was assessed by the investigations underpinning the extension of the Liverpool Bay SPA

⁶⁸ NE 2016. *Tern verification surveys for marine sites*. Natural England Commissioned Report NECR212 [online]. Available at: <https://publications.naturalengland.org.uk/file/4504267260428288https://publications.naturalengland.org.uk/file/4504267260428288>.

into the Mersey estuary⁶⁹, and so the principal foraging areas are relatively well-established. These do not extend into the upper estuary (i.e. into the non-designated areas beyond Runcorn Bridge) and hence will not overlap with the zone of hydrological change (such that it is) that may be associated with Option WR076 (note also, the effect of this option on the physio-chemical characteristics of the Mersey Estuary SPA/Ramsar are considered negligible).

- **Red throated divers** may periodically utilise areas of the Mersey estuary although this is not considered a core area for the species, and the effects of WR076 on the habitats of the Mersey estuary will be too small to affect their usage of this part of the site.

- 6.2.10 The remaining features are unlikely to be exposed to the environmental changes associated with any of the options due to their behavioural preferences (common scoter and little gull do not make significant use of inshore waters during the periods for which the SPA is designated; and little tern are associated with the Dee and do not range as far as the inner Mersey estuary when foraging).
- 6.2.11 The mobile features of the Liverpool Bay SPA/Ramsar will not be exposed to any environmental changes as a result of Option WR076 (alone or in combination).

⁶⁹ NE 2016. *Tern verification surveys for marine sites*. Natural England Commissioned Report NECR212 [online]. Available at: <https://publications.naturalengland.org.uk/file/4504267260428288https://publications.naturalengland.org.uk/file/4504267260428288>.

7. Strategic In Combination Assessment

7.1 Between-option 'in combination' effects

- 7.1.1 The WRMP only has one option (WR076) and so 'between-option' in combination effects cannot occur.

7.2 'In combination' effects with other UuW Plans

NWT SRO

- 7.2.1 As noted, STT is not currently part of any other water company revised draft WRMP24 preferred plan, and therefore the NWT SRO scenario is fundamentally the same as the final WRMP24 (i.e. one option, WR076), and so in combination effects cannot occur.
- 7.2.2 The NWT SRO as it might be delivered under 'WRSE higher demand' and 'WRSE no SESRO' scenarios is dependent on selection of STT in future planning cycles by other water companies and so these scenarios are not a 'plan' or 'programme' that can be meaningfully assessed for in combination effects at this point (since substantial components of the assessment would be speculative, and the additional SRO options would not be required until 2043 at the earliest).
- 7.2.3 Note that any such in combination effects will be addressed by the forthcoming SRO Gate 3 investigations (this includes additional groundwater modelling, water quality, ecological and hydrological monitoring and fish pass assessments) and in future WRMP cycles.

Drought Plan

- 7.2.4 The requirements of UuW's current Drought Plan are accounted for within the WRMP calculations and the HRA of this plan, and so there cannot be additional 'in combination' effects between the WRMP and the Drought Plan.
- 7.2.5 In addition, the drought options identified in the Drought Plan 2022⁷⁰ do not affect any of the European sites potentially affected by the preferred WRMP options⁷¹, and the Drought Plan 2022 HRA⁷² confirms that there will be 'no LSE' alone or in combination as a result of the Drought Plan.

⁷⁰ https://www.unitedutilities.com/globalassets/z_corporate-site/about-us-pdfs/water-resources/draft-final-drought-plan-2022.pdf

⁷¹ Note, the two Drought Plan options (River Lune LCUS abstraction; and Lake Windermere) have the potential to affect this **Morecambe Bay Ramsar, Morecambe Bay SAC and Morecambe Bay and Duddon Estuary SPA**, which may also be affected by reserve option WR191 (see Appendix D); however, the assessment in Appendix D concludes that The Lake Windermere DP option will not affect the Lune (which is the only part of the European sites exposed to WR191); and the effects of option WR191 alone will be too small to alter the conclusion for the River Lune LCUS abstraction. There will therefore be no operational in combination effects if the DP options are utilised and reserve option WR191 is in operation.

⁷² https://www.unitedutilities.com/globalassets/z_corporate-site/about-us-pdfs/water-resources/uu-revised-draft-dp-hra-300721.pdf

Drainage and Wastewater Management Plan (DWMP)

- 7.2.6 UUW's draft DWMP has identified a total of 403 options for 22 Tactical Planning Units (TPUs)⁷³. For each of the 22 TPU catchments a legal obligation to 'increase treatment capacity' option has been identified for the relevant wastewater treatment works; however, the options are largely generic (e.g. 'enhanced operational maintenance'; 'sludge centre rationalisation'; 'surface water source control measures') that do not identify specific locations for interventions below the TPU level.
- 7.2.7 The DWMP HRA concludes that there is insufficient information available in the DWMP to enable potential effects on European sites within, near or downstream of TPUs to be meaningfully assessed, and so assessment is necessarily deferred 'down the line'. However:
- The options will involve minor and/or unexceptional construction works, and construction effects can clearly be avoided with normal best-practice measures.
 - Implementation of the options must be consistent with the DWMP objectives and these include meeting all permitting requirements (now, or in the future) and protecting, restoring or improving the environment by reducing spills from storm overflows and delivering WINEP-driven schemes. Operational effects on water quality would therefore be neutral or positive both collectively and for individual schemes. Other operational effects are conceivable (for example, new pumping stations may introduce noise and vibration effects), but these will be scheme-specific, not systematically driven by the options in the DWMP, and avoidable with best-practice design measures.
- 7.2.8 Consequently, the interaction of the WRMP options with specific schemes derived from the DWMP can only be assessed at the project level (although there is nothing to suggest that adverse effects will be unavoidable); and overall water quality within the receiving waterbodies (including European sites potentially affected by the WRMP) will be positive as a result of the DWMP (so adverse in combination effects would not occur).

7.3 Between-company 'in combination' effects

WRMPs

- 7.3.1 UUW's WRMP options will not affect any European sites that are likely to also be exposed to effects associated with options from other WRMPs, and so in combination effects with other WRMPs would not be expected.

Drought Plans

- 7.3.2 As with the WRMPs, the drought options within other water company Drought Plans will not affect any European sites that are likely to also be exposed to effects associated with the WRMP options, and so in combination effects with other WRMPs would not be expected.

⁷³ TPUs are essentially units within wastewater drainage catchments, typically associated with a treatment works.

7.4 In combination effects with other plans and programmes

Effects with other strategic plans and water resource demand

- 7.4.1 The WRMP explicitly accounts for growth forecasts when calculating future water demand (and hence areas with potential deficits). This means that ‘in combination’ water-resource effects with growth promoted by other plans or projects are considered and accounted for during the WRMP development process and its deficit calculations.
- 7.4.2 Potential ‘in combination’ effects in respect of water-resource demands due to other plans or projects are therefore unlikely since these demands are explicitly modelled when determining deficit zones and hence developing Feasible Options. As a result (in respect of water resources) the WRMP is not likely to make non-significant effects in other plans significant (indeed, other plans are arguably the ‘source’ of any potential effects in respect of water demand, with the WRMP having to manage potential effects that are not generated by the WRMP itself).
- 7.4.3 Local plans are not all consistent with regard to planned growth and this arguably introduces some uncertainty. However, with regard to water resources and planning uncertainty it is important to note the following:
- The WRMP safeguards against uncertainty in option yield and timing through ‘Target Headroom’; this is an allowance provided in the planning process (i.e. designed-in spare capacity) that ensures that any supply-demand deficit will still be met if there is an underperforming demand management measure or growth exceeds predicted levels. It is therefore extremely unlikely that additional demand or a poorly-performing option would ‘suddenly’ result in a deficit that might affect a European site; and (in any case);
 - The WRMP is revised on a five-yearly cycle, which allows any changes in demand forecasts (e.g. as new plans come forward) to be accounted for, and for timely intervention should a measure not be performing as expected. Delivery is also formally reviewed on an annual basis.
- 7.4.4 It is therefore considered that the WRMP options will not have significant ‘in combination’ effects with local plans in respect of water resources.

Effects with major projects

- 7.4.5 Known major projects that are likely to increase demand have been taken into account during the development of UUW’s WRMP and determination of future deficits.
- 7.4.6 With regard to individual projects interacting with specific options to affect particular sites, this is addressed in **Section 5**. In summary, reference has been made to the Planning Inspectorates National Infrastructure Projects database⁷⁴ which includes major projects, subject to the requirements of the Planning Act 2008. It includes projects:
- where the developer has advised the Planning Inspectorate in writing that they intend to submit an application in the future;
 - where an application has already been made to the Planning Inspectorate and is undergoing the development consent process;

⁷⁴ <https://infrastructure.planninginspectorate.gov.uk/projects/>

- where a Development Consent Order (DCO) application has been determined.

7.4.7 This exercise did not identify any major projects likely to adversely affect the integrity of any sites in combination with the WRMP.

Minor projects

7.4.8 It has not been possible to produce a definitive list of existing (minor) planning applications near each option's zone of influence and, generating a list at this stage would be of little value. It is possible that there will be 'in combination' project-specific construction effects associated with future planning applications, although this can only be assessed at the time of any application. This is consistent with the ACWG guidance on cumulative/in combination assessments.

Effects with strategic development pressure

7.4.9 Regional and local plans have been reviewed at a high level to determine whether there are any likely significant 'in combination' effects, with allocation sites identified where possible. This review has not indicated any potential or likely 'in combination' effects that could occur as a result of cumulative development pressure, and in reality the timescales involved in the implementation of the options and the absence of detail on allocation proposals makes any 'in combination' assessment difficult and potentially meaningless. However, the construction works required for the option are temporary and not of a scale or type that would make 'in combination' effects likely.

8. Demand-Side Options

8.1 Screening Summary

- 8.1.1 Sixteen demand-side options may involve physical interventions in the network (e.g. meter installation; pipe lining; etc.), with the remaining options essentially providing support for direct and indirect measures to improve water efficiency (e.g. household visits). The 'water efficiency support' options cannot have significant effects due to the nature of the option (based on established guidance for similar policies and proposals in strategic planning documents that do not promote development).
- 8.1.2 The physical works required for the remaining demand-side options will typically be very minor (e.g. meter installation) with virtually no risk of significant effects on European sites. In some instances effect pathways might be conceivable (for example, a hypothetical leaking pipe might be located in or near a European site) but it is not possible to predict or identify specific locations where such measures might be applied and so effects on specific European sites cannot be identified.
- 8.1.3 Non-specific residual risks such as these can almost always be avoided with established scheme-level mitigation measures and it is very unlikely that significant or significant and adverse effects as the result of a particular demand-side measure would be unavoidable at the scheme level; however, these options are carried forward to the 'appropriate assessment' stage for procedural reasons and to avoid potential conflict with the 'People over Wind' case.

8.2 Appropriate Assessment

- 8.2.1 Demand-side options will have no negative operational effects on European sites as they will reduce treated water use. The only realistic mechanism for a negative effect would be through any construction required (for example, the leakage reduction programme may require repair of a pipe in or near an SAC), but this cannot be meaningfully assessed at the strategic level since information on the location of specific intervention requirements (e.g. leaks; households requesting meters) is not available without specific investigations, which would form part of the option package (e.g. the precise location and severity of most leakages is not known ahead of detection), and there is consequently no information on the scale (etc.) of any construction required. Therefore, from an HRA perspective, the options are 'screened in' (as an effect pathway is conceivable) but as a meaningful appropriate assessment is not possible, the assessment is necessarily deferred to the project level.
- 8.2.2 However, it is clear that the anticipated works associated with these options are not of a scale that would suggest that effects are potentially unavoidable at the project stage, and the WRMP requires that the standard avoidance measures in **Appendix C** be employed (which includes a requirement for the potential for European sites to be affected to be considered at the planning stage). The WRMP does not imply any approval for schemes that come forward under these options or remove the need for project-level assessments, although the measures noted in **Appendix C** will ensure that potential adverse effects can be identified and avoided at the project stage. **The distribution management and leakage-reduction options are therefore excluded from further assessment.**

9. Conclusions

9.1 Overview

- 9.1.1 UUW has identified one supply-side and 33 demand-side options to maintain supplies to customers in the north-west.
- 9.1.2 Water company WRMPs are subject to the provisions of the *Conservation of Habitats and Species Regulations 2017*. UUW has a statutory duty to prepare a WRMP and is therefore the Competent Authority for the HRA of that plan. This HRA report accompanies the submission version of the WRMP24, and summarises the current assessment of UUW's preferred portfolio of options (plus its reserve supply-side options) against the requirements of the Habitats Regulations. It also documents the iterative HRA process that has been applied through the development of the draft WRMP24.
- 9.1.3 For each option (or group of options, as appropriate), the assessment comprises:
- a 'screening' of European sites within the study area to identify those sites and features where there will self-evidently be 'no effect', 'no likely significant effects', or positive effects due to the option⁷⁵, and those where significant effects are likely or uncertain; and
 - an 'appropriate assessment' of any European sites where significant effects cannot be excluded (this may include 'down-the-line' deferral of some options in accordance with established HRA practice, where appropriate).
- 9.1.4 The conservation objectives (including any supplementary advice) are taken into account at the screening and appropriate assessment stages as necessary.

9.2 Screening

- 9.2.1 The screening has concluded that significant effects are either likely or uncertain for the following sites and options (note, this includes options that may rely on mitigation measures to prevent significant effects occurring); these are therefore taken forward to an appropriate assessment stage.

Table 9.1 Summary of options and sites requiring 'appropriate assessment'

European site	Preferred Portfolio Options	Alone or IC*?
Liverpool Bay SPA	WR076: SWN_River Bollin	Alone
Mersey Estuary Ramsar	WR076: SWN_River Bollin	Alone
Mersey Estuary SPA	WR076: SWN_River Bollin	Alone
Mersey Narrows and North Wirral Foreshore Ramsar	WR076: SWN_River Bollin	Alone

⁷⁵ Note, for options with 'no effects' or positive effects there is no possibility of 'in combination' effects.

European site	Preferred Portfolio Options	Alone or IC*?
Mersey Narrows and North Wirral Foreshore SPA	WR076: SWN_River Bollin	Alone

*IC – ‘In combination’ with other WRMP options

9.3 Appropriate Assessments

- 9.3.1 Appropriate assessments were undertaken for those European sites that may be significantly affected by WRMP options (or where there was uncertainty at the screening stage), alone or in combination.
- 9.3.2 With regard to **demand-side measures**, the only realistic mechanism for a negative effect would be through any construction required (for example, the leakage reduction programme may require repair of a pipe in or near an SAC), but this cannot be meaningfully assessed at the strategic level since information on the location of specific intervention requirements (e.g. leaks; households requesting meters) is not available without specific investigations, which would form part of the option package, and there is consequently no information on the scale (etc.) of any construction required. Therefore, from an HRA perspective, the options are ‘screened in’ (as an effect pathway is conceivable) but as a meaningful appropriate assessment is not possible, the assessment is necessarily deferred to the project level.
- 9.3.3 The results of the assessments of the **supply-side option** are summarised in **Table 9.2**.

9.4 Conclusion

- 9.4.1 Option WR076 will have no adverse effects on any European sites, alone or in combination, based on the data available at the plan-level, and therefore **the HRA of the WRMP can conclude that the WRMP will have no adverse effect alone or in combination on the integrity of any European sites.**
- 9.4.2 Note that this conclusion relates to the WRMP only and does not remove the need for project-level HRA as the option is developed and delivered.

Table 9.2 Summary of HRA conclusions, key uncertainties and additional investigations that may be required

Site(s)	Assessment summary	Key uncertainties	Additional investigations
Mersey Estuary SPA / Mersey Estuary Ramsar	<p>Option WR076 is located within the Mersey estuary catchment; this will not have adverse effects on the SPA / Ramsar alone or in combination due to the small magnitude of change associated with the abstraction relative to freshwater inputs to the estuary and the large tidal influx.</p> <p>A conservative analysis of the maximum impact of the option on non-saline inputs to the estuary indicate that Q95 flows below Bollin Point will be reduced by ~2.34%; Q50 flows will be reduced by 1.04%. However, it should be noted that these decreases will not be at a single location (as the impact will be split between the Ship Canal and the River Mersey), and they substantially over-estimate the reduction of non-saline flows to the SPA/Ramsar (as there are several other major inputs to the upper estuary down-catchment from Bollin Point, including the River Weaver, Sankey Brook, Ditton Brook and Warrington WwTW).</p> <p>Furthermore, freshwater inputs to the estuary are relatively small for the estuary’s size, and the estuary is considered ‘well-mixed’ due to the high tidal current velocities and low freshwater input. Any effects due to the reduction in freshwater input is therefore unlikely to be measurable outside the upper estuary. Furthermore, this location of this impact is at least [REDACTED] upstream of the closest point of the Mersey Estuary SPA / Ramsar at Runcorn Bridge.</p> <p>Based on the available data, it is considered that the options will have no adverse effects on the integrity of the SPA/Ramsar, alone or in combination through</p>	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • Additional information on the operation of the Ship Canal and typical apportionment of flows with the River Mersey. • Project level assessments of potential FLL.

Site(s)	Assessment summary	Key uncertainties	Additional investigations
	<p>changes in freshwater input (and any associated physio-chemical changes). This is based principally on the small magnitude of change for the flows into the estuary, in proportion to freshwater flows from the Mersey and other sources and other sources, and in relation to the tidal volumes and turnover.</p>		
<p>Mersey Narrows and North Wirral Foreshore Ramsar / Mersey Narrows and North Wirral Foreshore SPA</p>	<p>These sites will not be directly exposed to the environmental changes associated with the options, and so effects are only likely through effects on foraging areas used by the mobile species (most notably areas of the Mersey Estuary that may be used by common tern). However, there is little evidence of the upper estuary providing a notable habitat resource for foraging terns, and the effects of the option on the habitats of the Mersey estuary will be negligible in any case.</p>	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • None
<p>Liverpool Bay SPA</p>	<p>The exposure and sensitivity of the marine and inshore habitats of this site will be low or negligible, and so effects are only likely through effects on foraging areas used by the mobile species. However, it should be noted that the effects of the options on the Mersey estuary are unlikely to be measurable outside the upper estuary due to the dominance of marine influences and the tidal flux, and there is no evidence (from the Liverpool Bay SPA extension studies) of common tern making extensive use of the upper Mersey estuary.</p>	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • None

Bibliography

- Allen J R L & Pye K (1992) *Saltmarshes: Morphodynamics, conservation and engineering significance*, Cambridge University Press, Cambridge.
- Banks A N, Austin G E, Burton N H K & Mellan H J (2005) *Investigating possible movements of waterbirds between the Medway Estuary & Marshes SPA and neighbouring areas of the Thames and Swale estuaries*, BTO Research Report No. 400, BTO, Thetford, Norfolk
- Benstead P J, Kohler M J A, & Showler D A (2002) *Preliminary study to determine the distribution of waterfowl around freshwater inflows at Lower Halstow on the Medway Estuary* (unpublished research report for Southern Water)
- Clarke D, And Sanitwong Na Ayutthaya (2010). Predicted effects of climate change, vegetation and tree cover on dune slack habitats at Ainsdale on the Sefton Coast, UK. *Journal of Coastal Conservation* 14: pp. 115–125.
- Clarke, D. And Pegg, R.K. (1993) Hydrological investigations in the Ainsdale Sand Dunes National Nature Reserve. In Atkinson, D and Houston, J. (eds.) *Sand Dunes of the Sefton Coast: Proceedings of the Sefton Coast Research Seminar*, Liverpool, 31 May 1991. National Museums & Galleries on Merseyside. pp. 55-58.
- Collins, J. (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd edn). The Bat Conservation Trust, London.
- Colwell M A & Landrum S L (1993) Non-random shorebird distribution and fine-scale variation in prey abundance, *Condor* **95**(1): 94-103
- Colwell M A (1993) Shorebird community patterns in a seasonally dynamic estuary, *Condor* **95** (1): 104-114
- Cutts N., Phelps A. & Burdon D. (2009) *Construction and waterfowl: defining sensitivity, response, impacts and guidance*. Report to Humber INCA by the Institute of Estuarine and Coastal Studies, University of Hull
- Cutts N., Phelps A. & Burdon D. (2009) *Construction and waterfowl: defining sensitivity, response, impacts and guidance*. Report to Humber INCA by the Institute of Estuarine and Coastal Studies, University of Hull. EN (2003) *The Humber Estuary European Marine Site: English Nature's advice given under Regulation 33(2) of the Conservation (Natural Habitats &c.) Regulations 1994*. English Nature, Peterborough
- Cutts, N.D., Hemingway, K.L. & J. Spencer. (2013). *TIDE Tool: Waterbird Disturbance & Mitigation Toolkit (Context & Guidance Document)*. Institute of Estuarine and Coastal Studies (IECS), University of Hull. Produced for the European 'TIDE' project as part of the Interreg IVB North Sea Region Programme.
- Dierschke V, Kube J & Rippe H (1999) Feeding ecology of dunlins *Calidris alpina* staging in the southern Baltic Sea, 2. Spatial and temporal variations in the harvestable fraction of their favourite prey *Hediste diversicolor*, *J. Sea Res.* **42**(1): 65-82
- Emu (2002) *Halstow Creek Marine Ecological Survey*, Emu Ltd., Durley, Soton. (unpublished research report for Southern Water)
- Emu (2003) *North Kent Marshes Estuarine Invertebrate Survey*, Emu Ltd., Durley, Soton. (unpublished research report for Southern Water)

- Entec (2004a) *North Kent Marshes Scoping Study*, Entec UK Ltd, Shrewsbury (report for Southern Water)
- Entec (2004b) *Thanet Sands Boreholes*, Entec UK Ltd, Shrewsbury (report for Mid Kent Water)
- Entec (2004c) *Signal Test Data Presentation and Analysis*, Entec UK Ltd, Shrewsbury (unpublished research report for Southern Water)
- Entec (2005) *Halstow Creek Desk Study and Investigation* Entec UK Ltd, Shrewsbury (unpublished research report for Southern Water)
- Environment Agency (2004) *North Kent and Shale CAMS Technical Document*, Environment Agency, Kent Region, Addington
- Enviros (2005) *Impact of Freshwater Flows on Natura 2000 Estuarine Sites*, Enviros, Shrewsbury (unpublished research report for Southern Water for Southern Water)
- ESI (2004). *Manchester and East Cheshire Water Resources Study: Final Report*
- ESI (2009). *Lower Mersey and North Merseyside Water Resources Study: Final Report*
- Goss-Custard J D, Warwick R M, Kirby R, Mcgrorty S, Clarke R T, Pearson B, Rispin W E, Durell S E A L D, & Rose R J (1991) Towards predicting wading bird densities from predicted prey densities in a post-barrage Severn Estuary, *J. Appl. Ecol.* **28**(3): 1004-1026.
- Granadeiro J P, Andrade J, Palmeirim J M (2004) Modelling the distribution of birds in estuarine areas using generalised additive models, *J. Sea Res.* **52**:227-240
- Halcrow (2002). *Futurecoast*. Department for Environment, Food and Rural Affairs CD ROM.
- Halcrow (2004) *Geomorphological Study of the North Kent Marshes* (unpublished research report for Southern Water)
- Hendry K & Cragg-Hine D (2003). *Ecology of the Atlantic Salmon*. Conserving Natura 2000 Rivers Ecology Series No. 7. English Nature, Peterborough.
- Hoffman E., Astrup J., Larsen F., Munch-Peterson S., & Strottrup J. (2000). *The effects of marine windfarms on the distribution of fish, shellfish and marine mammals in the Horns Rev area*. Baggrundsrapport nr 24. Report to ELSAMPROJERT A/S. Danish Institute of Fisheries Research.
- HS2 (2022a) *High Speed Rail (Crewe – Manchester) Environmental Statement: Volume 5: Appendix WR-008-00001, Water resources and flood risk MA05: Risley to Bamfurlong Groundwater modelling report - Holcroft Moss*. [online]. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1046795/M342.pdf
- HS2 (2022b) *High Speed Rail (Crewe – Manchester) Environmental Statement Ecology and biodiversity: Document to inform a Habitats Regulations Assessment for Rostherne Mere Ramsar site and Midland Meres and Mosses Phase 1 Ramsar site* [online]. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1049770/M139.pdf
- Humphreyes I & Kellett K (2003) *A Chemical and Biological Characterisation of the North Kent Springs 2002/2003*, Environment Agency, Kent Region, Addington
- IAQM (2020). *A guide to the assessment of air quality impacts on designated nature conservation sites* [online]. Institute of Air Quality Management, London. [Available at: <https://iaqm.co.uk/text/guidance/air-quality-impacts-on-nature-sites-2020.pdf>

- J Ridgway, E Bee, N Breward, M Cave, S Chenery, C Gowing, I Harrison, E Hodgkinson, B Humphreys, M Ingham, A Jarrow, G Jenkins, A Kim, R T Lister, A Milodowski, S Pearson, K Rowlands, B Spiro, M Strutt, P Turner, and C Vane (2012). *The Mersey estuary: sediment geochemistry*. Coastal Geoscience and Global Change Impacts Programme Research Report RR/10/02. NERC / BGS.
- JNCC (2001a) <http://www.jncc.gov.uk/default.aspx?page=2043>
- JNCC (2001b) <http://www.jncc.gov.uk/default.aspx?page=2041>
- Kelly J P (2001) Hydrographic correlates of winter Dunlin abundance and distribution in a temperate estuary, *Waterbirds* **24**(3):309-322
- Keuper Gas Storage Project Habitats Regulations Screening Assessment. Report for Keuper Gas Storage Ltd. ERM, London. [Available at: <http://www.kgsp.co.uk/wp-content/uploads/2015/12/5.4-KGSP-HRA.pdf>]
- Laursen K, Kahlert J & Frikke J (2005). Factors affecting escape distances of staging waterbirds. *Wildlife Biology* **11**(1) pp 13 – 19.
- NE (2015). *Review and analysis of changes in waterbird use of the Mersey Estuary SPA, Mersey Narrows & North Wirral Foreshore pSPA and Ribble & Alt Estuaries SPA*. Report by BTO for Natural England, ref. NECR173.
- Newbold C & Mountford O (1997) *English Nature Freshwater Series No.5: Water level requirements of wetland plants and animals*, English Nature, Peterborough
- Pye, K. Blott, S. & Van der Wal, D. (2002). *Morphological Change as a result of Training Banks in the Mersey Estuary, Northwest England*. Internal Research Report CS4, Royal Holloway, University of London.
- Ravenscroft N O M & Beardall C H (2002) The importance of freshwater flows over estuarine mudflats for wintering waders and wildfowl, *Biological Conservation* **113**: 89-97
- Ravenscroft N O M & Emes C H (2004) Freshwater flows and birds in estuaries: relationships with sediment and invertebrates. *Era Report* **31**. Report to the Environment Agency, Anglian Region, Eastern Area.
- Ravenscroft N O M (1998) *Associations of wintering waterfowl with freshwater on the mudflats of three estuaries in East Anglia*, Unpublished report to the Environment Agency
- Ravenscroft N O M (1999) The influence of freshwater on broad-scale waterfowl distributions on the Estuarine Norfolk coast, Unpublished report to the Environment Agency and English Nature.
- Ravenscroft N O M, Beardall C H, Cottle R, Willett P & Wright M T (1997) *The distribution of wintering waterfowl around freshwater flows over the mudflats of the Orwell estuary, England*. Unpublished report to the Environment Agency and English Nature.
- RPS (2004a) *North Kent Marshes Ornithological Surveys*, RPS Ecoscope, Cambs. (unpublished research report for Southern Water)
- RPS (2004b) *Swale and Medway Estuaries: Analysis of invertebrate and bird communities within freshwater creeks*, RPS, St. Ives, Cambs. (unpublished research report for Southern Water)
- RPS (2004c) *North Kent Marshes Ornithological Surveys 2003/4*, RPS, St. Ives, Cambs. (unpublished research report for Southern Water)
- RPS (2005a) *Lower Halstow and Funton Creeks: Survey and analysis of bird and invertebrate communities during winter 2004/5*, RPS, St. Ives, Cambs. (unpublished research report for Southern Water)

- RPS (2005b) *Literature Review: association between birds and freshwater flows in the Medway and Swale Estuaries*, RPS, St Ives, Cambs. (unpublished research report for Southern Water)
- RPS (2011). *Environmental Appraisal of the Brine Discharge from Solution Mining*. Report for INEOS Enterprises, ref. JER4338. RPS, Chepstow. [Available at: www.kgsp.co.uk/wp-content/uploads/2015/12/6.2-KGSP-ES-Technical-Appendices.pdf]
- RSPB, English Nature and the Institute of Terrestrial Ecology (1997) *The Wet Grassland Guide; Managing floodplain and coastal wet grasslands for wildlife*, Eds. Treweek J, José P & Benstead P, RPSB, Sandy, Beds.
- Smith T, Skipp S & Humpheryes I (2005) *Variation in Salinity across an area of Coastal Grazing Marsh: Implications for the Conservation of both Flora and Fauna*, Environment Agency, Addington
- Water Management Consultants (2003) *Phase 1 (Conceptual Model) Report for the North Kent Groundwater Modelling Study* (for the Environment Agency)
- Williams P (1996) *A survey of ditch flora in the North Kent Marshes SSSIs – 1995*, EN Research Report No. 167, EN, Peterborough
- Yates M G, Goss-Custard J D, Mcgrorty S, Lakhani K H, Durrell S E, Clarke R T, Riggan W E, Moy L, Yates T, Plant R A & Frost A J (1993) Sediment characteristics, invertebrate densities and shorebird densities on the inner banks of the Wash, *Journal of Applied Ecology* **30**: 599-614
- Stantec (2022). Environmental Quantitative Risk Assessment at Lancaster Wastewater Treatment Works. Report for United Utilities, ref. 331001867R3. Stantec, Shrewsbury.
- NE (2015). Review and analysis of changes in waterbird use of the Mersey Estuary SPA, Mersey Narrows & North Wirral Foreshore pSPA and Ribble & Alt Estuaries SPA. Report by BTO for Natural England, ref. NERC173.
- NE (2021). Identification of Functionally Linked Land supporting SPA waterbirds in the North West of England. Report by Bowland Ecology for Natural England, ref. NECR361. Available at: <https://publications.naturalengland.org.uk/publication/6303434392469504>
- NE (2023). Identification of Functionally Linked Land supporting SPA waterbirds in the North West of England – Phase 2. Report by Bowland Ecology for Natural England, ref. NECR483. Available at: <https://publications.naturalengland.org.uk/publication/5359972901453824>

Appendix A

European sites

The table below lists the European sites and their features considered for the assessment of the supply-side options (i.e. sites within 20km of an option, or downstream, or upstream sites supporting fish that may use affected reaches of rivers), plus additional sites not noted but within or associated with the U UW supply area (note, all European sites within or close to the U UW supply area might theoretically be exposed to effects of some demand-side options).

Asby Complex SAC

- H3140: Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.
- H4030: European dry heaths
- H6210: Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites)
- H6410: *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)
- H7210: Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*
- H7220: Petrifying springs with tufa formation (*Cratoneurion*)
- H7230: Alkaline fens
- H8240: Limestone pavements
- S1013: Geyer's whorl snail *Vertigo geyeri*
- S1393: Slender green feather-moss *Drepanocladus (Hamatocaulis) vernicosus*

Bolton Fell Moss SAC

- H7120: Degraded raised bogs still capable of natural regeneration

Border Mires, Kielder - Butterburn SAC

- H4010: Northern Atlantic wet heaths with *Erica tetralix*
- H4030: European dry heaths
- H7130: Blanket bogs (* if active bog)
- H7140: Transition mires and quaking bogs
- H7220: Petrifying springs with tufa formation (*Cratoneurion*)

Borrowdale Woodland Complex SAC

- H8220: Siliceous rocky slopes with chasmophytic vegetation
- H91A0: Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
- H91D0: Bog woodland

Bowland Fells SPA

- A082r: Hen harrier *Circus cyaneus*
- A098r: Merlin *Falco columbarius*
- A183r: Lesser black-backed gull *Larus fuscus*

Calf Hill and Cragg Woods SAC

- H91A0: Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
- H91E0: Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)

Clints Quarry SAC

- S1166: Great crested newt *Triturus cristatus*

Cumbrian Marsh Fritillary Site SAC

- S1065: Marsh fritillary butterfly *Euphydryas (Eurodryas, Hypodryas) aurinia*

Dee Estuary/ Aber Dyfrdwy SAC

- H1130: Estuaries
- H1140: Mudflats and sandflats not covered by seawater at low tide
- H1210: Annual vegetation of drift lines
- H1230: Vegetated sea cliffs of the Atlantic and Baltic Coasts
- H1310: *Salicornia* and other annuals colonizing mud and sand
- H1330: Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
- H2110: Embryonic shifting dunes
- H2120: Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes")
- H2130: Fixed coastal dunes with herbaceous vegetation ("grey dunes")
- H2190: Humid dune slacks
- S1095: Sea lamprey *Petromyzon marinus*
- S1099: River lamprey *Lampetra fluviatilis*
- S1395: Petalwort *Petalophyllum ralfsii*

Drigg Coast SAC

- H1130: Estuaries
- H1140: Mudflats and sandflats not covered by seawater at low tide
- H1310: *Salicornia* and other annuals colonizing mud and sand
- H1330: Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
- H2110: Embryonic shifting dunes
- H2120: Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes")
- H2130: Fixed coastal dunes with herbaceous vegetation ("grey dunes")
- H2150: Atlantic decalcified fixed dunes (*Calluno-Ulicetea*)
- H2170: Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*)
- H2190: Humid dune slacks

Duddon Estuary Ramsar

- Crit. 2 - supports vulnerable, endangered, or critically endangered species or threatened eco. communities
- Crit. 4 - supports plant/animal species at a critical stage in their life cycles, or provides refuge
- Crit. 5 - regularly supports 20,000 or more waterbirds
- Crit. 6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds

Duddon Mosses SAC

- H7110: Active raised bogs
- H7120: Degraded raised bogs still capable of natural regeneration

Esthwaite Water Ramsar

- Crit. 1 - sites containing representative, rare or unique wetland types
- Crit. 2 - supports vulnerable, endangered, or critically endangered species or threatened eco. communities

Helbeck and Swindale Woods SAC

- H9180: *Tilio-Acerion* forests of slopes, screes and ravines

Lake District High Fells SAC

- H3130: Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*
- H4010: Northern Atlantic wet heaths with *Erica tetralix*
- H4030: European dry heaths
- H4060: Alpine and Boreal heaths
- H5130: *Juniperus communis* formations on heaths or calcareous grasslands
- H6150: Siliceous alpine and boreal grasslands
- H6230: Species-rich *Nardus* grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe)
- H6430: Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels
- H7130: Blanket bogs (* if active bog)
- H7230: Alkaline fens
- H8110: Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*)
- H8210: Calcareous rocky slopes with chasmophytic vegetation
- H8220: Siliceous rocky slopes with chasmophytic vegetation
- H91A0: Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
- S1393: Slender green feather-moss *Drepanocladus (Hamatocaulis) vernicosus*

Leighton Moss SPA

- A021r: Great bittern *Botaurus stellaris*
- A081r: Eurasian marsh harrier *Circus aeruginosus*

Leighton Moss Ramsar

- Crit. 1 - sites containing representative, rare or unique wetland types

Liverpool Bay / Bae Lerpwl SPA

- A001w: Red-throated diver *Gavia stellata*
- A065w: Black (common) scoter *Melanitta nigra*
- A177w: Little gull *Larus minutus*
- A193r: Common tern *Sterna hirundo*
- A195r: Little tern *Sterna albifrons*
- WATR: Waterbird assemblage

Manchester Mosses SAC

- H7120: Degraded raised bogs still capable of natural regeneration

Martin Mere SPA

- A037w: Tundra swan *Cygnus columbianus bewickii*
- A038w: Whooper swan *Cygnus cygnus*
- A040w: Pink-footed goose *Anser brachyrhynchus*
- A050w: Eurasian wigeon *Anas penelope*
- A054w: Northern pintail *Anas acuta*
- WATR: Waterbird assemblage

Martin Mere Ramsar

- Crit. 5 - regularly supports 20,000 or more waterbirds
- Crit. 6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds

Mersey Estuary SPA

- A005w: Great crested grebe *Podiceps cristatus*
- A048w: Common shelduck *Tadorna tadorna*
- A050w: Eurasian wigeon *Anas penelope*
- A052w: Eurasian teal *Anas crecca*
- A054w: Northern pintail *Anas acuta*
- A137c: Ringed plover *Charadrius hiaticula*
- A140w: European golden plover *Pluvialis apricaria*
- A141w: Grey plover *Pluvialis squatarola*
- A142w: Northern lapwing *Vanellus vanellus*
- A160w: Eurasian curlew *Numenius arquata*
- A162c: Common redshank *Tringa totanus*
- A162w: Common redshank *Tringa totanus*
- A616w: Black-tailed godwit *Limosa limosa islandica*
- A672w: Dunlin *Calidris alpina alpina*

Mersey Estuary Ramsar

- Crit. 5 - regularly supports 20,000 or more waterbirds
- Crit. 6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds

Mersey Narrows and North Wirral Foreshore Ramsar

- Crit. 4 - supports plant/animal species at a critical stage in their life cycles, or provides refuge
- Crit. 5 - regularly supports 20,000 or more waterbirds
- Crit. 6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds

Mersey Narrows and North Wirral Foreshore SPA

- A017w: Great cormorant *Phalacrocorax carbo*
- A130w: Eurasian oystercatcher *Haematopus ostralegus*
- A141w: Grey plover *Pluvialis squatarola*
- A144w: Sanderling *Calidris alba*
- A157w: Bar-tailed godwit *Limosa lapponica*
- A162w: Common redshank *Tringa totanus*
- A177c: Little gull *Larus minutus*
- A193c: Common tern *Sterna hirundo*
- A193r: Common tern *Sterna hirundo*
- A671w: Red knot *Calidris canutus islandica*
- A672w: Dunlin *Calidris alpina alpina*
- WATR: Waterbird assemblage

Midland Meres and Mosses Phase 1 Ramsar

- Crit. 1 - sites containing representative, rare or unique wetland types
- Crit. 2 - supports vulnerable, endangered, or critically endangered species or threatened eco. communities

Midland Meres and Mosses Phase 2 Ramsar

- Crit. 1 - sites containing representative, rare or unique wetland types
- Crit. 2 - supports vulnerable, endangered, or critically endangered species or threatened eco. communities

Moor House - Upper Teesdale SAC

- H3140: Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.
- H4030: European dry heaths
- H4060: Alpine and Boreal heaths
- H5130: *Juniperus communis* formations on heaths or calcareous grasslands
- H6130: Calaminarian grasslands of the *Violetalia calaminariae*
- H6150: Siliceous alpine and boreal grasslands
- H6210: Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites)
- H6410: *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)
- H6430: Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels
- H6520: Mountain hay meadows
- H7130: Blanket bogs (* if active bog)
- H7220: Petrifying springs with tufa formation (*Cratoneurion*)
- H7230: Alkaline fens
- H7240: Alpine pioneer formations of the *Caricion bicoloris-atrofuscae*
- H8110: Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*)
- H8120: Calcareous and calcshist screes of the montane to alpine levels (*Thlaspietea rotundifolii*)
- H8210: Calcareous rocky slopes with chasmophytic vegetation
- H8220: Siliceous rocky slopes with chasmophytic vegetation
- H8240: Limestone pavements
- S1015: Round-mouthed whorl snail *Vertigo genesii*
- S1528: Marsh saxifrage *Saxifraga hirculus*

Morecambe Bay SAC

- H1110: Sandbanks which are slightly covered by sea water all the time
- H1130: Estuaries
- H1140: Mudflats and sandflats not covered by seawater at low tide
- H1150: Coastal lagoons
- H1160: Large shallow inlets and bays
- H1170: Reefs
- H1220: Perennial vegetation of stony banks
- H1310: *Salicornia* and other annuals colonizing mud and sand
- H1330: Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
- H2110: Embryonic shifting dunes
- H2120: Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes")
- H2130: Fixed coastal dunes with herbaceous vegetation ("grey dunes")
- H2150: Atlantic decalcified fixed dunes (*Calluno-Ulicetea*)
- H2170: Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*)
- H2190: Humid dune slacks
- S1166: Great crested newt *Triturus cristatus*

Morecambe Bay Ramsar

- Crit. 4 - supports plant/animal species at a critical stage in their life cycles, or provides refuge
- Crit. 5 - regularly supports 20,000 or more waterbirds
- Crit. 6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds

Morecambe Bay and Duddon Estuary SPA

- A026w: Little egret *Egretta garzetta*
- A038w: Whooper swan *Cygnus cygnus*
- A040c: Pink-footed goose *Anser brachyrhynchus*
- A048c: Common shelduck *Tadorna tadorna*
- A054c: Northern pintail *Anas acuta*
- A130c: Eurasian oystercatcher *Haematopus ostralegus*
- A137c: Ringed plover *Charadrius hiaticula*
- A140w: European golden plover *Pluvialis apricaria*
- A141c: Grey plover *Pluvialis squatarola*
- A143c: Red knot *Calidris canutus*
- A144c: Sanderling *Calidris alba*
- A151w: Ruff *Philomachus pugnax*
- A157w: Bar-tailed godwit *Limosa lapponica*
- A160c: Eurasian curlew *Numenius arquata*
- A162c: Common redshank *Tringa totanus*
- A169c: Ruddy turnstone *Arenaria interpres*
- A176w: Mediterranean gull *Larus melanocephalus*
- A183r: Lesser black-backed gull *Larus fuscus*
- A183c: Lesser black-backed gull *Larus fuscus*
- A184r: Herring gull *Larus argentatus*
- A191r: Sandwich tern *Sterna sandvicensis*
- A193r: Common tern *Sterna hirundo*
- A195r: Little tern *Sterna albifrons*
- A616c: Black-tailed godwit *Limosa limosa islandica*
- A672c: Dunlin *Calidris alpina alpina*
- SBA: Seabird assemblage
- SBA : Seabird assemblage
- WATR: Waterbird assemblage

Morecambe Bay Pavements SAC

- H3140: Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.
- H4030: European dry heaths
- H5130: *Juniperus communis* formations on heaths or calcareous grasslands
- H6210: Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites)
- H7210: Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*
- H8240: Limestone pavements
- H9180: *Tilio-Acerion* forests of slopes, screes and ravines
- H91A0: Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
- H91J0: *Taxus baccata* woods of the British Isles
- S1014: Narrow-mouthed whorl snail *Vertigo angustior*

Naddle Forest SAC

- H4010: Northern Atlantic wet heaths with *Erica tetralix*
- H4030: European dry heaths
- H91A0: Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

North Pennine Dales Meadows SAC

- H6410: *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)
- H6520: Mountain hay meadows

North Pennine Moors SAC

- H4010: Northern Atlantic wet heaths with *Erica tetralix*
- H4030: European dry heaths
- H5130: *Juniperus communis* formations on heaths or calcareous grasslands
- H6130: Calaminarian grasslands of the *Violetalia calaminariae*
- H6150: Siliceous alpine and boreal grasslands
- H6210: Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites)
- H7130: Blanket bogs (* if active bog)
- H7220: Petrifying springs with tufa formation (*Cratoneurion*)
- H7230: Alkaline fens
- H8110: Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*)
- H8210: Calcareous rocky slopes with chasmophytic vegetation
- H8220: Siliceous rocky slopes with chasmophytic vegetation
- H91A0: Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
- S1528: Marsh saxifrage *Saxifraga hirculus*

North Pennine Moors SPA

- A082r: Hen harrier *Circus cyaneus*
- A098r: Merlin *Falco columbarius*
- A103r: Peregrine falcon *Falco peregrinus*
- A140r: European golden plover *Pluvialis apricaria*

Oak Mere SAC

- H3110: Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)
- H7140: Transition mires and quaking bogs

Peak District Moors (South Pennine Moors Phase 1) SPA

- A098r: Merlin *Falco columbarius*
- A140r: European golden plover *Pluvialis apricaria*
- A222r: Short-eared owl *Asio flammeus*

Ribble and Alt Estuaries Ramsar

- Crit. 2 - supports vulnerable, endangered, or critically endangered species or threatened eco. communities
- Crit. 5 - regularly supports 20,000 or more waterbirds
- Crit. 6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds

Ribble and Alt Estuaries SPA

- A017w: Great cormorant *Phalacrocorax carbo*
- A037w: Tundra swan *Cygnus columbianus bewickii*
- A038w: Whooper swan *Cygnus cygnus*
- A040w: Pink-footed goose *Anser brachyrhynchus*
- A048w: Common shelduck *Tadorna tadorna*
- A050w: Eurasian wigeon *Anas penelope*
- A052w: Eurasian teal *Anas crecca*
- A054w: Northern pintail *Anas acuta*
- A062w: Greater scaup *Aythya marila*
- A065w: Black (common) scoter *Melanitta nigra*
- A130w: Eurasian oystercatcher *Haematopus ostralegus*
- A137c: Ringed plover *Charadrius hiaticula*
- A140w: European golden plover *Pluvialis apricaria*
- A141w: Grey plover *Pluvialis squatarola*
- A142w: Northern lapwing *Vanellus vanellus*
- A143w: Red knot *Calidris canutus*
- A144c: Sanderling *Calidris alba*
- A144w: Sanderling *Calidris alba*
- A151r: Ruff *Philomachus pugnax*
- A157w: Bar-tailed godwit *Limosa lapponica*
- A158c: Whimbrel *Numenius phaeopus*
- A160w: Eurasian curlew *Numenius arquata*
- A162c: Common redshank *Tringa totanus*
- A162w: Common redshank *Tringa totanus*
- A179r: Black-headed gull *Larus ridibundus*
- A183r: Lesser black-backed gull *Larus fuscus*
- A193r: Common tern *Sterna hirundo*
- A616w: Black-tailed godwit *Limosa limosa islandica*
- A672w: Dunlin *Calidris alpina alpina*
- SBA: Seabird assemblage
- SBA : Seabird assemblage
- WATR: Waterbird assemblage

River Dee and Bala Lake/ Afon Dyfrdwy a Llyn Tegid SAC

- H3260: Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitriche-Batrachion* vegetation
- S1095: Sea lamprey *Petromyzon marinus*
- S1096: Brook lamprey *Lampetra planeri*
- S1099: River lamprey *Lampetra fluviatilis*
- S1106: Atlantic salmon *Salmo salar*
- S1163: Bullhead *Cottus gobio*
- S1355: Otter *Lutra lutra*
- S1831: Floating water-plantain *Luronium natans*

River Derwent and Bassenthwaite Lake SAC

- H3130: Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*
- H3260: Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
- S1065: Marsh fritillary butterfly *Euphydryas (Eurodryas, Hypodryas) aurinia*
- S1095: Sea lamprey *Petromyzon marinus*
- S1096: Brook lamprey *Lampetra planeri*
- S1099: River lamprey *Lampetra fluviatilis*
- S1106: Atlantic salmon *Salmo salar*
- S1355: Otter *Lutra lutra*
- S1831: Floating water-plantain *Luronium natans*

River Eden SAC

- H3130: Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*
- H3260: Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
- H91E0: Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)
- S1092: White-clawed (or Atlantic stream) crayfish *Austropotamobius pallipes*
- S1095: Sea lamprey *Petromyzon marinus*
- S1096: Brook lamprey *Lampetra planeri*
- S1099: River lamprey *Lampetra fluviatilis*
- S1106: Atlantic salmon *Salmo salar*
- S1163: Bullhead *Cottus gobio*
- S1355: Otter *Lutra lutra*

River Ehen SAC

- S1029: Freshwater pearl mussel *Margaritifera margaritifera*
- S1106: Atlantic salmon *Salmo salar*

River Kent SAC

- H3260: Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
- S1029: Freshwater pearl mussel *Margaritifera margaritifera*
- S1092: White-clawed (or Atlantic stream) crayfish *Austropotamobius pallipes*
- S1163: Bullhead *Cottus gobio*

Rixton Clay Pits SAC

- S1166: Great crested newt *Triturus cristatus*

Rochdale Canal SAC

- S1831: Floating water-plantain *Luronium natans*

Rostherne Mere Ramsar

- Crit. 1 - sites containing representative, rare or unique wetland types

Roudsea Wood and Mosses SAC

- H7110: Active raised bogs
- H7120: Degraded raised bogs still capable of natural regeneration
- H9180: *Tilio-Acerion* forests of slopes, screes and ravines
- H91J0: *Taxus baccata* woods of the British Isles

Sefton Coast SAC

- H2110: Embryonic shifting dunes
- H2120: Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes")
- H2130: Fixed coastal dunes with herbaceous vegetation ("grey dunes")
- H2150: Atlantic decalcified fixed dunes (*Calluno-Ulicetea*)
- H2170: Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*)
- H2190: Humid dune slacks
- S1166: Great crested newt *Triturus cristatus*
- S1395: Petalwort *Petalophyllum ralfsii*

Solway Firth SAC

- H1110: Sandbanks which are slightly covered by sea water all the time
 - H1130: Estuaries
 - H1140: Mudflats and sandflats not covered by seawater at low tide
 - H1170: Reefs
 - H1220: Perennial vegetation of stony banks
 - H1310: *Salicornia* and other annuals colonizing mud and sand
 - H1330: Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
 - H2130: Fixed coastal dunes with herbaceous vegetation ("grey dunes")
 - S1095: Sea lamprey *Petromyzon marinus*
 - S1099: River lamprey *Lampetra fluviatilis*
-

Upper Solway Flats and Marshes SPA

- A001w: Red-throated diver *Gavia stellata*
- A017w: Great cormorant *Phalacrocorax carbo*
- A065w: Black (common) scoter *Melanitta nigra*
- A070w: Goosander *Mergus merganser*
- A137c: Ringed plover *Charadrius hiaticula*
- A142w: Northern lapwing *Vanellus vanellus*
- A179w: Black-headed gull *Larus ridibundus*
- A182w: Mew gull *Larus canus*
- A184w: Herring gull *Larus argentatus*
- WATR: Waterbird assemblage
- A037w: Tundra swan *Cygnus columbianus bewickii*
- A052w: Eurasian teal *Anas crecca*
- A140w: European golden plover *Pluvialis apricaria*
- A142w: Northern lapwing *Vanellus vanellus*
- WATR: Waterbird assemblage
- A003w: Great northern diver *Gavia immer*
- A007w: Slavonian grebe *Podiceps auritus*
- A063w: Common eider *Somateria mollissima*
- A069w: Red-breasted merganser *Mergus serrator*
- A098r: Merlin *Falco columbarius*
- A140r: European golden plover *Pluvialis apricaria*
- A222r: Short-eared owl *Asio flammeus*
- BBA: Breeding bird assemblage
- BBA : Breeding bird assemblage
- A040w: Pink-footed goose *Anser brachyrhynchus*
- A043w: Greylag goose *Anser anser*
- A050r: Eurasian wigeon *Anas penelope*
- WATR: Waterbird assemblage
- A122r: Corn crane *Crex crex*
- A130r: Eurasian oystercatcher *Haematopus ostralegus*

South Pennine Moors SAC

- H4010: Northern Atlantic wet heaths with *Erica tetralix*
- H4030: European dry heaths
- H7130: Blanket bogs (* if active bog)
- H7140: Transition mires and quaking bogs
- H91A0: Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

South Pennine Moors Phase 2 SPA

- A098r: Merlin *Falco columbarius*
- A140r: European golden plover *Pluvialis apricaria*
- A222r: Short-eared owl *Asio flammeus*
- BBA: Breeding bird assemblage
- BBA : Breeding bird assemblage

South Solway Mosses SAC

- H7110: Active raised bogs
- H7120: Degraded raised bogs still capable of natural regeneration

Subberthwaite, Blawith and Torver Low Commons SAC

- H7140: Transition mires and quaking bogs
- H7150: Depressions on peat substrates of the *Rhynchosporion*

Tarn Moss SAC

- H7140: Transition mires and quaking bogs

The Dee Estuary SPA

- A048w: Common shelduck *Tadorna tadorna*
- A052w: Eurasian teal *Anas crecca*
- A054w: Northern pintail *Anas acuta*
- A130w: Eurasian oystercatcher *Haematopus ostralegus*
- A141w: Grey plover *Pluvialis squatarola*
- A143w: Red knot *Calidris canutus*
- A157w: Bar-tailed godwit *Limosa lapponica*
- A160w: Eurasian curlew *Numenius arquata*
- A162c: Common redshank *Tringa totanus*
- A162w: Common redshank *Tringa totanus*
- A191c: Sandwich tern *Sterna sandvicensis*
- A193r: Common tern *Sterna hirundo*
- A195r: Little tern *Sterna albifrons*
- A616w: Black-tailed godwit *Limosa limosa islandica*
- A672w: Dunlin *Calidris alpina alpina*
- WATR: Waterbird assemblage

The Dee Estuary Ramsar

- Crit. 1 - sites containing representative, rare or unique wetland types
- Crit. 2 - supports vulnerable, endangered, or critically endangered species or threatened eco. communities
- Crit. 5 - regularly supports 20,000 or more waterbirds
- Crit. 6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds

The Dee Estuary Ramsar

- Crit. 1 - sites containing representative, rare or unique wetland types
- Crit. 2 - supports vulnerable, endangered, or critically endangered species or threatened eco. communities
- Crit. 5 - regularly supports 20,000 or more waterbirds
- Crit. 6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds

Tyne and Nent SAC

- H6130: Calaminarian grasslands of the *Violetalia calaminariae*

Ullswater Oakwoods SAC

- H91A0: Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

Upper Solway Flats and Marshes Ramsar

- Crit. 2 - supports vulnerable, endangered, or critically endangered species or threatened eco. communities
- Crit. 5 - regularly supports 20,000 or more waterbirds
- Crit. 6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds

Walton Moss SAC

- H7110: Active raised bogs
- H7120: Degraded raised bogs still capable of natural regeneration

Wast Water SAC

- H3130: Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*

West Midlands Mosses SAC

- H3160: Natural dystrophic lakes and ponds
- H7140: Transition mires and quaking bogs

Witherslack Mosses SAC

- H7110: Active raised bogs
- H7120: Degraded raised bogs still capable of natural regeneration

Yewbarrow Woods SAC

- H5130: *Juniperus communis* formations on heaths or calcareous grasslands
- H91A0: Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
- H91J0: *Taxus baccata* woods of the British Isles

Appendix B

Notes on Effect Pathways

Table B1 (from UKWIR 2021) and the following paragraphs outline some of the general assumptions that are typically (and reliably) applied to plan-level assessments where effect pathways are imaginable but not quantifiable at the plan level. These are applied cautiously, recognising that there is always a risk of atypical scenarios, but have been proved to be generally robust across a wide range of scenarios.

Table B1 Potential Impacts of Plan Options (from UKWIR 2021)

Broad categories of potential impacts on European sites, with examples	Examples of operations responsible for impacts (distance assumptions in <i>italics</i>)
<p>Physical loss:</p> <ul style="list-style-type: none"> Removal (including offsite effects, e.g. foraging habitat, and removal of supporting habitat within boundary of a SPA) Smothering 	<p>Development of infrastructure associated with scheme, e.g. new or temporary pipelines, transport infrastructure, temporary weirs.</p> <p>Indirect effects from a reduction in flows e.g. drying out marginal habitat.</p> <p>Physical loss is most likely to be significant where the boundary of the scheme extends within the boundary of the European site, or within an offsite area of known foraging, roosting, breeding habitat (that supports species for which a European site is designated).</p>
<p>Physical damage:</p> <ul style="list-style-type: none"> Sedimentation / silting Prevention of natural processes including coastal and fluvial bank stabilisation, prevention of long-shore drift etc. Habitat degradation Erosion Fragmentation Severance/barrier effect 	<p>Reduction in river flow leading to permanent and/or temporary loss of available habitat, sedimentation/siltation, fragmentation, etc.</p> <p>Physical damage is likely to be significant where the boundary of the scheme extends within or is directly adjacent to the boundary of the European site, or within/adjacent to an offsite area of known foraging, roosting, breeding habitat (that supports species for which a European site is designated, or where natural processes link the scheme to the site, such as through hydrological connectivity downstream of a scheme, long shore drift along the coast, or the scheme impacts the linking habitat).</p>
<p>Edge effects</p> <p>Non-physical disturbance:</p> <ul style="list-style-type: none"> Noise (incl. underwater) Visual presence Human presence Light pollution <p>Vibration (incl. underwater).</p>	<p>Noise from temporary construction or temporary pumping activities.</p> <p>Taking into consideration the noise level generated from general building activity (c. 122dB(A)) and considering the lowest noise level identified in appropriate guidance as likely to cause disturbance to bird species, it is concluded that noise impacts</p>

Broad categories of potential impacts on European sites, with examples

Examples of operations responsible for impacts (distance assumptions in italics)

	<p>could be significant up to 1km from the boundary of the European site⁷⁶.</p> <p>Noise from vehicular traffic during operation of a scheme.</p> <p>Noise from construction traffic is only likely to be significant where the transport route to and from the scheme is within 3-5km of the boundary of the European site.</p> <p>Plant and personnel involved in in operation of the scheme.</p> <p>These effects (noise, visual/human presence) are only likely to be significant where the boundary of the scheme extends within or is directly adjacent to the boundary of the European site, or within/adjacent to an offsite area of known foraging, roosting, breeding habitat (that supports species for which a European site is designated).</p> <p>Schemes which might include artificial lighting, e.g. for security around a temporary pumping station.</p> <p>Effects from light pollution are only likely to be significant where the boundary of the scheme is within 500m of the boundary of the European site.</p> <p>Vibration from temporary construction</p> <p>From a review of Environment Agency internal guidance on HRA and various websites/sources^{77,78,79} it is considered that effects of vibration are more likely to be significant if development is within 500m of a European site.</p>
--	---

Water table/availability:

- Drying
- Flooding / stormwater
- Changes to surface water levels and flows including both increases and reductions.
- Changes in groundwater levels and flows

Changes to coastal water movement

Changes to water levels and flows due to increased water abstraction, reduced storage or reduced flow releases from reservoirs to river systems.

These effects are only likely to be significant where the boundary of the scheme extends within the same ground or surface water catchment as the European site. However, these effects are dependent on hydrological continuity between the scheme and the European site, and sometimes, whether the scheme is up or down stream from the European site.

Toxic contamination:

- Water pollution

Reduced dilution in downstream or receiving waterbodies due to changes in abstraction or reduced compensation flow releases to river systems.

⁷⁶ British Standards Institute (BSI) (2009) BS5228 - Noise and Vibration Control on Construction and Open Sites. BSI, London.

⁷⁷ Institute of Lighting Professionals (2011) Guidance Notes for the Reduction of Obtrusive Light GN01:2011

⁷⁸ Environment Agency (2013) Bird Disturbance from Flood and Coastal Risk Management Construction Activities. Overarching Interpretive Summary Report. Prepared by Cascade Consulting and Institute of Estuarine and Coastal Studies.

⁷⁹ Cutts N, Hemingway K and Spencer J (2013) The Waterbird Disturbance Mitigation Toolkit Informing Estuarine Planning and Construction Projects. Produced by the Institute of Estuarine and Coastal Studies (IECS). Version 3.2.

Broad categories of potential impacts on European sites, with examples

Examples of operations responsible for impacts (distance assumptions in italics)

<ul style="list-style-type: none"> • Soil contamination <p>Air Pollution</p>	<p>These effects are only likely to be significant where the boundary of the scheme extends within the same ground or surface water catchment as the European site. However, these effects are dependent on hydrological continuity between the scheme and the European site, and sometimes, whether the scheme is up or down stream from the European site.</p> <p>Air emissions associated with plant and vehicular traffic during construction and operation of schemes.</p> <p>The effect of dust is only likely to be significant where site is within or in proximity to the boundary of the European site^{80,81}. Without mitigation, dust and dirt from the construction site may be transported onto the public road network and then deposited/spread by vehicles on roads up to 500m from large sites, 200m from medium sites, and 50m from small sites as measured from the site exit.</p> <p>Effects of road traffic emissions from the transport route to be taken by the project traffic are only likely to be significant where the protected site falls within 200 metres of the edge of a road affected⁸².</p>
<p>Non-toxic contamination:</p> <ul style="list-style-type: none"> • Nutrient enrichment (e.g. of soils and water) • Algal blooms • Changes in salinity • Changes in water chemistry (e.g. pH, calcium balance etc) • Changes in thermal regime • Changes in turbidity <p>Changes in sedimentation/silting</p>	<p>Changes to water salinity, nutrient levels, turbidity, thermal regime due to increased water abstraction, storage, or reduced compensation flow releases to river systems.</p> <p>These effects are only likely to be significant where the boundary of the scheme extends within the same ground or surface water catchment as the European Site. However, these effects are dependent on hydrological continuity between the scheme and the European site, and sometimes, whether the scheme is up or down stream from the European site.</p>
<p>Biological disturbance:</p> <ul style="list-style-type: none"> • Direct mortality • Changes to habitat availability • Out-competition by non-native species • Selective extraction of species • Introduction of disease • Rapid population fluctuations <p>Natural succession</p>	<p>Potential for changes to habitat availability, for example reductions in wetted width of rivers leading to desiccation of macrophyte beds due to changes in abstraction or reduced compensation flow releases to river systems. In addition, via removal of vegetation (including hedgerows and trees) used by based as foraging, roosting and hibernation sites and birds as roosting and nesting sites.</p> <p>Creation of new pathway of non-native invasive species.</p> <p>This effect is only likely to be significant where the scheme is situated within the European site or an upstream tributary of the European site (or affects groundwater levels supporting these sites or tributaries)</p>

⁸⁰ Highways Agency (2003) Design Manual for Roads and Bridges (DMRB), Volume 11.

⁸¹ Institute of Air Quality Management (2014) Guidance on the assessment of dust from demolition and construction v1.1.

⁸² NE Internal Guidance – Approach to Advising Competent Authorities on Road Traffic Emissions and HRAs V1.4 Final - June 2018

Broad categories of potential impacts on European sites, with examples

Examples of operations responsible for impacts (distance assumptions in italics)

	<p>Entrapment during in-river or terrestrial construction works causing injury and/or mortality of mobile species</p> <p>Likely to be a risk of entrapment, injury and/or mortality where the boundary of the option extends within or is directly adjacent to the boundary of a European site or within/adjacent to offsite functionally linked habitat. Mobile species could include fish, bats and European otters for example.</p> <p>Potential for changes to habitat availability via removal of vegetation (including hedgerows and trees) to facilitate construction activities and potential entrapment, injury and/or mortality of breeding birds and roosting/hibernating bats.</p> <p>This effect is dependent on the requirement to remove vegetation (if it cannot be avoided), ecological surveys to determine species presence and timing of removal based on species specific ecological considerations.</p>
--	---

In addition:

Water resource sensitive features

The EA has previously published advice on qualifying species and habitats that it considers to be water-resource dependent (*National EA guidance: Habitats Directive Stage 2 Review: Water Resources Authorisations – Practical Advice for Agency Water Resources Staff*). This is not reproduced here, but as a general rule most species are not considered water resource dependent with the exception of aquatic features (fish, otter) and wildfowl and waders associated with estuarine and wetland sites. Wide-ranging marine / marine dependent species associated with marine sites that are not directly connected to the hydrological zone of influence are not typically considered to be both sensitive and exposed to the effects of the options (except in certain relatively unique circumstances, such as some desalination schemes).

Estuarine birds and freshwater flows

Several studies have suggested that the number and densities of wintering waterbirds around estuarine freshwater channels are consistently greater than across associated mudflats, and that several bird species show significant preferences for freshwater flow areas over mudflats (e.g. Ravenscroft et al. (1997), Ravenscroft (1998, 1999), Ravenscroft & Beardall (2002) & Ravenscroft & Emes (2004)), although other studies have indicated that deeply incised channels associated with large volume inflows are less attractive to birds (Ravenscroft & Beardall, 2002).

There are a number of possible mechanisms for this. Correlations between freshwater flow and particle size (e.g. Ravenscroft & Emes (2004)), and substrate particle size distribution and invertebrate distribution have been recognised (e.g. Goss-Custard et al. (1991), Colwell and Landrum (1993), Yates et al. (1993)). Freshwater flow, salinity and invertebrate distribution have also been correlated (Kelly (2001)).

These physical relationships between invertebrate distributions and freshwater flows are important since there are numerous studies detailing relationships between overwintering waterbirds and the densities or distributions of their invertebrate prey (e.g. Goss-Custard et al. (1991), Colwell (1993), Colwell and Landrum (1993), Yates et al. (1993), Dierschke et al. (1999), Ravenscroft et al. (2002,

2004). Associations between bird densities and particle size (Granadeiro et al. 2004) have also been recognised.

Possible relationships between birds and freshwater flows were investigated in detail through a series of studies in The Swale SPA/Ramsar and the Medway Estuary and Marshes SPA/Ramsar (RPS 2004a, 2004b, 2004c, 2005a; Humpheryes & Kellett 2003). These studies found few consistent patterns, however; for example:

- Whilst the general relationship of birds and creek corridors (rather than channels) was usually replicated between watercourses and embayments, the species assemblage was variable between creeks and years, suggesting that creek-specific variables may be less important for determining the community composition than environmental or community processes operating in the wider estuary or beyond. Most species (67%) displayed no, or a negative, association with creeks (70% when feeding behaviour only was considered).
- Latitudinal relationships between creeks and invertebrates were inconsistent, with only a slight tendency for invertebrate biomass to be higher within the creek corridor than the channel or surrounding mudflats.
- Significant decreases in invertebrate abundance and biomass down longitudinal gradients (potentially related to greater exposure to tidal processes) were recorded, although bird numbers showed the opposite (i.e. greater numbers towards the sea), perhaps reflecting greater foraging accessibility due to interstitial water, or less disturbance.

Furthermore, no significant differences in the usage of creeks by birds were recorded between freshwater creeks and those that were predominantly saline.

A broad consensus position appears to be that it is not freshwater flow volumes *per se* that are critical to the bird / intertidal channel relationship, rather the presence of some flows within channels to maintain morphology, and that bird distributions are often influenced instead by estuary-wide factors (e.g. changes in disturbance levels, reductions in bird populations altering estuary usage, proximity of roost sites), local factors (e.g. the role of creek morphology or substrate penetrability) and small-scale interactions (e.g. inter and intra-specific bird relationships, or prey availability associated with behavioural or physiological responses to intertidal exposure).

Bat species and functional land

Bat species associated with UK SACs are not considered 'water resource sensitive' and so (in the absence of substantial habitat changes caused by operational aspects (e.g. draining of a wetland or replacement of extensive foraging habitat with a reservoir; or introduction of light etc. sources that may disrupt commuting or seasonal movements), their exposure to the outcomes of the WRMP will be limited to incidental effects from construction. In most instances potential effects will not be specifically identifiable or quantifiable (as the locations of works are not necessarily defined, and field surveys would not typically be undertaken at plan level).

UK bat species do not typically travel substantial distances (i.e. tens of kilometres) when foraging and the Bat Conservation Trust has therefore identified Core Sustainance Zones (CSZs) – defined as *“the area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the roost”* – for UK bat species; the CSZs for all UK species have a radius of 4km or less, with the exception of the CSZ for barbastelle (6km). This can be cautiously applied to bat SACs, although it is recognised that many roosts used by SAC bat populations will not be within the boundaries of the SAC. In general, therefore, unavoidable adverse effects would not be expected unless significant permanent land-take within those zones is likely; virtually all other potential effects are avoidable with normal good

practice in planning and design, and with established mitigation measures that are known to be effective – although these inevitably cannot be defined above the project level.

Birds and construction noise / visual disturbance

The **exposure** of any birds to **noise** and **visual disturbance** associated with development will depend on several factors, including:

- the sound power level of the machinery;
- the principal habitats and locations used by the birds species (and hence the distance from the source of any disturbance);
- attenuating factors (such as screening by topography, buildings or vegetation);
- the seasonal timing of the works;
- background noise levels in this area⁸³.

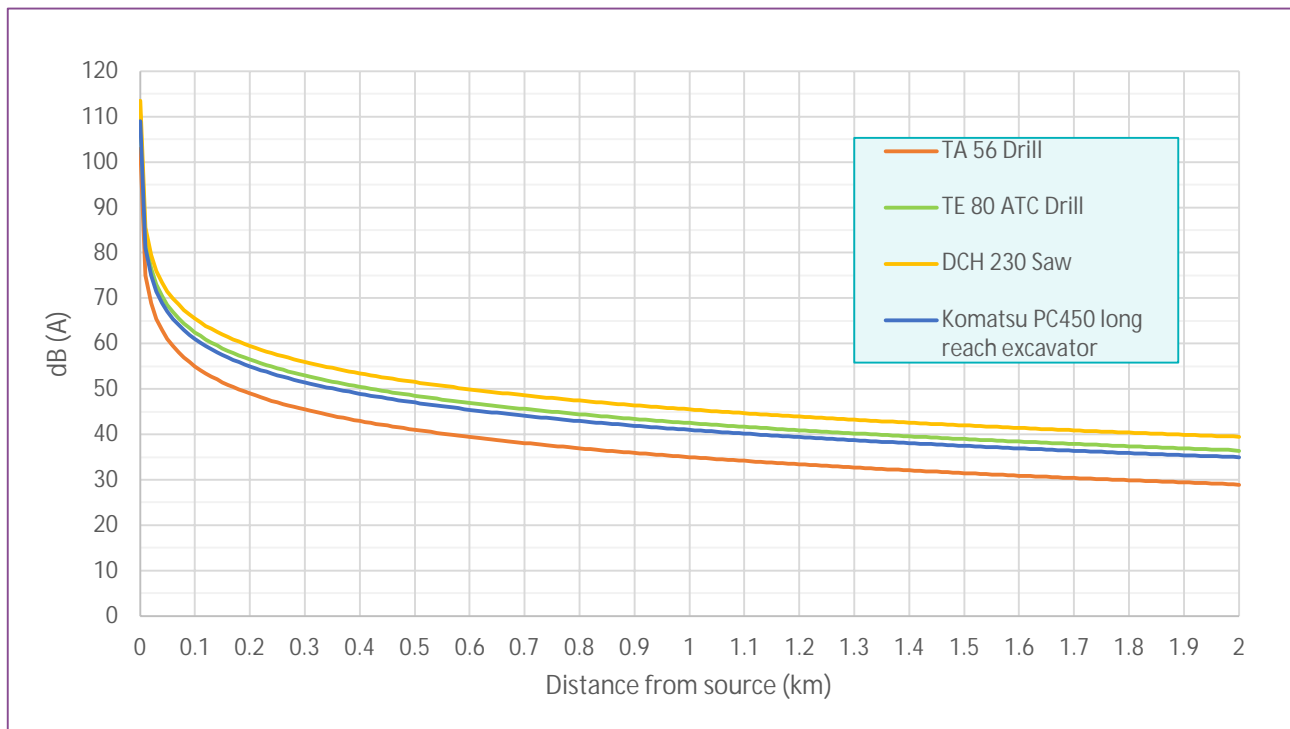
The sensitivity of the interest features will depend on their behavioural characteristics, their general tolerance / habituation to existing or new activities at a site, and the extent to which avoidance behaviours are achievable. This may also vary during the year (for example, most bird species will be more sensitive when nesting as avoidance behaviours are more constrained).

With regard to noise, a typical long-reach excavator has sound power level of ~109 dB(A); drills and saws have sound power level between 103 dB(A) and 114 dB(A). Without any barriers, the noise level of the loudest equipment used would attenuate to around 55dB(A) within 300m, and to 50 dB(A)⁸⁴ within 600m due to distance alone (see Figure B1).

⁸³ Noise levels do not operate additively, so the dB levels in an area are not the sum of the component sources.

⁸⁴ As a guide, 60dB(A) is approximately equivalent to a conversation; 50dB(A) is approximately equivalent to the level associated with a quiet suburb or light traffic (which is unlikely to be reached except at night in this area).

Figure B1 Approximate attenuation of equipment noise with no barriers



With regard to visual disturbance, sensitivity may be broadly correlated with size, with larger species typically having greater ‘flush distances’ (the distances at which birds typically move when approached by people). Laursen *et al.* (2005) determined that the mean flush distance for shelduck was 225 m; 319 m for brent geese; but only 70 m for dunlin (a much smaller species).

Cutts *et al.* (2009)⁸⁵ provide a useful review of available data on bird disturbance. It makes particular reference to noise and disturbance investigations studies undertaken during sea defence works, which included piling works. These studies identified disturbance levels for various activities associated with construction, based on observations of bird responses, which are summarised in **Table B2** below.

Table B2 Estuarine bird responses to construction activity

Activity	Observed Disturbance Level
Personnel and plant on mudflat	High
Personnel and plant on seaward toe and face	High to Moderate
Intermittent plant and personnel on crest	High to Moderate
Irregular piling noise (above 70 dB)	High to Moderate
Long term plant and personnel on crest	Moderate

⁸⁵ Cutts N., Phelps A. & Burdon D. (2009) *Construction and waterfowl: defining sensitivity, response, impacts and guidance*. Report to Humber INCA by the Institute of Estuarine and Coastal Studies, University of Hull

Activity	Observed Disturbance Level
Regular piling noise (below 70dB)	Moderate
Irregular noise (50-70 dB)	Moderate
Regular noise (50-70dB)	Moderate to low
Occasional movement of the crane jib and load above sight-line	Moderate to low
Noise below 50 dB	Low
Long-term plant only on crest	Low
Activity behind flood bank (inland)	Low

Key:

High	Maximum response; preparing to fly away and flying away, may leave area altogether
Moderate-high	} Head turning, scanning behaviour, reduced feeding, movement to other areas close by (decreasing response)
Moderate	
Moderate-low	
Low	No effect

The study also records the following observations from other construction schemes on the Humber:

- Piling activity on the landward side of the sea wall at Pyewipe (southern shore), associated with construction of a pumping station, had no disturbance effect on birds in January, February and March; the numbers and distributions of birds were similar during periods with and without piling. Disturbance only occurred when construction was moved to the seaward-side of the sea wall in April.
- Six years of bird monitoring associated with the construction of the Humber International Terminal (HIT) concluded that most disturbance only caused birds to move over a small area, and that the HIT development did not have a significant effect on usage of the area by birds.

In general, therefore, effects from noise and visual disturbance during construction typically have a limited range and duration, are reversible, and do not result in long-term adjustments in bird behaviours (such that they might constitute an adverse effect).

Air Quality Effects from Construction Schemes

A number of pollutants have a negative effect on air quality; however, the most significant and relevant to habitats and species (particularly plant species) are the primary pollutants sulphur dioxide (SO₂, typically from combustion of coal and heavy fuel oils although this has declined substantially), nitrogen oxides (NO_x, mainly from vehicles) and ammonia (NH₃, principally from

agriculture), which (together with secondary aerosol pollutants⁸⁶) are deposited as wet or dry deposits. These pollutants affect habitats and species mainly through acidification and eutrophication.

Acidification increases the acidity of soils, which can directly affect some organisms and which also promotes leaching of some important base chemicals (e.g. calcium), and mobilisation and uptake by plants of toxins (especially metals such as aluminium).

Air pollution contributes to eutrophication within ecosystems by increasing the amounts of available nitrogen (N)⁸⁷. This is a particular problem in low-nutrient habitats, where available nitrogen is frequently the limiting factor on plant growth, and results in slow-growing low-nutrient species being out-competed by faster growing species that can take advantage of the increased amounts of available N.

Overall in the UK, there has been a significant decline in SO_x and NO_x emissions in recent years and a consequential decrease in acid deposition. In England, SO_x and NO_x have declined by 97% and 72% respectively since 1970 (Defra, 2018) which is the result of a switch from coal to gas, nuclear and renewables for energy generation, and increased efficiency and emissions standards for cars. These emissions are expected to decline further in future years with the transition to electric vehicles. In contrast, emissions of ammonia have remained largely unchanged; they have declined by 10% in England since 1980 (Defra, 2018), but since 2008 have started to increase slightly.

The effect of SO_x and NO_x decreases on ecosystems has been marked, particularly in respect of acidification; the key contributor to acidification is now thought to be deposited nitrogen, for which the major source (ammonia emissions) has not decreased significantly. Indeed, eutrophication from N-deposition (again, primarily from ammonia) is now considered the most significant air quality issue for many habitats.

In terms of the exposure of designated sites to air quality changes associated with construction, this tends to be considered on a case-by-case basis. However, the Department of Transport's *Transport Analysis Guidance*⁸⁸ states that "**beyond 200m, the contribution of vehicle emissions from the roadside to local pollution levels is not significant**" and this distance is typically applied to construction schemes also when considering the potential for European sites to be exposed to any local effects associated with emissions to air. However, it should be noted that concentrations and deposition of traffic-generated pollutants do not decline linearly with distance from the road; typically, air pollution levels fall sharply within the first 20 – 30m before declining more slowly with increased distance⁸⁹. Concentrations and deposition will also be affected by physical parameters, such as local topography or vegetation structure.

Highways England's *Design Manual for Roads and Bridges* (DMRB) sets out an approach for assessing the effect of emissions from specific road schemes on designated sites; this suggests that a quantitative air quality assessment may be required if a European site is within 200m of an affected road and the predicted change in annual average daily traffic (AADT) is over 1000. It should be noted that this is 'in combination' with other projects (etc.), but this is a relatively large increase which

⁸⁶ Secondary pollutants are not emitted, but are formed following further reactions in the atmosphere; for example, SO₂ and NO_x are oxidised to form SO₄²⁻ and NO₂⁻ compounds; ozone is formed by the reaction of other pollutants (e.g. NO_x or volatile organic compounds) with UV light; ammonia reacts with SO₄²⁻ and NO₂⁻ to form ammonium (NH₄⁺).

⁸⁷ Nitrogen that is in a form that can be absorbed and used by plants.

⁸⁸ See <http://www.dft.gov.uk/webtag/documents/expert/unit3.3.3.php#013>; accessed 15/06/14.

⁸⁹ For example, recent air quality modelling by Wood of a new link road at an MoD establishment in the UK found that an Average Annual Daily Traffic (AADT) increase of ~7,000 increased nitrogen deposition by 0.21 kg N/ha/yr at the worst receptor point (at the immediate kerbside), and that by 25m from the road the increase in N-deposition was zero.

- would not be met by the vast majority of construction schemes when considering either vehicle access to the site / deliveries, or the equivalent movement / use of construction plant); and
- is assumed to be permanent (which is not the case for most construction).

Although it is not simple to apply 'rule of thumb' estimates to relationships between traffic volumes and N-deposition (as this is influenced by a number of factors), it is worth noting that the DMRB guidance regarding air quality thresholds is based on the assumption that 1,000 extra vehicles is equivalent to ~0.01 kg N/ha/yr (this is obviously a coarse figure and there are other factors that come into play such as the emissions factors used for opening year/ wind direction / number of HGVs / speed etc.). The EA-accepted threshold for 'significant effects' on habitats to be possible is an increase of >1% of the minimum critical load⁹⁰.

Air quality modelling and assessment is unlikely to be achievable at the WRMP level due to the absence of information on scheme design and construction approaches; and arguably not proportionate. However, it is clear that in the vast majority of cases emissions associated with construction schemes are of a magnitude that (a) will not exceed the thresholds for significant or significant adverse effects (even if relatively close to a site), and which (b) can be reliably managed or avoided using standard and unexceptional avoidance and mitigation measures, if required.

⁹⁰ The 1% threshold is used as it is accepted that levels below this are difficult to measure and not typically distinguishable from background fluctuations. An exceedance of 1% of the critical load should be seen as a 'starting point' for assessing the significance of any effects; the Institute of Air Quality Management (IAQM) position statement on air quality effects notes that "*it is the position of the IAQM that the use of a criterion of 1% of an assessment level in the context of habitats should be used only to screen out impacts that will have an insignificant effect. It should not be used as a threshold above which damage is implied and is therefore used to conclude that a significant effect is likely.*"

Appendix C

Standard Mitigation and Avoidance Measures

Overview

The 'avoidance measures' that may be applied to the options are detailed below, and are grouped as follows:

- General Measures (established construction best-practice, etc.) which will be applied to all options;
- Option-specific Measures (established and reliable measures identified to avoid specific potential effects on European sites, such as in relation to mobile species from the sites).

These measures will be applied unless project-level HRAs or project-specific environmental studies demonstrate that they are not required (i.e. the anticipated effect will not occur), not appropriate, or that alternative or additional measures are necessary or more appropriate.

Note that these measures are not exhaustive or exclusive and must be reviewed at the project stage, taking into account any changes in best-practice as well as scheme-specific survey information or studies.

General Measures and Principles

Scheme Design and Planning

All options will be subject to project-level environmental assessment as they are brought forward, which will include assessments of their potential to affect European sites during their construction or operation. These assessments will consider or identify (inter alia):

- opportunities for avoiding potential effects on European sites through design (e.g. alternative pipeline routes; micro siting; etc);
- construction measures that need to be incorporated into scheme design and/or planning to avoid or mitigate potential effects - for example, ensuring that sufficient working area is available for pollution prevention measures to be installed, such as sediment traps;
- operational designs required to ensure no adverse effects occur (e.g. screening, additional treatment, etc.) – although note that these measures can only be identified through detailed investigation schemes and agreed through the project-level HRA process.

Pollution Prevention

The habitats of European sites are most likely to be affected indirectly, through site-derived pollutants, rather than through direct encroachment. There is a substantial body of general construction good-practice which is likely to be applicable to all of the proposed options and can be

relied on (at this level) to prevent significant or adverse effects on a European site occurring as a result of construction site-derived pollutants. The following guidance documents detail the industry best-practices in construction that are likely to be relevant to the proposed schemes:

- Environment Agency Pollution Prevention Guidance Notes⁹¹, including:
 - ▶ PPG1: General guide to the prevention of pollution (May 2001);
 - ▶ PPG5: Works and maintenance in or near water (October 2007);
 - ▶ PPG6: Pollution prevention guidance for working at construction and demolition sites (April 2010);
 - ▶ PPG21: Pollution incident response planning (March 2009);
 - ▶ PPG22: Dealing with spillages on highways (June 2002);
- Environment Agency (2001) Preventing pollution from major pipelines [online]. Available at www.environment-agency.gov.uk/static/documents/Business/pipes.pdf. [Accessed 1 March 2011];
- Venables R. et al. (2000) Environmental Handbook for Building and Civil Engineering Projects. 2nd Edition. Construction Industry Research and Information Association (CIRIA), London.

The best-practice procedures and measures detailed in these documents will be followed for all construction works derived from the DWMP as a minimum standard, unless scheme-specific investigations identify additional measures and/or more appropriate non-standard approaches for dealing with potential site-derived pollutants.

General measures for species

Most species-specific avoidance or mitigation measures can only be determined at the scheme level, following scheme-specific surveys, and 'best-practice' mitigation for a species will vary according to a range of factors that cannot be determined at the strategic (DP) level. In addition, some general 'best-practice' measures may not be relevant or appropriate to the interest features of the European sites concerned (for example, clearing vegetation over winter is usually advocated to avoid impacts on nesting birds; however, this is unlikely to be necessary to avoid effects on some SPA species (such as overwintering estuarine birds) and the winter removal of vegetation might actually have a negative effect on these species through disturbance). However, the following general measures will be followed to minimise the potential for impacts on species that are European site interest features unless project level environmental studies or HRA indicate that they are not required or not appropriate, or that alternative or additional measures are more appropriate/necessary:

- Scheme design will aim to minimise the environmental effects by 'designing to avoid' potential habitat features that may be used by species that are European site interest features when outside the site boundary (e.g. linear features such as hedges or stream corridors; large areas of scrub or woodland; mature trees; etc.) through scheme-specific routing studies.
- The works programme and requirements for each option will be determined at the earliest opportunity to allow investigation schemes, surveys and mitigation to be appropriately scheduled and to provide sufficient time for consultations with NRW/NE.

⁹¹ Note, the Environment Agency Pollution Prevention Guidance Notes have been withdrawn by the Government, although the principles within them are sound and form a reasonable basis for pollution prevention measures.

- Night-time working, or working around dusk/dawn, should be avoided to reduce the likelihood of negative effects on nocturnal species.
- Any lighting required (either temporary or permanent) will be designed with an ecologist to ensure that potential 'displacement' effects on nocturnal animals, particularly SAC bat species, are avoided.
- All compounds/pipe stores etc. will be sited, fenced or otherwise arranged to prevent vulnerable SAC species (notably otters) from accessing them.
- All materials will be stored away from commuting routes/foraging areas that may be used by species that are European site interest features.
- All excavations will have ramps or battered ends to prevent species becoming trapped.
- Pipe-caps must be installed overnight to prevent species entering and becoming trapped in any laid pipe-work.

Appendix D

Assessment of Reserve Options

Overview

As noted (see Section 3), case-practice in WRMP HRAs and the current WRPG suggests it may be acceptable to include Preferred Programme options with residual uncertainties provided that:

- there is sufficient flexibility within the terms of the WRMP to ensure adverse effects can be avoided at the project level (e.g. the plan does not dictate specific pipeline routes or yields that cannot be deviated from); and/or
- the option is not required within the first five years of the plan period, so allowing time for additional investigations to be completed; and
- the uncertainty that this creates is mitigated at the plan-level by the inclusion of alternative options which:
 - ▶ will meet the required demand / deficit should the Preferred Programme option prove to have an unavoidable risk of adverse effects on the European sites in question; **and**
 - ▶ will not themselves have any adverse effect on any European sites.

This approach allows for the WRMP to be compliant with the Habitats Regulations, since certainty over outcomes for the plan as a whole is provided, despite residual uncertainties over some options.

The assessments documented in Sections 5 – 7 of this report do not suggest that there are any substantive residual uncertainties relating to the effects of **Option WR076** (River Bollin) on any European sites. However, it is possible that alternative options may be required for non-HRA reasons, i.e. in relation to the WFD; U UW has therefore identified ‘backup’ options that will be pursued if project-level assessments demonstrate that Option WR076 is not achievable. These options are as follows:

Table D1 Alternative Options

Option Ref	Option Name	Summary	Capacity (MI/d)	Year selected
WR026c	SWN_RIVER RIBBLE		3	-

Option Ref	Option Name	Summary	Capacity (MI/d)	Year selected
WR065b	RES_WHITEHOLME		2	
WR185	SSO_STOCKPORT PH II		12	
WR191	PRO_NORTH LANCASHIRE		4	

The screening and (if required) appropriate assessments of these options are summarised in the following sections. Note, due to the limited scope of the effects and the overlaps with the assessments in the main body of this report, the assessment structure has been simplified relative to Sections 5 – 7 to ensure it remains appropriate to the scale and complexity of the potential effects.

WR026c – SWN River Ribble

Option Summary

[Redacted content]

Screening

The screening of **Option WR026c** is summarised in **Table D2**. In summary, the **Ribble and Alt Estuaries SPA** and **Ribble and Alt Estuaries Ramsar** are downstream receptors. Construction will be unexceptional and so construction effects would not be anticipated (although this aspect is ‘screened in’ to avoid conflict with ‘People over Wind’). Operation will potentially reduce flows in the Ribble to the estuary by up to 3MI/d. No other European sites will be exposed to potentially

significant effects as a result of the option; note, as the option will have ‘no effects’ on these sites ‘in combination’ effects are not possible.

Table D2 Option screening summary – WR026c SWN River Ribble

European sites in scope	Dist (km)*	LSE (alone?)	Notes
North Pennine Dales Meadows SAC		0	Site/features not exposed and sensitive to likely outcomes of option (upstream; distance)
Bowland Fells SPA		0	Site not exposed to scheme effects; exposure / sensitivity of features will be low (distance; feature distribution in site; habitat preferences; species behaviour) and significant effects are unlikely.
South Pennine Moors SAC		0	Site/features not exposed and sensitive to likely outcomes of option (upstream; distance)
South Pennine Moors Phase 2 SPA		0	Site/features not exposed and sensitive to likely outcomes of option (upstream; distance)
Ribble and Alt Estuaries Ramsar		U	Site is ultimate downstream receptor (>40km); alone effects likely to be nil / inconsequential; catchment-scale in combination effects theoretically possible depending on option mix.
Ribble and Alt Estuaries SPA		U	Site is ultimate downstream receptor (>40km); alone effects likely to be nil / inconsequential; catchment-scale in combination effects theoretically possible depending on option mix.

Appropriate Assessment

The appropriate assessments for **Ribble and Alt Estuaries SPA** and **Ribble and Alt Estuaries Ramsar** are summarised in the following tables:

Table D3 Summary of Appropriate Assessment - Ribble and Alt Estuaries SPA

Aspect	Notes
Site Name	Ribble and Alt Estuaries SPA
Site Code	UK9005103
Qualifying Features	<ul style="list-style-type: none"> - A017w: Great cormorant <i>Phalacrocorax carbo</i> - A616w: Black-tailed godwit <i>Limosa limosa islandica</i> - A038w: Whooper swan <i>Cygnus cygnus</i> - A179r: Black-headed gull <i>Larus ridibundus</i> - A160w: Eurasian curlew <i>Numenius arquata</i> - A062w: Greater scaup <i>Aythya marila</i> - A144c: Sanderling <i>Calidris alba</i> - A158c: Whimbrel <i>Numenius phaeopus</i> - A183r: Lesser black-backed gull <i>Larus fuscus</i> - A672w: Dunlin <i>Calidris alpina alpina</i>

Aspect	Notes
	<ul style="list-style-type: none"> - A162c: Common redshank <i>Tringa totanus</i> - A048w: Common shelduck <i>Tadorna tadorna</i> - A137c: Ringed plover <i>Charadrius hiaticula</i> - A141w: Grey plover <i>Pluvialis squatarola</i> - A065w: Black (common) scoter <i>Melanitta nigra</i> - A193r: Common tern <i>Sterna hirundo</i> - A162w: Common redshank <i>Tringa totanus</i> - A142w: Northern lapwing <i>Vanellus vanellus</i> - A144w: Sanderling <i>Calidris alba</i> - A130w: Eurasian oystercatcher <i>Haematopus ostralegus</i> - A143w: Red knot <i>Calidris canutus</i> - A157w: Bar-tailed godwit <i>Limosa lapponica</i> - A151r: Ruff <i>Philomachus pugnax</i> - A037w: Tundra swan <i>Cygnus columbianus bewickii</i> - A052w: Eurasian teal <i>Anas crecca</i> - A050w: Eurasian wigeon <i>Anas penelope</i> - A040w: Pink-footed goose <i>Anser brachyrhynchus</i> - A140w: European golden plover <i>Pluvialis apricaria</i> - A054w: Northern pintail <i>Anas acuta</i> - SBA: Seabird assemblage - WATR: Waterbird assemblage - A122r: Corn crane <i>Crex crex</i>
Standard data form	Available at: https://jncc.gov.uk/jncc-assets/SPA-N2K/UK9005103.pdf
Conservation Objectives	Available at: http://publications.naturalengland.org.uk/publication/4868920422957056?category=4582026845880320
Site Improvement Plan	Available at: http://publications.naturalengland.org.uk/publication/4868920422957056?category=4582026845880320
Supplementary advice	Available at: http://publications.naturalengland.org.uk/publication/4868920422957056?category=4582026845880320
Associated SSSIs potentially exposed	Ribble Estuary SSSI (units within estuary all in favourable condition)
Assessment – Construction	<p>Construction will be required within the Ribble catchment, including a crossing of the river. Indirect effects (e.g. through site-derived pollutants) can be reliably avoided with established best-practice construction measures (see Appendix C). These will be sufficient to ensure that there is ‘no effect’ on the habitats of the SPA, and so no risk of ‘in combination’ effects with other plans / projects etc.</p> <p>Conclusion: No adverse effects, alone or in combination.</p>
Assessment – Operation	<p>The WFD assessment predicts that this option could reduce flows in the River Ribble by up to a maximum of 4% at Q95 at the abstraction point, with decreasing impacts downstream towards the tidal limit (over 30km downstream). The Ribble, Douglas and Crossens ALS (Environment Agency, 2013) states that water is available in the Lower Ribble; more recent water availability information provided by the Environment Agency in March 2022 indicates that this is still the case, with approximately 150MI/d available at Q95).</p>

Aspect	Notes
	<p>Consequently, the hydrological impact of this option is considered too small to be detectable at the boundary of the SPA, and the volumes lost will be inconsequential in relation to flows in the Ribble and the tidal turnover of the Ribble estuary. As a result, there will be no adverse effects on the integrity of this SPA as a result of this option.</p> <p>With regard to in combination effects, the approach outlined in Section 3 of this report was followed to identify other plans and projects that might interact with this option. No Drought Plan options have the potential to affect this SPA; and no other potential in combination effects have been identified (e.g. with Shoreline Management Plans or projects on the Planning Inspectorate's National Infrastructure Projects database).</p> <p>Conclusion: No adverse effects, alone or in combination.</p>

WR065b – RES Whiteholme Reservoir

Option Summary



Figure D1 Weir being removed in 2015



Note, the topography of the reservoir and operational use ensured that this did not fundamentally alter the area of the reservoir affected by its operation.

Screening

The screening of **Option 065b** is summarised in **Table D4**. In summary, this [REDACTED]

construction is likely to be a relatively minor undertaking (and the reverse of the weir removal works that were undertaken in 2015 without adverse effects) but this aspect is 'screened in' to avoid conflict with 'People over Wind'. With regard to operation the scheme will restore water levels to the designed capacity ([REDACTED])

[REDACTED]. No other European sites will be exposed to potentially significant effects as a result of the option; note, as the option will have 'no effects' on these sites 'in combination' effects are not possible.

Table D4 Option screening summary – WR065b – RES Whiteholme Reservoir

European sites in scope	Dist (km)*	LSE (alone?)	Notes
South Pennine Moors Phase 2 SPA		U*	Scheme will involve restoration of reservoir to pre-2015 levels and so breeding / foraging etc. habitat for the interest features unlikely to be affected (certainly not potentially significant areas). Construction effects avoidable with established measures, but requires AA.
South Pennine Moors SAC		U*	Scheme will involve restoration of reservoir to pre-2015 levels and so qualifying habitats unlikely to be affected in area inundated (certainly not potentially significant areas). Construction effects avoidable with established measures, but requires AA.
Rochdale Canal SAC		0	Site/features not exposed and sensitive to likely outcomes of option (distance). No effects therefore no risk of i/c effects.
Peak District Moors (South Pennine Moors Phase 1) SPA		0	Site/features not exposed and sensitive to likely outcomes of option (distance). No effects therefore no risk of i/c effects.
Mersey Estuary Ramsar		0	Site is ultimate downstream receptor (~60km direct, substantially more via watercourses); alone effects will be nil / inconsequential; catchment-scale in combination effects not possible due to option characteristics (will not ultimately reduce flows to the estuary).
Mersey Estuary SPA		0	Site is ultimate downstream receptor (~60km direct, substantially more via watercourses); alone effects will be nil / inconsequential; catchment-scale in combination effects not possible due to option characteristics (will not ultimately reduce flows to the estuary).

Appropriate Assessment

The appropriate assessments for **South Pennine Moors Phase 2 SPA** and **South Pennine Moors SAC** are summarised in the following tables:

Table D5 Summary of Appropriate Assessment - South Pennine Moors SAC

Aspect	Notes
Site Name	South Pennine Moors SAC
Site Code	UK0030280

Aspect	Notes
Qualifying Features	<ul style="list-style-type: none"> - H4010: Northern Atlantic wet heaths with <i>Erica tetralix</i> - H4030: European dry heaths - H7130: Blanket bogs (* if active bog) - H7140: Transition mires and quaking bogs - H91A0: Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles
Standard data form	Available at: https://jncc.gov.uk/jncc-assets/SAC-N2K/UK0030280.pdf
Conservation Objectives	Available at: http://publications.naturalengland.org.uk/publication/4973604919836672?category=5758332488908800
Site Improvement Plan	Available at: http://publications.naturalengland.org.uk/publication/4973604919836672?category=5758332488908800
Supplementary advice	Available at: http://publications.naturalengland.org.uk/publication/4973604919836672?category=5758332488908800
Associated SSSIs potentially exposed	South Pennine Moors SSSI (units within / near reservoir all in unfavourable recovering condition)
Assessment – Construction	<p>Construction will be required at the location of an existing concrete spillway / weir, with access to this available from operational areas of the reservoir and hardstanding / access tracks, and so direct effects on the qualifying habitats of the site will not occur. Indirect effects (e.g. through site-derived pollutants) can be reliably avoided with established best-practice construction measures (see Appendix C). These will be sufficient to ensure that there is ‘no effect’ on the habitats of the SAC, and so no risk of ‘in combination’ effects with other plans / projects etc.</p> <p>Conclusion: No adverse effects, alone or in combination.</p>
Assessment – Operation	<p>Operation of the scheme will restore the reservoir to its designed capacity and increase water levels by ~1m. However, the topography of the reservoir and operational use since 2015 has ensured that the previous water level reduction did not fundamentally alter the area of the reservoir affected by its operation – i.e. the area of the reservoir affected by the restoration of water levels does not support the qualifying features of the SAC (since most of it is still regularly inundated), nor is it a functional component of the integrity of these features. Furthermore, the restoration of water levels is consistent with the condition of the reservoir at the time of designation. Operational in combination effects are not possible through any mechanism.</p> <p>Conclusion: No adverse effects, alone or in combination.</p>

Table D6 Summary of Appropriate Assessment - South Pennine Moors Phase 2 SPA

Aspect	Notes
Site Name	South Pennine Moors Phase 2 SPA

Aspect	Notes
Site Code	UK9007022
Qualifying Features	<ul style="list-style-type: none"> - A098r: Merlin <i>Falco columbarius</i> - A140r: European golden plover <i>Pluvialis apricaria</i> - A222r: Short-eared owl <i>Asio flammeus</i> - BBA: Breeding bird assemblage - A040w: Pink-footed goose <i>Anser brachyrhynchus</i>
Standard data form	Available at: https://jncc.gov.uk/jncc-assets/SPA-N2K/UK9007022.pdf
Conservation Objectives	Available at: http://publications.naturalengland.org.uk/publication/4885083764817920?category=5758332488908800
Site Improvement Plan	Available at: http://publications.naturalengland.org.uk/publication/4885083764817920?category=5758332488908800
Supplementary advice	Available at: http://publications.naturalengland.org.uk/publication/4885083764817920?category=5758332488908800
Associated SSSIs potentially exposed	South Pennine Moors SSSI (units within / near reservoir all in unfavourable recovering condition)
Assessment – Construction	<p>Construction will be required at the location of an existing concrete spillway / weir, with access to this available from operational areas of the reservoir and hardstanding / access tracks, and so direct effects on the supporting habitats for the qualifying species of the site will not occur. Indirect effects (e.g. through site-derived pollutants, or through disturbance of the qualifying features when breeding) can be reliably avoided with established best-practice construction measures (see Appendix C). These will be sufficient to ensure that there is ‘no effect’ on the habitats of the SAC, and so no risk of ‘in combination’ effects with other plans / projects etc.</p> <p>Conclusion: No adverse effects, alone or in combination.</p>
Assessment – Operation	<p>Operation of the scheme will restore the reservoir to its designed capacity and increase water levels by ~1m. However, the topography of the reservoir and operational use since 2015 has ensured that the previous water level reduction did not fundamentally alter the area of the reservoir affected by its operation – i.e. the area of the reservoir affected by the restoration of water levels does is not likely to provide potentially notable breeding / foraging habitat for the qualifying species of the site (since most of it is still regularly inundated), nor is it a functional component of the integrity of these features. Furthermore, the restoration of water levels is consistent with the condition of the reservoir at the time of designation. Operational in combination effects are not possible through any mechanism.</p> <p>Conclusion: No adverse effects, alone or in combination.</p>

WR185 – SSO Stockport Ph. II

Option Summary



Screening

The screening of **Option WR185** is summarised in **Table D7**. In summary, this is a small-scale construction scheme that will have **no significant effects, alone or in combination**, on any European sites due to the distances involved and absence of pathways for site-derived pollutants to reach the sites (irrespective of mitigation, hence no risk of conflict with PoW). Note, as the option will have ‘no effects’ on any European sites ‘in combination’ effects are not possible.

Table D7 Option screening summary – WR185 SSO Stockport Ph. II

European sites in scope	Dist (km)*	LSE (alone?)	Notes
Rochdale Canal SAC		0	No effect pathways (distance, separate catchment)
Peak District Moors (South Pennine Moors Phase 1) SPA		0	No effect pathways (distance, upstream)
South Pennine Moors SAC		0	No effect pathways (distance, upstream)
Peak District Dales SAC		0	No effect pathways (distance, upstream)
South Pennine Moors Phase 2 SPA		0	No effect pathways (distance, upstream)
Rostherne Mere Ramsar		0	No effect pathways (distance, separate catchment)
Mersey Estuary Ramsar		0	No effect pathways (distance, option characteristics)
Mersey Estuary SPA		0	No effect pathways (distance, option characteristics)

WR191 – PRO North Lancashire

Option Summary



Screening

The screening of **Option WR191** is summarised in **Table D8**. In summary, the estuarine components of the **Morecambe Bay Ramsar, Morecambe Bay SAC and Morecambe Bay and Duddon Estuary SPA** are downstream receptors. Construction will be a relatively minor undertaking at an existing operational site (i.e. with existing drainage and containment structures present) and so construction effects would not be anticipated (although this aspect is ‘screened in’ to avoid conflict with ‘People over Wind’). With regard to operation the scheme will utilise washwater that would otherwise be sent to Lancaster STW for treatment and discharge into the tidal Lune near Stodday; this is examined in a brief appropriate assessment. No other sites are exposed to the likely outcomes of the option.

Table D8 Option screening summary – WR191 PRO North Lancashire

European sites in scope	Dist (km)*	LSE (alone?)	Notes
Bowland Fells SPA		0	No effect pathways (distance, species habitat preferences)
Morecambe Bay Ramsar		U	Features sensitive to water resource permissions but magnitude of environmental change will be extremely small (relative and absolute) although this is characterised through AA, below.
Morecambe Bay SAC		U	Features sensitive to water resource permissions but magnitude of environmental change will be extremely small (relative and absolute) although this is characterised through AA, below.
Morecambe Bay and Duddon Estuary SPA		U	Features sensitive to water resource permissions but magnitude of environmental change will be extremely small (relative and absolute) although this is characterised through AA, below.
Calf Hill and Cragg Woods SAC		0	No effect pathways (distance)
Leighton Moss Ramsar		0	No effect pathways (distance)
Leighton Moss SPA		0	No effect pathways (distance)
Morecambe Bay Pavements SAC		0	No effect pathways (distance)

Appropriate Assessment

The appropriate assessments for **Morecambe Bay Ramsar, Morecambe Bay SAC and Morecambe Bay and Duddon Estuary SPA** are summarised in the following tables:

Table D9 Summary of Appropriate Assessment - Morecambe Bay SAC

Aspect	Notes
Site Name	Morecambe Bay SAC
Site Code	UK0013027
Qualifying Features	<ul style="list-style-type: none"> - H1110: Sandbanks which are slightly covered by sea water all the time - H1130: Estuaries - H1140: Mudflats and sandflats not covered by seawater at low tide - H1150: Coastal lagoons - H1160: Large shallow inlets and bays - H1170: Reefs - H1220: Perennial vegetation of stony banks - H1310: <i>Salicornia</i> and other annuals colonizing mud and sand - H1330: Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) - H2110: Embryonic shifting dunes - H2120: Shifting dunes along the shoreline with <i>Ammophila arenaria</i> ("white dunes") - H2130: Fixed coastal dunes with herbaceous vegetation ("grey dunes") - H2150: Atlantic decalcified fixed dunes (<i>Calluno-Ulicetea</i>) - H2170: Dunes with <i>Salix repens</i> ssp. <i>argentea</i> (<i>Salicion arenariae</i>) - H2190: Humid dune slacks - S1166: Great crested newt <i>Triturus cristatus</i>
Standard data form	Available at: https://jncc.gov.uk/jncc-assets/SAC-N2K/UK0013027.pdf
Conservation Objectives	Available at: http://publications.naturalengland.org.uk/publication/5314736417669120?category=4582026845880320
Site Improvement Plan	Available at: http://publications.naturalengland.org.uk/publication/5314736417669120?category=4582026845880320
Supplementary advice	Available at: http://publications.naturalengland.org.uk/publication/5314736417669120?category=4582026845880320
Associated SSSIs potentially exposed	Lune Estuary SSSI (units downstream of Lancaster WwTW and Lancaster STW all in favourable condition)
Assessment – Construction	<p>Construction will be required at the existing WwTW / reservoir site, which is between the catchments of the Lune and the River Conder (both drain to Morecambe Bay). Indirect effects (e.g. through site-derived pollutants) can be reliably avoided with established best-practice construction measures (see Appendix C). These will be sufficient to ensure that there is ‘no effect’ on the habitats of the SAC, and so no risk of ‘in combination’ effects with other plans / projects etc.</p> <p>Conclusion: No adverse effects, alone or in combination.</p>
Assessment – Operation	<p>Operation of the scheme will theoretically reduce the input of non-saline water to the Lune estuary by 3.5MI/d (maximum; in practice it would be less due to process losses etc.), as washwater from the WwTW is understood to be passed to [REDACTED] for treatment and subsequently discharged into the tidal Lune at Stodday (i.e. directly to the SAC at this point).</p>

Aspect	Notes
	<p>The only features potentially exposed at this location are Estuaries; Mudflats and sandflats not covered by seawater at low tide; <i>Salicornia</i> and other annuals colonizing mud and sand; and potentially Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>).</p> <p>With regard to water quality, the loss of the washwater will have essentially no effect on the quality of the discharges from the STW as the existing discharge permits will still be met, and the washwater is a very small component of the DWF and discharges from the STW in relation to wastewater received from Lancaster (~90% of the raw waste inputs at the [REDACTED] is of residential origin (Stantec 2022), with the remainder being from industrial sources).</p> <p>The volume of non-saline water entering the Lune estuary would theoretically decrease by around 3.5MI/d assuming that all of the water extracted at the WwTW would otherwise have been discharged to the estuary via the STW. This has the potential to alter the estuarine habitats in the immediate vicinity of the STW outfall depending on their sensitivity to non-saline inputs. However, this volume loss will be inconsequential in relation to (a) the volumes of non-saline water that will continue to be discharged from the STW at this location (b) the volumes of freshwater from the Lune (Q95 flows at the lowest gauging station on the Lune, approximately 13.5km upstream from the SWT, are ~282.5MI/d); and (c) the tidal influx. It is therefore certain that any reduction of this magnitude will have no practically measurable effects on habitat condition, and so adverse effects on integrity would not occur.</p> <p>With regard to in combination effects, the approach outlined in Section 3 of this report was followed to identify other plans and projects that might interact with this option. Two Drought Plan options (River Lune LCUS abstraction; and Lake Windermere) have the potential to affect this SAC; the Drought Plan HRA concluded that there would be 'no LSE' alone or in combination. The Lake Windermere DP option will not affect the Lune; and the effects of option WR191 alone will be too small to alter the conclusion for the River Lune LCUS abstraction. There will therefore be no operational in combination effects if the DP options are utilised).</p> <p>No other potential in combination effects have been identified (e.g. with Shoreline Management Plans or projects on the Planning Inspectorate's National Infrastructure Projects database).</p> <p>Conclusion: No adverse effects, alone or in combination.</p>

Table D10 Summary of Appropriate Assessment – Morecambe Bay and Duddon Estuary SPA

Aspect	Notes
Site Name	Morecambe Bay and Duddon Estuary SPA
Site Code	UK9020326
Qualifying Features	<ul style="list-style-type: none"> - A026w: Little egret <i>Egretta garzetta</i> - A038w: Whooper swan <i>Cygnus cygnus</i> - A040c: Pink-footed goose <i>Anser brachyrhynchus</i> - A048c: Common shelduck <i>Tadorna tadorna</i> - A130c: Eurasian oystercatcher <i>Haematopus ostralegus</i> - A137c: Ringed plover <i>Charadrius hiaticula</i> - A140w: European golden plover <i>Pluvialis apricaria</i> - A141c: Grey plover <i>Pluvialis squatarola</i> - A143c: Red knot <i>Calidris canutus</i> - A144c: Sanderling <i>Calidris alba</i> - A672c: Dunlin <i>Calidris alpina alpina</i> - A151w: Ruff <i>Philomachus pugnax</i> - A616c: Black-tailed godwit <i>Limosa limosa islandica</i> - A157w: Bar-tailed godwit <i>Limosa lapponica</i> - A160c: Eurasian curlew <i>Numenius arquata</i> - A162c: Common redshank <i>Tringa totanus</i> - A169c: Ruddy turnstone <i>Arenaria interpres</i> - A176w: Mediterranean gull <i>Larus melanocephalus</i> - A183r: Lesser black-backed gull <i>Larus fuscus</i> - A184r: Herring gull <i>Larus argentatus</i> - A191r: Sandwich tern <i>Sterna sandvicensis</i> - A193r: Common tern <i>Sterna hirundo</i> - A195r: Little tern <i>Sterna albifrons</i> - A054c: Northern pintail <i>Anas acuta</i> - A183c: Lesser black-backed gull <i>Larus fuscus</i> - WATR: Waterbird assemblage - SBA: Seabird assemblage - A194r: Arctic tern <i>Sterna paradisaea</i>
Standard data form	Available at: https://jncc.gov.uk/jncc-assets/SPA-N2K/UK9020326.pdf
Conservation Objectives	Available at: http://publications.naturalengland.org.uk/publication/6242841537806336?category=4582026845880320
Site Improvement Plan	Available at: http://publications.naturalengland.org.uk/publication/6242841537806336?category=4582026845880320
Supplementary advice	Available at: http://publications.naturalengland.org.uk/publication/6242841537806336?category=4582026845880320
Associated SSSIs potentially exposed	Lune Estuary SSSI (units downstream of Lancaster WwTW and Lancaster STW all in favourable condition)

Aspect	Notes
Assessment – Construction	<p>Construction will be required at the existing WwTW / reservoir site, which is between the catchments of the Lune and the River Conder (both drain to Morecambe Bay). Indirect effects (e.g. through site-derived pollutants, or through disturbance of SPA species if using the [REDACTED] (e.g. for roosting, although note that there is no evidence of a significant functional linkage between the reservoir and the SPA) can be reliably avoided with established best-practice construction measures (see Appendix C). These will be sufficient to ensure that there is ‘no effect’ on the habitats of the SAC, and so no risk of ‘in combination’ effects with other plans / projects etc.</p> <p>Conclusion: No adverse effects, alone or in combination.</p>
Assessment – Operation	<p>The operational assessment is as per that for the Morecambe Bay SAC; in summary, the environmental changes expected from operation of the scheme will be negligible and will not result in any substantive changes to the supporting habitats for the SPA qualifying features (i.e. such that the integrity of the qualifying species’ populations might be adversely affected).</p> <p>Conclusion: No adverse effects, alone or in combination.</p>

Table D11 Summary of Appropriate Assessment – Morecambe Bay Ramsar

Aspect	Notes
Site Name	Morecambe Bay Ramsar
Site Code	UK11045
Qualifying Features	<ul style="list-style-type: none"> - Crit. 6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds - Crit. 4 - supports plant/animal species at a critical stage in their life cycles, or provides refuge - Crit. 5 - regularly supports 20,000 or more waterbirds
Standard data form	Available at: https://jncc.gov.uk/jncc-assets/RIS/UK11045.pdf
Conservation Objectives	As per associated SAC / SPA, or underpinning SSSI(s)
Site Improvement Plan	As per associated SAC / SPA, or underpinning SSSI(s)
Supplementary advice	As per associated SAC / SPA, or underpinning SSSI(s)
Associated SSSIs potentially exposed	Lune Estuary SSSI (units downstream of Lancaster WwTW and Lancaster STW all in favourable condition)
Assessment – Construction	<p>Construction will be required at the existing WwTW / reservoir site, which is between the catchments of the Lune and the River Conder (both drain to Morecambe Bay). Indirect effects (e.g. through site-derived pollutants, or through disturbance of Ramsar bird species if using the [REDACTED] (e.g. for roosting, although note that there is no evidence of a significant functional linkage</p>

Aspect	Notes
	<p>between the reservoir and the SPA) can be reliably avoided with established best-practice construction measures (see Appendix C). These will be sufficient to ensure that there is 'no effect' on the habitats of the SAC, and so no risk of 'in combination' effects with other plans / projects etc.</p> <p>Conclusion: No adverse effects, alone or in combination.</p>
Assessment – Operation	<p>The operational assessment is as per that for the Morecambe Bay SAC / Morecambe Bay and Duddon Estuary SPA; in summary, the environmental changes expected from operation of the scheme will be negligible and will not result in any substantive changes to the supporting habitats for the SPA qualifying features (i.e. such that the integrity of the qualifying species' populations might be adversely affected).</p> <p>Conclusion: No adverse effects, alone or in combination.</p>

Between-Option In Combination Effects

The reserve options above would replace Option WR076 (River Bollin) and so there would be no in combination effects with the WRMP preferred option. The European sites potentially exposed to the reserve options are summarised in **Table D12**.

Table D12 In combination Effects between Reserve and Retained Preferred Options

Site	Options	Effects alone	i/c?
Ribble and Alt Estuaries SPA	WR026b	No adverse effect	No between-option in combination effects. Conclusion: no adverse effects i/c
Ribble and Alt Estuaries SPA	WR026b	No adverse effect	As for Ribble and Alt Estuaries SPA
Mersey Estuary SPA	WR065b WR185	No effects No adverse effect	Construction-related effects from these options will not occur with mitigation; operational effects will not occur. There will be no adverse effects on this site.
Mersey Estuary Ramsar	WR065b WR185	No effects No adverse effect	As for Mersey Estuary SPA.

Conclusion

It can be concluded that **the proposed reserve options will have no adverse effects on the integrity of any European sites, alone or in combination**, if they are required to replace one or more of the preferred options.

