Dŵr Cymru Welsh Water

Final Water Resources Management Plan 2019

Habitats Regulations Assessment

March 2019

Amec Foster Wheeler Environment & Infrastructure UK Limited (now Wood Environment & Infrastructure Solutions UK Ltd)

Report for

Richard Amos
Water Resources Regulation Manager
Water Services
Dŵr Cymru Welsh Water
Ty Awen
Spooner Close
Celtic Springs Business Park
Newport
NP10 8FZ

Main contributors

Mike Frost
Esme Hammer

Issued by

.....
Mike Frost

Approved by

.....
Alex Melling

Amec Foster Wheeler (now Wood)

Canon Court
Abbey Lawn
Abbey Foregate
Shrewsbury SY2 5DE
United Kingdom
Tel +44 (0) 1743 342 000

Doc Ref. B39086rr096i4

h:\projects\39086 bri welsh water wrmp\docs\hra\2019 hra\sept 2019 version\b39086rr096i4 - wrmp hra [final].docx

Copyright and non-disclosure notice

Third-party disclaimer

Management systems

This document has been produced by Amec Foster Wheeler Environment & Infrastructure UK Limited in full compliance with the management systems, which have been certified to ISO 9001, ISO 14001 and OHSAS 18001 by LRQA.

Document revisions

No.	Details	Date
1	Draft for client review	23/11/17
2	HRA of consultation submission	15/12/17
3	HRA of Revised Draft WRMP	12/09/17
4	HRA of Published WRMP	29/03/19

Executive summary

Background

All water companies in England and Wales must set out their strategy for managing water resources across their supply area over the next 25 years. This statutory requirement is defined under the Water Act 2003, which also sets out how water companies should publish a Water Resources Management Plan (WRMP) for consultation, setting out how they will balance supply and demand over a minimum 25-year planning period. The Draft WRMP was published on 16th March 2018 for a 12 week public consultation. A Revised Draft WRMP (along with the Statement of Response to the consultation) was published on 14th September 2018. Following a review of the Statement of Response to the consultation and the changes made, Welsh Government gave Welsh Water direction to publish the Final WRMP on the 8th March 2019. As a consequence, Welsh Water has now published the Final WRMP. It is available on Welsh Water's website at: https://www.dwrcymru.com/en/My-Water/Water-Resources/Draft-Water-Resources-Management-Plan-2019.aspx

The WRMP process identifies potential deficits in the future availability of water, taking into account

- abstraction volumes allowed under current statutory licences, as impacted by actual source yield;
- any future reductions in abstraction expected under environmental improvement regimes (e.g. sustainability reductions required due to the Review of Consents or Water Framework Directive);
- predicted future demand for water based on government data for population and housing growth plans; and
- predicted effects of climate change

It then proposes solutions ('Preferred Options') for maintaining the balance between water available and future demand for water.

To obtain a preferred set of solutions that resolves the supply demand imbalances, Welsh Water followed a robust process that is compliant with regulatory guidance and best practice to complete a thorough appraisal of the options, taking full account of external and internal engagement.

Regulation 63 of the *Conservation of Habitats and Species Regulations 2017* (the 'Habitats Regulations') states that if a plan or project is "*(a) is likely to have a significant effect on a European site*[1] *or a European offshore marine site*[2] *(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 plan is given effect.

The process by which Regulation 63 is met is known as Habitats Regulations Assessment (HRA)[3]. An HRA determines whether there will be any 'likely significant effects' (LSE) on any European site as a result of a

[1] Strictly, 'European sites' are: any Special Area of Conservation (SAC) from the point at which the European Commission and the UK Government agree the site as a 'Site of Community Importance' (SCI); any classified Special Protection Area (SPA); any candidate SAC (cSAC); and (exceptionally) any other site or area that the Commission believes should be considered as an SAC but which has not been identified by the Government. 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') apply; and to possible SACs (pSACs) and listed Ramsar Sites, to which the provisions of the Habitats Regulations are applied a matter of Government policy (TAN5 para 5.1.3) when considering development proposals that may affect them. "European site" is therefore used in this report in its broadest sense, as an umbrella term for all of the above designated sites. Additional information on European site designations is provided in Appendix A.

[2] 'European offshore marine sites' are defined by Regulation 15 of *The Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007* (as amended); these regulations cover waters (and hence sites) over 12 nautical miles from the coast.

[3] The term 'Appropriate Assessment' has been historically used to describe the process of assessment; however, the process is now more accurately termed 'Habitats Regulations Assessment' (HRA), with the term 'Appropriate Assessment' limited to the specific stage within the process.

plan's implementation (either on its own or 'in combination' with other plans or projects) and, if so, whether these effects will result in any adverse effects on the site's integrity. DCWW has a statutory duty to prepare its WRMP and is therefore the Competent Authority for any HRA.

DCWW commissioned Wood (previously Amec Foster Wheeler) to undertake the data collection and interpretation required to support an HRA of its WRMP for the period 2020 – 2050, and to determine whether any aspects of the WRMP (alone or in-combination) could have significant or significant adverse effects on the integrity of any European sites. The HRA process (as applied to the WRMP) includes the following steps:

i. An initial review of the Feasible Options, to assist DCWW's selection of Preferred Options.

ii. A formal assessment of the Preferred Options, comprising screening and (where necessary) an 'appropriate assessment', which accompanied the Preferred Options consultation (earlier versions of this report).

iii. A formal assessment of the post-consultation Revised Preferred Options, which form the Revised Draft WRMP and which would be intended for adoption.

iv. A formal assessment of the Final Options in the adopted plan (this report).

This report summarises Wood's assessment of the Final WRMP Options against the conservation objectives of any European sites that may be affected and summarises the iterative HRA process that has been undertaken to support the WRMP and ensure that it meets the requirements of Regulation 63.

Assessment Summary

DCWW has identified two WRZs with a predicted deficit over the planning period: **Tywyn Aberdyfi**, in West Wales, and **Pembrokeshire**. In addition, the **Vowchurch** WRZ has a vulnerability to severe droughts. The Preferred Options for addressing these deficits and resilience requirements are as follows:

WRMP Options Assessment Summary

WRZ	Option	Summary
Tywyn Aberdyfi	▸ Option TYA004 (New Abstraction from Afon Dysynni at Pont y Garth to Pen y Bont WTW).	The scheme would allow Pen y Bont WTW to receive abstracted water from the Afon Dysynni directly via a new raw water transfer main.
Tywyn Aberdyfi	▸ Option TYA009a (New Raw Water Storage at Pen y Bont WTW)	This option would require a new raw water storage reservoir (~0.5 ha.) located adjacent to the Pen-y-Bont WTW at Bryncrug. This would be used to buffer raw water supply and improve resilience of Pen-y-Bont WTW.
Pembrokeshire	One of the following two supply-side options: ▸ PEM024a (Canaston Pumping Station upgrade) ▸ PEM024b (Canaston Pumping Station upgrade plus bankside storage)	The two supply side options are variations on the same scheme, and would involve asset upgrades to allow finer control of abstraction volumes from the Afon Cleddau, and hence reduce unnecessary over-release of compensation flows from Llys-y-Fran reservoir.
Vowchurch	▸ Resilience Option VOW2a (Transfer from Hereford WRZ)	Welsh Water has assessed the susceptibility of the Vowchurch Water Resource Zone (WRZ) to severe droughts and identified that the River Dore and associated gravel aquifer may not provide the required yield to meet customer demands during a 1 in every 200 years drought event. To address this resilience risk, DCWW will lay a new main between the Hereford and Vowchurch WRZs to allow some of the Vowchurch demand to be met from Broomy Hill WTW when needed. This option would require the installation of a circa 12km main between Broomy Hill WTW and Kingstone service reservoir (SR) together with an upgrade to Broomy Hill water pumping station (WPS) to supply 2.5 Ml/d to Kingstone SR. A total of 0.5 Ml/d would be supplied from Aconbury SR using an existing main.

These options have been subject to ‘screening’ and (where necessary) an ‘appropriate assessment’ (at the plan-level) of their effects on European sites and interest features, ‘alone’ and ‘in combination’. Avoidance or mitigation measures relied on by the assessment or incorporated into the WRMP are accounted for at the ‘appropriate assessment’ stage, in accordance with the ‘People Over Wind’[4] judgement.

[4] Case C 323/17 Court of Justice of the European Union: People Over Wind

Summary of plan-level assessment of options (including 'in combination' effects and incorporated measures)

Option	Aspect	LSE	AE	Summary of Assessment	Key avoidance / mitigation measures
TYA004	Constr.	U	N	This option would require a new 3.2Ml/d abstraction from the Afon Dysynni at Pont y Garth, Gwynedd, with abstracted water being transferred via a new 6km raw water main for treatment at Pen y Bont WTW, near Bryncrug. The sites potentially exposed to the construction effects of this option are: ▸ **Craig yr Aderyn (Bird`s Rock) SPA** (breeding and wintering chough in close proximity to construction); ▸ **Dyfi Estuary / Aber Dyfi SPA** (wintering Greenland white-fronted geese may utilise habitats near the construction area); ▸ **Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC** (bat species may use habitats near the construction area); and ▸ Downstream sites / sites with mobile species that may be affected due to impacts on the Afon Dysynni (**Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC; Northern Cardigan Bay / Gogledd Bae Ceredigion SPA**; **West Wales Marine / Gorllewin Cymru Forol cSAC; Afon Eden - Cors Goch Trawsfynydd SAC**). The assessment has concluded that effects on these sites can certainly be avoided with the normal best-practice mitigation summarised in Appendix G of the HRA, and that any effects would be inconsequential and temporary in any case. There is arguably some residual uncertainty regarding effects on mobile species from Craig yr Aderyn (Bird`s Rock) SPA and Dyfi Estuary / Aber Dyfi SPA due to the proximity of the works, but this is removed by the inclusion of commitments to avoid the key periods when mobile species from these sites may be vulnerable, unless scheme-level assessments demonstrate that these measures are not essential to avoid adverse effects on the sites.	▸ Construction of the scheme will avoid the breeding period (March – August) to minimise the risk of disturbance to chough, unless scheme-specific surveys or analyses demonstrate that any effects associated with construction works can be avoided (e.g. through construction site supervision / monitoring), will be 'not significant' (i.e. chough will not be exposed to construction effects), or will have no adverse effect on the integrity of the SPA. ▸ Construction of the scheme will avoid the winter period (October – March) to minimise the risk of disturbance to wintering Greenland white-fronted geese, unless scheme-specific surveys or analyses demonstrate that any effects associated with construction works can be avoided (e.g. through construction site supervision / monitoring), will be 'not significant' (i.e. geese will not be exposed to construction effects), or will have no adverse effect on the integrity of the SPA.

Option	Aspect	LSE	AE	Summary of Assessment	Key avoidance / mitigation measures
	Oper.	U	N	The option would require a new abstraction from the Afon Dysynni at Pont y Garth, and so the sites / features exposed to the operational effects of the option are those that may be affected due to anticipated changes in flows in the Dysynni, specifically: ▸ **Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC** (**Reefs** feature is present near the mouth of the Dysynni and are theoretically sensitive to changes in freshwater inputs); ▸ **Northern Cardigan Bay / Gogledd Bae Ceredigion SPA** (mobile species (**red-throated diver**) may utilise habitats near the mouth of the Dysynni); ▸ **West Wales Marine / Gorllewin Cymru Forol cSAC** (mobile species (**harbour porpoise**) may utilise habitats near the mouth of the Dysynni); ▸ **Afon Eden - Cors Goch Trawsfynydd SAC** (mobile species (**Atlantic salmon, otter**) may utilise habitats near the mouth of the Dysynni). The assessment has concluded that the effects on these features is likely to be negligible (probably 'not significant') and certainly will have no adverse effect on the integrity, due to the small effect on flows in the Dysynni and the dominance of marine influences in the offshore areas. The 2015 Meirionnydd Catchment Abstraction Management Strategy (CAMS) states that water is available for abstraction without restrictions within the Dysynni, and so whilst the plan-level HRA cannot fully assess the operational effects of the licence 'in combination' with other permissions (this can only be undertaken by NRW as part of the licensing process) there is sufficient certainty that water is available for use and that there will be no adverse effects on integrity.	No specific measures proposed.
TYA009a	Constr.	U	N	The potential construction-stage effects of this option are the same as for Option TYA004, although the works are located at Pen y Bont and so far less likely to affect bird species from the SPAs. The assessment has concluded that effects on sites potentially exposed to construction-stage effects can certainly be avoided with the normal best-practice mitigation summarised in Appendix G of the HRA, and that any effects would be inconsequential and temporary in any case.	Established best-practice avoidance and mitigation measures (Appendix G of this report).
	Oper.	N	-	The option will operate within the terms of the existing licence, which has been confirmed valid for the planning period following the Review of Consents process; as a result the operation of the option will have 'no likely significant effects' on any European sites.	-

Option	Aspect	LSE	AE	Summary of Assessment	Key avoidance / mitigation measures
PEM024a / PEM024b	Constr.	U	N	These two supply side options are variations on the same scheme, and would involve asset upgrades to allow finer control of abstraction volumes from the Afon Cleddau, and hence reduce unnecessary over-release of compensation flows from Llys-y-Fran reservoir. The construction required would be local to the Canaston Bridge pumping station, adjacent to the Eastern Cleddau, and would require a new low-lift pump set with a variable pump rate between 30 Ml/d and 55 Ml/d, and either replacement of the fixed speed high-lift pumps with variable-speed pumps (PEM024a); or an increase in the bankside storage volume to attenuate the impact of the high-lift pump abstraction rate (PEM024b). The sites / features potentially exposed to the construction effects of this option are: ▸ **Afonydd Cleddau/ Cleddau Rivers SAC** (**sea lamprey, river lamprey** on migration; **otter; bullhead**) ▸ **Pembrokeshire Marine/ Sir Benfro Forol SAC** (**sea lamprey, river lamprey** on migration; **otter**) ▸ **Pembrokeshire Bat Sites and Bosherston Lakes/ Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston SAC** (bat species may utilise habitats around construction area) ▸ **Limestone Coast of South West Wales/ Arfordir Calchfaen de Orllewin Cymru SAC** (bat species may utilise habitats around construction area) ▸ **North Pembrokeshire Woodlands/ Coedydd Gogledd Sir Benfro SAC** (bat species may utilise habitats around construction area) The assessment has concluded that effects on these sites can certainly be avoided with the normal best-practice mitigation summarised in Appendix G of the HRA. There is arguably some residual uncertainty regarding effects on mobile species associated with the Afon Cleddau and the estuary (notably sea lamprey and river lamprey during migration); and with bat species due to the proximity of important roost sites that contribute to the Pembrokeshire Bat Sites and Bosherston Lakes/ Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston SAC. This uncertainty is addressed by the inclusion of commitments to avoid the key periods when mobile species from these sites may be vulnerable, unless scheme-level assessments demonstrate that these measures are not essential to avoid adverse effects on the sites.	▸ **Afonydd Cleddau/ Cleddau Rivers SAC / Pembrokeshire Marine/ Sir Benfro Forol SAC:** in addition to normal project-level planning and best-practice, construction of the scheme will avoid the main migration period for lamprey species (late October – April) to minimise the risk of displacement or barrier effects due to noise, vibration or site-derived pollutants, unless scheme-specific analyses demonstrate that any effects associated with construction works will be 'not significant' or will have no adverse effect on the integrity of the SACs. ▸ **Pembrokeshire Bat Sites and Bosherston Lakes/ Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston SAC:** Construction works should avoid removal of scrub/trees, or damage to stream corridors and other linear features, to prevent possible fragmentation of habitats which may be used by local bat populations, unless surveys or additional investigations establish that they are unlikely to be significant or critical resources for bats from this SAC.

Option	Aspect	LSE	AE	Summary of Assessment	Key avoidance / mitigation measures
	Oper.	N	-	These two supply side options would allow finer control of abstraction volumes from the Afon Cleddau; this would then allow water to be conserved within the Llys y Fran reservoir by matching compensation releases to actual abstraction. It will result in 'less' water passing down the Afon Cleddau as the compensation releases match the actual abstraction more closely, although licence conditions for compensation flows will be still be met and so (from an HRA perspective) the operational effects of altered compensation releases will be 'not significant' (as the licences have been previously assessed through the Review of Consents and are considered valid for the planning period). There may be minor operational effects associated with the change of pumps (e.g. on entrainment) but established measures can ensure these effects do not occur.	-
VOW2a	Constr.	U	N	This option would require a new 12 km pipeline between Broomy Hill WTW and Kingstone service reservoir (SR) together with an upgrade to Broomy Hill water pumping station (WPS). The pipeline would need to cross the River Wye, which would be via Horizontal Directional Drill (HDD) or a similar non-invasive technique. The sites and features potentially exposed to the construction effects of this option are: ▸ **River Wye/ Afon Gwy SAC** (Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation; Sea lamprey; Brook lamprey; River lamprey; Twaite shad; Allis shad; Atlantic salmon; Bullhead; Otter. All features potentially exposed to site derived pollutants, with mobile species also vulnerable to disturbance or displacement) ▸ **Severn Estuary/ Môr Hafren SAC** (Sea lamprey; River lamprey; Twaite shad. Vulnerable to disturbance or displacement if using the Wye) ▸ **Severn Estuary Ramsar** (Sea lamprey; Brook lamprey; River lamprey; Twaite shad; Allis shad; Atlantic salmon; Eel. Vulnerable to disturbance or displacement if using the Wye) ▸ **Usk Bat Sites/ Safleoedd Ystlumod Wysg SAC** (Lesser horseshoe bat; bat species may use habitats near the construction areas) The assessment has concluded that effects on these sites can certainly be avoided with the normal best-practice mitigation summarised in Appendix G of the HRA, and that any effects would be inconsequential and temporary in any case. There is some residual uncertainty regarding effects on mobile species associated with the River Wye/ Afon Gwy SAC due to the proximity of the works, but this is removed by the inclusion of commitments to avoid the key periods when mobile species from these sites may be vulnerable, unless scheme-level assessments demonstrate that these measures are not essential to avoid adverse effects on the sites.	▸ **River Wye/ Afon Gwy SAC / Severn Estuary/ Môr Hafren SAC / Severn Estuary Ramsar**: in addition to normal project-level planning and best-practice, the following construction-stage measures will be employed unless project-level HRAs 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: • construction of the scheme near the Wye will avoid the main migration period for salmon, and shad and lamprey species (September – May) to minimise the risk of displacement or barrier effects due to noise, vibration or site-derived pollutants; and • the river crossing will be completed using a non-invasive crossing method that does not require in-channel disturbance (e.g. Horizontal Directional Drill (HDD) or similar) ▸ Established best-practice avoidance and mitigation measures (Appendix G of this report).
	Oper.	N	-	The option is a transfer of treated water within the terms of the existing licences, and will have no operational effects.	-

Key:

LSE – Likely Significant Effects (screening)
AE – Adverse Effects (appropriate assessment)
U – Uncertain (i.e. effects uncertain or cannot be entirely excluded in the absence of mitigation)
N – No (i.e. effects not significant or not adverse, alone or in combination)

Conclusion

Based on the available evidence, none of the WRMP Options will result in adverse effects on any European sites or interest features (alone or in combination) that cannot obviously be avoided with established best-practice and mitigation measures, which are summarised in Appendix G. The only residual uncertainties relate to the specifics of scheme delivery (e.g. timing; precise working areas; etc.) and can only be resolved through scheme-level assessments; however, there is no evidence to suggest that the WRMP Options will have any effects that are of a scale or type that cannot be reliably avoided or mitigated using the normal project-level controls identified.

Therefore, DCWW's assessment of the Final WRMP19 against the requirements of Regulation 63 of the *Conservation of Habitats and Species Regulations 2017* can reasonably conclude that **the WRMP will have no adverse effects, alone or in combination, on any European sites**. This conclusion does not remove the need for consideration of Regulation 63 at the project-level, which will be required to address those aspects and uncertainties that cannot be meaningfully assessed at the plan-level, such as potential 'in combination' effects with forthcoming plans or projects that may coincide with option delivery.

Contents

1. Introduction

Dŵr Cymru Welsh Water (DCWW) has set out its strategy for managing its water resources over the next 30 years in its Water Resources Management Plan (WRMP). This Plan is subject to the *Conservation of Habitats and Species Regulations 2017* (as amended) and so requires an assessment of its effects on European sites, known as 'Habitat Regulations Assessment' (HRA).

1.1 Water Resources Planning

All water companies in England and Wales must set out their strategy for managing water resources across their supply area over the next 25 years. This statutory requirement is defined under the Water Act 2003, which also sets out how water companies should publish a Water Resources Management Plan (WRMP) for consultation, setting out how they will balance supply and demand over a minimum 25-year planning period. The Draft WRMP was published on 16th March 2018 for a 12 week public consultation. A Revised Draft WRMP (along with the Statement of Response to the consultation) was published on 14th September 2018. Following a review of the Statement of Response to the consultation and the changes made, Welsh Government gave Welsh Water direction to publish the Final WRMP on the 8th March 2019. As a consequence, Welsh Water has now published the Final WRMP. It is available on Welsh Water's website at: https://www.dwrcymru.com/en/My-Water/Water-Resources/Draft-Water-Resources-Management-Plan-2019.aspx

The Final WRMP 2019 details how Welsh Water will maintain the balance between demand for water from its customers and the resources available to it over the 30 year period from 2020 to 2050.

The WRMP process identifies potential deficits in the future availability of water and sets out the possible solutions required to maintain the balance between water available and future demand for water.

The process initially reviews as many potential solutions as possible (the 'unconstrained list' of options) to identify 'feasible' options for each Water Resource Zone (WRZ) where deficits are predicted.

To obtain a preferred set of solutions that resolves the supply demand imbalances, Welsh Water followed a robust process that is compliant with regulatory guidance and best practice to complete a thorough appraisal of the options, taking full account of external and internal engagement. The key principles of Welsh Water's decision making process have been:

- conduct detailed customer and stakeholder engagement to understand their views and preferences for the proposed options;
- undertake a detailed options appraisal process, including SEA/HRA and WFD assessment, to generate a set of costed, feasible supply side and demand side options;
- utilise the UKWIR Industry Standard "Economics of Balancing Supply and Demand" (EBSD) methodology to generate the 'least cost' plan;
- review against Welsh Government objectives as set out in the Environment (Wales) Act 2016, Water Strategy for Wales and Future Generations Act 2015;
- ensure options are aligned with Welsh Water's PR19 priorities, the 2050 vision and Biodiversity Plan.

1.2 Habitats Regulations Assessment

Regulation 63 of the *Conservation of Habitats and Species Regulations 2017* (the 'Habitats Regulations') states that if a plan or project is "*(a) is likely to have a significant effect on a European site*[5] *or a European offshore marine site*[6] *(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 plan is given effect.

The process by which Regulation 63 is met is known as Habitats Regulations Assessment (HRA)[7]. An HRA determines whether there will be any 'likely significant effects' (LSE) on any European site as a result of a plan's implementation (either on its own or 'in combination' with other plans or projects) and, if so, whether these effects will result in any adverse effects on the site's integrity. DCWW has a statutory duty to prepare its WRMP and is therefore the Competent Authority for any HRA.

1.3 This Report

Regulation 63 essentially provides a test that the final plan must pass; there is no statutory requirement for HRA to be undertaken on draft plans or similar developmental stages (e.g. the unconstrained or Feasible Options). However, it is accepted best-practice for the HRA of strategic planning documents to be run as an iterative process alongside plan development, with the emerging proposals or options assessed for their possible effects on European sites and modified or abandoned (as necessary) to ensure that the subsequently adopted plan is not likely to result in significant or significant adverse effects on any European sites, either alone or 'in combination' with other plans. This is undertaken in consultation with Natural England (NE), Natural Resources Wales (NRW) and other appropriate consultees.

DCWW commissioned Wood (previously Amec Foster Wheeler) to undertake the data collection and interpretation required to support an HRA of its WRMP for the period 2020 – 2050, and to determine whether any aspects of the WRMP (alone or in-combination) could have significant or significant adverse effects on the integrity of any European sites. The HRA process (as applied to the WRMP) includes the following steps:

i. An initial review of the Feasible Options, to assist DCWW's selection of Preferred Options.

ii. A formal assessment of the Preferred Options, comprising screening and (where necessary) an 'appropriate assessment', which accompanied the Preferred Options consultation (earlier versions of this report).

iii. A formal assessment of the post-consultation Revised Preferred Options, which form the Revised Draft WRMP and which would be intended for adoption.

iv. A formal assessment of the Final Options included in the adopted plan (this report).

This report summarises Wood's assessment of Final WRMP Options against the conservation objectives of any European sites that may be affected and summarises the iterative HRA process that has been undertaken to support the WRMP and ensure that it meets the requirements of Regulation 63.

[5] Strictly, 'European sites' are: any Special Area of Conservation (SAC) from the point at which the European Commission and the UK Government agree the site as a 'Site of Community Importance' (SCI); any classified Special Protection Area (SPA); any candidate SAC (cSAC); and (exceptionally) any other site or area that the Commission believes should be considered as an SAC but which has not been identified by the Government. 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') apply; and to possible SACs (pSACs) and listed Ramsar Sites, to which the provisions of the Habitats Regulations are applied a matter of Government policy (TAN5 para 5.1.3) when considering development proposals that may affect them. "European site" is therefore used in this report in its broadest sense, as an umbrella term for all of the above designated sites. Additional information on European site designations is provided in Appendix A.

[6] 'European offshore marine sites' are defined by Regulation 15 of *The Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007* (as amended); these regulations cover waters (and hence sites) over 12 nautical miles from the coast.

[7] The term 'Appropriate Assessment' has been historically used to describe the process of assessment; however, the process is now more accurately termed 'Habitats Regulations Assessment' (HRA), with the term 'Appropriate Assessment' limited to the specific stage within the process.

The report sets out:

- the approach to HRA of WRMPs, including the key issues for these strategic plans (Section 2);
- a summary of the Feasible Options review (Section 3);
- the screening and (where required) appropriate assessment of the final options and WRMP as a whole, including 'in combination' assessments (Section 4);
- the conclusion of the HRA of DCWW's WRMP, based on the adopted version of the plan (Section 5).

2. Approach to HRA of WRMPs

WRMPs identify specific measures for addressing predicted deficits, but the strategic nature of the WRMP creates some challenges for HRA as there are fundamental limitations on the scheme details and data that are available at the plan-level. This section summarises the approach used for HRAs of WRMPs, and the mechanisms employed to address residual uncertainties.

2.1 Plan-Level HRA

An HRA determines whether there will be any LSEs on any European sites as a result of a plan's implementation, either on its own or 'in combination' with other plans or projects (referred to as 'screening'); and, if so, whether it can be concluded that these effects will not have an adverse effect on the site's integrity (referred to as 'appropriate assessment'). European Commission guidance[8] suggests a four-stage process for HRA, although all stages will not always be required (see **Box 3**).

Box 1 – Stages of Habitats Regulations Assessment

Stage 1 – Screening:
This stage identifies the likely impacts upon a European site of a project or plan, either alone or 'in combination' with other projects or plans, and considers whether these impacts are likely to be significant.

Stage 2 – Appropriate Assessment:
Where there are likely significant effects, or where this is uncertain, this stage considers the effects of the plan or project on the integrity of the relevant European Sites, either alone or 'in combination' with other projects or plans, with respect to the sites' structure and function and their conservation objectives. Where it cannot be concluded that there will be no adverse effects on sites' integrity, it is necessary to consider potential mitigation for these effects.

Stage 3 – Assessment of Alternative Solutions:
Where adverse effects remain after the inclusion of mitigation, this stage examines alternative ways of achieving the objectives of the project or plan that avoid adverse impacts on the integrity of European sites.

Stage 4 – Assessment Where No Alternative Solutions Exist and Where Adverse Impacts Remain:
This stage assesses compensatory measures where it is deemed that 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.

The 'screening' test or 'test of significance' is a low bar: a plan should be considered 'likely' to have an effect if the competent authority (in this case DCWW) is unable (on the basis of objective information) to exclude the possibility that the plan could have significant effects on any European site, either alone or in combination with other plans or projects; an effect will be 'significant' if it could undermine the site's conservation objectives.

An 'appropriate assessment' stage provides a more detailed examination of the plan (or its components) where the effects are significant or uncertain[9], to determine whether there will be any 'adverse effects on integrity' (AEoI) of any sites as a result of the plan.

The approach summarised in **Box 1** works well at the project-level where the scheme design is usually established and possible effects on European sites can be assessed (usually quantitatively) using a stepwise process and detailed scheme-specific data. In contrast, the fundamental nature of the WRMP presents a number of distinct challenges for a 'strategic' HRA and it is therefore important to understand how the WRMP is developed, how it would operate in practice, and hence how it might consequently affect European sites. In particular, there is a potential conflict between the specific nature of the options; the requirement that the

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

[9] i.e. 'likely significant effects', where the possibility of significant effects cannot be excluded.

options (and hence the plan) have 'no likely significant effects (LSE)' or 'no adverse effects'; the level of certainty that can be established at the strategic level; and the desirability of not excluding every potential solution which cannot be conclusively investigated within the WRMP development timescales.

2.2 The WRMP

The WRMP process establishes supply and demand balances for the DCWW WRZs, to identify potential deficits in the future availability of water; this takes into account:

- abstraction volumes allowed under current statutory licences, as impacted by actual source yield;
- any future reductions in abstraction expected under environmental improvement regimes (e.g. sustainability reductions required due to the Review of Consents (see Appendix B) or Water Framework Directive);
- predicted future demand for water based on government data for population and housing growth plans; and
- the predicted effects of climate change.

Options are then proposed to resolve these deficits. Demand forecasts are completed in accordance with the *Water Resource Planning Guidelines* (EA / NRW (2016), updated in 2018[10]) and consider (*inter alia*):

- economic factors (economic growth, metering, pricing);
- behavioural factors (patterns of water use);
- demographic factors (population growth, inward and outward migration, changes in occupancy rate);
- planning policy (LPA land use plans);
- company policies (e.g. on leakage control and water efficiency measures); and
- environmental factors, including climate change.

The WRMP therefore accounts for these demand forecasts based on historical trends, an established growth forecast model, and through review of local and regional planning documents.

The WRMP process initially sets out an 'unconstrained list' of possible solutions regardless of cost or technical merit. This is then refined to identify a 'constrained list' or '**Feasible Options**' and subsequently the '**Preferred Options**'. This filtering process is based on a range of assessments including SEA and the principles of Habitats Regulations Assessment. The list of Feasible Options is subject to financial, environmental and social costing, with these options then reviewed and assessed to derive 'Preferred Options' for the zones that are predicted to be in deficit within the planning horizon (25 years).

Options to resolve deficits or predicted deficits can be broadly categorised as follows:

- **Production and Resource Management** - options that vary yield (e.g. new abstractions) or which reduce/ modify usage from where it is abstracted to where it enters the network;
- **Customer-side Management** - options which reduce customers' consumption; and
- **Distribution Management** - options within or affecting the distribution network, such as leakage reduction or new distribution pipelines.

These are also characterised as '**demand-side**' measures (options which reduce consumption post-treatment, such as metering or leakage reduction) or '**supply-side**' measures (options that vary yield). The options will generally require one or more of the following:

[10] Available at: https://cdn.naturalresources.wales/media/686174/interim-wrpg-update-july18-final-changes-highlighted.pdf

- 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 regime (e.g. additional abstraction);
- 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; or
- transferring water from adjacent water companies with a supply / demand surplus.

2.3 HRA of the WRMP

The HRA assesses the options proposed to resolve predicted deficits. It does not assess the existing consents regime: the examination of existing individual consents was undertaken by NRW (in Wales) or the Environment Agency (EA) through the Review of Consents process (now through Water Framework Directive assessments) and the HRA of the WRMP cannot and should not replicate this. Any licence amendments required by RoC or WFD (see Appendix B) are factored into the DO calculations, and NRW has confirmed that these are valid for the planning period. Consequently, the WRMP will only affect European sites through any new resource and production-side options it advocates to resolve deficits, and not through the existing permissions regime[11].

The various Options could affect European sites through their implementation (for example, construction of new pipelines) or operation (e.g. new abstractions), and these effects can broadly be categorised as:

- **direct** (activities that affect a European site directly; for example, construction of a new intake within an SPA reservoir; discharges to an SAC from a desalination plant; new or increased abstractions from an SAC river);
- **indirect** (activities that affect a European site indirectly through an impact pathway; for example, construction affecting a downstream SAC through sediment release; new abstractions entraining SAC fish species away from the SAC itself); or
- **consequential** (for example, adjusting or stopping a bulk transfer between water resource zones, or between water companies, may have indirect 'consequential' effects on distant European sites if this results in additional abstraction to make up a shortfall; this is more typically a type of 'in combination' effect).

The HRA of the WRMP must consider any European sites that could be affected by the implementation of the Plan, whether they are within the geographical boundaries of the Welsh Water supply area or not. When determining this it is also necessary to consider potential 'in combination' effects; these are possible cumulative effects on European sites caused by the WRMP, together with the effects of any existing or proposed projects or plans[12]. However, it must be recognised that many of the possible 'in combination' effects (particularly with respect to water resources and land-use plans) are explicitly considered and accounted for as part of the WRMP development process (see below).

The HRA process (as applied to the WRMP) therefore includes the following steps:

i. An initial review of the Feasible Options, to assist DCWW's selection of Preferred Options.

[11] It is recognised that, occasionally, the sustainability reductions agreed through the RoC process have been subsequently shown to be insufficient to address the effects of PWS abstraction on some sites (the most notable example is the River Ehen in Cumbria); Welsh Water are not aware of any current uncertainties regarding its abstractions or the RoC outcomes, although any such uncertainties that are subsequently identified can be addressed through the five-yearly WRMP review process.

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

ii. A formal assessment of the Preferred Options, comprising screening and (where necessary) an 'appropriate assessment', which accompanies the Preferred Options consultation (earlier versions of this report).

iii. A formal assessment of the post-consultation Revised Preferred Options, which form the Revised Draft WRMP and which would be intended for adoption

iv. A formal assessment of the Final Options in the adopted plan (this report).

For each step, the assessment identifies the location and the anticipated outcomes of each option based on the option descriptions provided by DCWW. GIS is then used to identify all European sites within a precautionary 20km 'zone of influence', with sites beyond this considered where reasonable impact pathways are present based on the scheme description (for example, receptors downstream of significant new abstractions). This is a suitably precautionary approach that has important advantages due to the number of Feasible Options and the benefits of a consistent approach[13]. The possible effects of each option on European sites and their interest features is then assessed, based on

- the anticipated operation of each option and predicted zone of hydrological influence[14];
- any predicted construction works required for each option[15];
- 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)

Data Collection

Data on the Feasible and Preferred Options are provided by DCWW. These data include descriptions of each option; the likely outcomes (design yields/capacities); the scheme requirements; the type and indicative location of any works; and an outline of how the option would function. Further information on general water resources was obtained from DCWW (groundwater (GW) and surface water (SW) abstraction locations, source operational parameters, WRZ operation, emergency or drought plan operations) and NRW/EA.

Data on European site locations; interest features; conservation objectives; and condition assessments were collected from the Joint Nature Conservation Committee (JNCC), Natural Resources Wales (NRW) and Natural England (NE). These data were used to determine the locations of the sites relative to the options; the condition, vulnerabilities and sensitivities of the sites and their interest features; and the approximate locations of the interest features within each site (if reported). European sites within 20km of the Welsh Water supply area and their interest features are listed in Appendix C, although it should be noted that sites outside this area were also considered where there was a potential risk of effects from an option. Appendix D identifies those European site interest features considered 'water resource dependent' by the EA.

[13] 'Arbitrary' buffers are not generally appropriate for HRA. However, as distance is a strong determinant of the scale and likelihood of most effects the considered use of a suitably precautionary search area as a starting point for the screening (based on a thorough understanding of both the options and European site interest features) has some important advantages. Using buffers allows the systematic identification of European sites using GIS, so minimising the risk of sites or features being overlooked, and also ensures that sites where there are no reasonable impact pathways can be quickly and transparently excluded from any further screening or assessment. When assessing multiple options it also has the significant advantage of providing 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.

[14] Note that for groundwater sources and groundwater fed habitats, the EA consider that significant effects as a result of ground water abstractions are unlikely on 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*). This premise is applied to the option assessments.

[15] Note that the location of some works, particularly pipelines outside DCWW-owned land, are only tentatively defined by the WRMP. In these instances, the 'to' and 'from' locations were identified and a broad study area used to identify any European sites that could potentially be affected by a route between these locations.

Review of Feasible Options

The Feasible Options review is reported in Amec Foster Wheeler Technical Note ref. B39086n079 '*Welsh Water WRMP 2019: Habitats Regulations Assessment – Initial Review of Feasible Options*' (see Appendix E) The Feasible Options review is not a 'draft HRA', 'screening', or similar assessment of the final plan and is not intended to provide a definitive conclusion on the likely effects of the WRMP or its options; rather, the assessment principles that underpin the HRA process are applied to the Feasible Options to:

- guide the selection of Preferred Options by DCWW;
- inform the scope of any further assessments likely to be required as the options are refined and developed, including any data likely to be required to support the selection of an option as a Preferred Option; and

A detailed 'in combination' assessment is not set out at the Feasible Options stage although the potential for options to operate 'in combination' with each other, and with other DCWW plans (e.g. the Drought Plan) is considered but not explicitly reported; the 'in combination' assessment is completed at the Preferred Options stage.

Preferred Options Assessment

The Preferred Options assessment employs the assessment principles used at the Feasible Option stage, with the addition of an 'in combination' assessment (see below). For each option, the Preferred Options assessment comprises:

- a 'screening' of European sites to identify those sites and features where there will self-evidently be 'no effect' (as opposed to 'no likely significant effects') due to the option[16], and those where significant effects are likely or uncertain; and
- an 'appropriate assessment' of any options where significant effects cannot be excluded.

The Preferred Option assessments are set out in Section 4. Note that the 'low-bar' principle has been used for the screening of the Preferred Options; any reasonable impact pathways identified are investigated further in an appropriate assessment rather than through a more detailed 'secondary screening' or similar. Consequently, the appropriate assessment is 'appropriate' to the nature or the WRMP, and the scale and likelihood of any effects. Undertaking an appropriate assessment does not necessarily imply a conclusion of 'significant effects' for those sites or aspects that are 'screened in' since in many cases the assessment is completed due to a residual uncertainty which the assessment is intended to resolve. The 'appropriate assessment' stage may therefore conclude that the proposals are likely to have an adverse effect on the integrity of a site; or that option will have no adverse effects (i.e. an effect pathway exists, but those effects will not undermine site integrity); or that the effects will, if re-screened, be 'not significant' (taking into account the additional assessment or perhaps additional measures included in the final plan).

Assessment Assumptions

Several assumptions are taken into account during the option assessment process; in summary, the assessments assume that

- the existing consents regime (taking into account any required sustainability reductions) is effectively a 'no adverse effect' baseline and that options that operate within the terms of existing licences will have 'no adverse effect';
- that there is 'water available for use' where this is confirmed by NRW/EA through the relevant Catchment Abstraction Management Strategy; and
- that all normal licensing and consenting procedures will be employed at option delivery, including HRA.

[16] Note, for options with 'no effects' there is no possibility of 'in combination' effects.

Since the Draft WRMP consultation, case law known as 'People Over Wind'[17] has altered how avoidance and mitigation measures are accounted for by an HRA. The 'People Over Wind' judgement states that "…*it is not appropriate, at the screening stage, to take account of the measures intended to avoid or reduce the harmful effects [mitigation] of the plan or project on that site*". This contrasts with established practice in this area (based on the "Dilly Lane" judgment[18]) where avoidance and mitigation measures have typically been accounted for during screening.

There is currently little information on the practical implementation of the 'People over Wind' judgement, particularly for strategy-level HRA, although broad guidance has been issued by the Planning Inspectorate (PINS)[19]. In previous WRMP rounds, HRAs of WRMPs typically assumed that established best-practice avoidance and mitigation measures (see **Appendix G**) would be employed at the project level throughout scheme design and construction 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.

Therefore, the following principles are applied for the HRA of the WRMP:

- As the Feasible Options review has no statutory basis[20] the established scheme-level best-practice avoidance and mitigation measures noted in **Appendix G** are accounted for when considering the likelihood of a European site or feature being affected by an option. This is to ensure that the HRA process provides robust, proportionate and pragmatic assessment for DCWW to factor in to its consideration of the Feasible Options and hence choice of Preferred Options.
- For the Revised Preferred Options and Final Options, which constitute the plan as adopted (and assessed), the established best-practice avoidance and mitigation measures noted in **Appendix G** are not taken into account at screening, but are instead introduced at the 'appropriate assessment' stage (if required).

In combination effects

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. The 'two-tier' nature of the WRMP (i.e. a plan with specific schemes) also complicates this assessment.

Broadly, it is considered that the WRMP could have the following in combination effects:

- within-plan effects - i.e. separate options within the WRMP affecting the same European site(s);
- 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.

In undertaking the 'in combination' assessment it is critical to note that:

[17] Case C 323/17 Court of Justice of the European Union: People Over Wind

[18] (*R on the application of Hart DC*) v Secretary of State for Communities and Local Government [2008].)

[19] PINS Note 05/2018: *Consideration of avoidance and reduction measures in Habitats Regulations Assessment: People over Wind, Peter Sweetman v Coillte Teoranta*.

[20] i.e. there is no statutory requirement for HRA to be undertaken on draft plans or similar developmental stages (e.g. the unconstrained or Feasible Options).

- the Review of Consents (RoC) process has completed an 'in combination' assessment for all currently licensed abstractions (and many unlicensed abstractions);
- the RoC underpins the WRMP, which also explicitly accounts for land-use plans, growth forecasts and population projections when calculating future water demand (and hence areas with potential deficits);
- the detailed examination of non-Welsh Water abstraction or discharge consents for 'in combination' effects can only be undertaken by the EA or NRW through their permitting procedures; and
- known major projects that are likely to increase demand (e.g. power station decommissioning) are also taken into account during the development of the WRMP.

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 plans. The main exception to this is other water company WRMPs, which are developed concurrently with the DCWW WRMP and so cannot necessarily be fully assessed at the Preferred Options stage; for these, the potential for the DCWW Preferred Options to operate 'in combination' is assessed and (if necessary) conclusions caveated subject to the future review of the consultation versions of the other companies' WRMPs.
- With regard to other strategic plans, the list of plans included within the SEA is used as the basis for a high-level 'in combination' assessment (see Appendix F). The SEA is used to provide information on the themes, policies and objectives of the 'in combination' plans, with the plans themselves are examined in more detail as necessary. Plans are obtained from the SEA datasets or internet sources where possible.
- With regard to projects:
  - The WRMP 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.

Uncertainty and determining significant or adverse effects

The WRMP is a high-level strategy for managing water resources across the Welsh Water supply area over the next 30 years. Due to its wide geographic scale and long-term outlook there are inevitably many uncertainties inherent within it. It is therefore similar, in this respect, to a typical strategic land-use plan (such as a Core Strategy), which also has inherent uncertainties around its implementation, and hence over its likely effects. Usually, with strategy-level HRAs, uncertainty is addressed by including caveats and 'avoidance measures' or mitigation within the policy text to ensure that significant or adverse effects will not occur. This is possible because the key components of the strategic plan (i.e. the policies) are inherently malleable from the outset, and can be easily abandoned or modified if required.

This approach is more difficult to apply directly to the WRMP because:

- the strategic nature of the WRMP ensures that there are fundamental limitations on the scheme details that are available for the HRA; **but**

- its principal components (the options that are proposed to resolve actual or predicted deficits) are generally specific schemes with a clear spatial component, rather than the broad policies that are characteristic of most strategies.

This means that potential effects on specific European sites are much easier to envisage or identify (due to the specific nature of the options and the known 'sensitivities' of the interest features), but often harder to quantify and assess (due to the strategic nature of the plan and frequent absence of detailed information on each option; i.e. the 'exposure' of an interest feature to a potential effect cannot necessarily be established).

Normally, where there is uncertainty over likely effects then additional data must be obtained until that uncertainty can be resolved; or 'avoidance measures' or mitigation specified that will remove the uncertainty; or the option should be abandoned and not included in the final plan. However, this can present difficulties for plans such as the WRMP since:

- the options have to solve specific deficits but are heavily constrained by existing sources and infrastructure, the availability of new resources, and the patterns of customer demand;
- it is possible that there will be several options where the precise effects are unclear, but which Welsh Water or NRW would wish to be able to explore in more detail at a later stage (and therefore would wish to include as Options within the WRMP); and
- the WRMP itself is a key component of the regulatory mechanism by which funding is secured for the detailed design, feasibility studies and investigations required for new supply-side measures.

Consequently, for some options there may be uncertainties which cannot be fully resolved at the strategic level, which in some cases would make a conclusion of 'no significant effects' or 'no adverse effects' difficult. Indeed, for some schemes it will only be possible to fully assess any potential effects at the pre-project planning stage or permit/order application stage, when certain specific details are known; for example: construction techniques or site-specific survey information. In addition, it may be several years before an option is employed, during which time other factors may alter the likely effects of the option.

For example, an option that proposes a new water transfer main between existing pumping stations will have a limited number of feasible routes. These can be theoretically assessed at a high-level for potential impacts on European sites, and routes with obvious and unavoidable 'likely significant effects' excluded from the WRMP. However, in most instances a specific route (or even a range of routes) will not be determined at the strategic level and any route would, in any case, be largely determined by design-stage constraints (e.g. land ownership; access; engineering feasibility; and so on). If the route had to cross a SAC river then 'significant effects' (at the strategic level) are clearly conceivable and arguably likely, which would suggest that the option should be abandoned. But it is equally likely that most potential construction effects could almost certainly be avoided or suitably mitigated through project-level design (e.g. ensuring the use of existing road crossings for construction, or using trenchless techniques), which would itself be subject to an HRA at project level.

As a result, the HRA must consider and assess the specific options within the WRMP **appropriately**, whilst recognising (and mitigating) the inherent uncertainties within those options (i.e. the absence of detailed scheme design or parameters) **and** within the plan itself (i.e. so that the WRMP, as a whole, is compliant with the HRA regulations even if some residual uncertainty persists with some options). Ultimately, the plan should not create a scenario where significant adverse effects are possible ('likely') if these cannot clearly be avoided with appropriate scheme-level measures; these may be established best-practice mitigation and avoidance measures, or bespoke requirements identified at the plan-level.

Mitigating uncertainty and 'down the line' assessment

For most options, even at the strategic level, it will be clear if adverse effects are likely to be unavoidable and in these instances the option should not be included as a Preferred Option within the WRMP since plans should not include proposals which would be likely to fail the Habitats Regulations tests at the project application stage. For other options, however, the effects may be uncertain and it is therefore important that this uncertainty is addressed either through additional investigation or (if this is not possible) through appropriate mitigation measures that ensure that the *plan* is compliant with the Habitats Regulations.

For many options, particularly those involving construction, it is reasonable to assume that established mitigation measures which are typically successful can be employed at the project stage to avoid significant or adverse effects – for example, avoiding works near SPAs at certain times of the year. In these instances it is considered that the option can be included within the WRMP provided that any specific measures that are likely to be required are identified to ensure that they are appropriately addressed throughout the project planning process (e.g. constraints on the timing of construction activities).

Nevertheless, it is possible that the potential effects (or required mitigation) for some options cannot be clearly determined at the strategic-level. In these instances, current guidance[21] indicates that it may be appropriate and acceptable for some assessment to be undertaken 'down-the-line' at a lower tier in the planning hierarchy, if:

- the higher tier plan appraisal cannot reasonably predict the effects on a European site in a meaningful way; whereas
- the lower tier plan, which will identify more precisely the nature, scale or location of development, and thus its potential effects, retains sufficient flexibility over the exact location, scale or nature of the proposal to enable an adverse effect on site integrity to be ruled out (even if that would mean ultimately deleting the proposal); and
- the later or lower tier appraisal is required as a matter of law or Government policy, so it can be relied upon.

Strictly, this is less appropriate for plans that sit immediately above the project stage, although the WRMP and its options will, in most instances, meet these criteria. For some schemes – particularly those schemes requiring 'new water' or modifications to abstraction licences, but also larger construction schemes within or near European sites – there may be insufficient information available to determine 'no likely significant effects' or 'no adverse effects' with certainty at this level (i.e. meaningful assessment cannot be undertaken). All the Options will, of course be subject to project-level environmental assessment as part of the normal EIA, planning and/or EA consenting processes, which will necessarily include assessments of their potential to affect European sites during their construction or operation (i.e. HRA is required by law).

It is therefore considered acceptable to include these proposals within the WRMP, but complete the assessment of those options where uncertainty persists at a later stage, provided that:

- the option is not required within the first three years of the plan period, so allowing time for additional investigations to be completed; and
- the uncertainty that this creates is mitigated by the inclusion of alternative options which:
  - will meet the required demand / deficit should the Preferred Option prove to have an unavoidable risk of adverse effects on the European sites in question; **and**
  - will not themselves have any significant or adverse effect on any European sites.

It should be noted that this flexibility is desirable in any case, since it is possible that a 'no LSE' option might be subsequently proven to have significant or adverse effects when brought to the design stage. This approach allows for the WRMP to be compliant with the Habitats Regulations, since certainty for the plan as a whole is provided by the inclusion of alternative options with no LSE.

It is also important to recognise that, in contrast to land-use plans, the statutory framework underpinning the WRMP does not provide the same implicit approval of derived, lower tier plans and projects that are 'in accordance' with it; or have the same influence over the decisions made on projects; or have the same direct or indirect legal effects for the use of land and the regulation of projects. Although the WRMP provides a framework for future water resource management it is not a rigid policy document or a set of proposals that cannot be deviated from once published. Also the WRMP itself is a key component of the regulatory mechanism by which funding is secured for the detailed design, feasibility studies and investigations required for new supply-side measures. Furthermore, the WRMP is (and must be) inherently flexible due to the formal five-yearly review process, which provides a clear mechanism for monitoring performance and an

[21] Tyldesley D (2012). *Draft Guidance for Plan Making Authorities in Wales: The Appraisal of Plans Under the Habitats Directive*. David Tyldesley and Associates, for the Countryside Council for Wales.

opportunity to adjust the proposals to reflect any changing circumstances. These measures can therefore be relied on to ensure that adverse effects do not occur as a result of the implementation of the WRMP.

3. Feasible Options Review

The review of the Feasible Options employed the principles of HRA to inform DCWW's selection of its Preferred Options, identifying those options that would appear to have an unavoidable risk of adverse effects on European sites. The Feasible Options Review is provided in Appendix E and summarised in this section.

3.1 Approach

The review of the Feasible Options is not a formal stage in the HRA process and is therefore not a 'draft HRA', 'screening', or similar assessment of the final plan and is not intended to provide a definitive conclusion on the likely effects of the final WRMP. Rather, it is primarily intended to inform DCWW's selection of Preferred Options, by identifying:

- those options that would appear to have an unavoidable risk of adverse effects on European sites (and which should therefore be avoided if possible);
- those options where significant or adverse effects would not appear likely, assuming established avoidance and mitigation measures can employed at the scheme level; and
- those options where effects are uncertain, which would require additional data or information on operation / construction to support their inclusion as preferred options.

The Feasible Options review focuses on the 'supply-side' options only. It does not explicitly consider demand- or post-distribution options designed to reduce treated water use (such as metering or provision of water butts), or leakage reduction options, as it is considered that these are extremely unlikely to affect any European sites[22].

The review of the Feasible Options takes account of established project-level avoidance and mitigation measures that are known to be achievable, available and likely to be effective – for example, normal construction best-practice or project planning. These measures are identified in **Appendix G** to this report. For the operational aspects of supply-side options, potential avoidance measures are considered where these are apparent, although in most instances the mitigation likely to be required for an option (e.g. compensation releases; 'hands-off' flows) cannot necessarily be determined at this stage.

The review also assumes that the existing licensing regime is having no significant effects on any European sites, or if this is not the case, that any necessary licence amendments required (e.g. sustainability reductions etc.) have been included in any deficit modelling. The Feasible Options will therefore only affect European sites through any new resource and production-side options advocated to resolve deficits, and not through the existing permissions regime[23], and it is therefore assumed that options that are 'network solutions' only (i.e. moving spare licensed volumes) will not have operational effects. The availability of water for abstraction is based on NRW advice to DCWW and the Catchment Abstraction Management Plans (CAMS).

The Feasible Options review is reported in Amec Foster Wheeler Technical Note ref. B39086n079 '*Welsh Water WRMP 2019: Habitats Regulations Assessment – Initial Review of Feasible Options*' (see Appendix

[22] The only realistic mechanism for a negative effect would through direct encroachment or proximal effects at the local-level (for example construction activity to repair leaks in a mains that might be located in or near a SAC), but this cannot be meaningfully assessed at the strategic level since location-specific information on the options is not available without specific investigations, which would form part of a leakage package (i.e. the precise location and severity of most leakages is not known ahead of detection). Any assessment of these effects must necessarily be deferred to the project-level (see 'Mitigating Uncertainty and 'down the line' assessment, below) and the WRMP does not imply any approval for options or remove the need for project-level assessments. In process terms, therefore, any demand-management options selected as preferred options would be taken to 'appropriate assessment' but then deferred 'down-the-line'.

[23] It is recognised that, occasionally, agreed sustainability reductions have been subsequently shown to be insufficient to address the effects of PWS abstraction on some sites (the most notable example is the River Ehen in Cumbria).

E). This provides a short description of each option and a narrative assessment of its likely effects, with those European sites within 20km that are most vulnerable (i.e. both exposed and sensitive) to the delivery or operation of the scheme[24] noted in the text. It then provides broad 'recommendations' regards progressing the options as Preferred Options based on the anticipated construction and operational effects. The criteria for these recommendations are as follows (colour coded for clarity):

Table 3.1 Summary of criteria for assessing suitability of Feasible Options

Recommend as Preferred Option?	Notes
Yes	Option appears unlikely to have any effects on European sites as features are either not exposed or not sensitive to the likely outcomes (i.e. no or no reasonable impact pathways – for example, operational effects for a 'construction only' network solution; 'dry' habitats over (say) 2km from an option; sites in different surface water catchments; upstream sites; etc. (being mindful of mobile species)). In these instances the recommendation is 'Yes', i.e. no reason not to pursue as Preferred Option.
Yes	Options where pathways for effects are clearly identifiable (such that HRA would probably be required at the scheme level) but where the potential effects can obviously be avoided or mitigated using established measures that are known to be effective, for example: ▶ construction near a European site (effects avoidable with normal project planning and best-practice); ▶ minor works within European sites (e.g. works to existing assets where effects unlikely to be adverse due to absence of features); ▶ major works near / within European sites that can be completed without adverse effects (e.g. crossings of SAC rivers using existing roads or directional drilling); ▶ operational effects that are avoidable with established operational mitigation (e.g. licence controls, although at this stage potential operational effects will usually lead to an 'uncertain' recommendation to flag the need for additional information). In these instances the generic measures outlined in Appendix B can be relied on if these are included within the WRMP package, although the final plan may need to include specific measures for potential 'high-impact' options (e.g. commitments to non-invasive river crossings or timing works to avoid sensitive periods).
Uncertain	Options where a potential effect is conceivable and cannot be discounted, and the likely effects are therefore uncertain at the Feasible Options stage. This is typically due to limitations on the information available, either in terms of the operation of the scheme, the mitigation that might be employed, or the data available on the interest features of the sites. These options, if pursued as Preferred Options, may require ▶ additional investigation to determine their effects, and there may be a risk that the risk of effects cannot be quantified satisfactorily at the strategic level (for example, substantial additional modelling or site-specific investigation may be required). ▶ the identification of specific measures or requirements for scheme delivery for inclusion with the WRMP. This category is therefore intended as a flag to identify those options where there is potentially additional 'cost' associated with their inclusion (either related to the data required to support a robust HRA and hence the option, or the need for specific mitigation commitments) which DCWW should consider when selecting the Preferred Options.
No	Options where significant effects (i.e. not negligible or inconsequential) on a European site are very likely or certain due to the scale/ nature/location of the option proposals, or the vulnerability and distribution of the interest features within /near the European site. Although a full appropriate assessment is not undertaken at this stage, adverse effects may be more likely (or even certain) if the scheme is taken forward as a Preferred Option and it is likely that extensive or unproven mitigation will be required following scheme-level investigations. Feasible Options in this category are not recommended for consideration as Preferred Options (although additional information may allow a re-assessment).

3.2 Summary

DCWW identified 39 Feasible Options across four WRZs[25]. Almost all schemes were considered potentially suitable as Preferred Options on the basis of the review, although uncertainties were identified for some options (principally around operation) which would require additional information for assessment if progressed as a Preferred Option. One option (a desalination scheme) had likely significant effects that

[24] For clarity, the summary tables do not explicitly identify or assess every European site within 20km; this will be set out in more comprehensive 'screening proformas' that will accompany the final HRA which will be used to transparently document the screening process.

[25] The Feasible Options review is necessarily completed prior to the final determination of WRZs with supply-demand deficits (due to the assessment timescales and complexities), and so includes Feasible Options for WRZs subsequently determined to be in surplus.

would be difficult to fully assess at the plan-level. The Feasible Options review was used to DCWW to inform the selection of Preferred Options for those WRZs in deficit.

4. Assessment of WRMP Options

DCWW has identified two WRZs with a predicted deficit over the planning period: **Tywyn Aberdyfi**, in West Wales, and **Pembrokeshire**. In addition, the **Vowchurch** WRZ has a vulnerability to severe droughts. The Options for addressing these deficits and resilience requirements are subject to 'screening' and (where necessary) an 'appropriate assessment' of their effects 'alone'. Possible 'in combination' effects are subsequently assessed.

4.1 WRMP Options

DCWW has identified two WRZs with a predicted dry year deficit over the planning period: **Tywyn Aberdyfi**and **Pembrokeshire**. In addition, DCWW has identified a resilience risk within the **Vowchurch** WRZ due to a vulnerability to severe droughts. The Options for addressing these deficits, and the resilience risk, are set out below.

Tywyn Aberdyfi

A deficit is predicted for the Tywyn Aberdyfi WRZ by 2020 (start of the planning period), reaching almost 1.6 Ml/d, under the Annual Average scenario by 2050. DCWW is proposing to resolve this deficit through the following options:

- TYA004: New Abstraction from Afon Dysynni in the vicinity of Pont y Garth to Pen y Bont WTW. The scheme would allow Pen y Bont WTW to receive abstracted water from the Afon Dysynni directly via a new raw water transfer main.
- TYA009a: Pen-y-Bont WTW Bankside Storage. This option would involve construction of a non-impounding raw water reservoir adjacent to Pen-y-Bont WTW to provide a buffer raw water supply and improve the resilience of Pen-y-Bont WTW to poor raw water quality and peak demand conditions.

DCWW is currently rolling out smart metering in the zone and will look to complement this with additional water efficiency activity. The 2015 Meirionnydd Catchment Abstraction Management Strategy (CAMS) states that water is available for abstraction without restrictions within the Dysynni; NRW has confirmed that there is water available in the Afon Dysynni, and the impacts have been assessed under the Water Framework Directive as part of the options assessment.

Pembrokeshire

A deficit is predicted for the Pembrokeshire WRZ by 2022 - 2023, reaching 12.15 Ml/d by the end of the planning period. DCWW is proposing to resolve this deficit through one of the following options:

- PEM024a: Canaston Pumping Station upgrade; or
- PEM024b: Canaston Pumping Station upgrade plus bankside storage

These two supply side options are essentially minor variations on the same scheme, and would involve asset upgrades to allow finer control of abstraction volumes from the Afon Cleddau and hence reduce unnecessary over-release of compensation flows from Llys-y-Fran reservoir; they are not therefore treated as separate options for assessment purposes.

Vowchurch

Welsh Water has assessed the susceptibility of the Vowchurch Water Resource Zone (WRZ) to severe droughts and identified that the River Dore and associated gravel aquifer may not provide the required yield

to meet customer demands during a 1 in every 200 years drought event. To address this resilience risk, DCWW will lay a new main between the Hereford and Vowchurch WRZs to allow some of the Vowchurch demand to be met from Broomy Hill WTW when needed. This option (**Resilience Option VOW2a: Transfer from Hereford WRZ**) would require the installation of a circa 12km main between Broomy Hill WTW and Kingstone service reservoir (SR) together with an upgrade to Broomy Hill water pumping station (WPS) to supply 2.5 Ml/d to Kingstone SR. A total of 0.5 Ml/d would be supplied from Aconbury SR using an existing main.

Demand-Side / Leakage Reduction Measures

No formal demand-side or leakage-reduction options are included in the WRMP (although Welsh Water is planning to increase its baseline water efficiency activities).

4.2 Option TYA004: New Abstraction from Afon Dysynni at Pont y Garth to Pen y Bont WTW

Summary of Scheme

This option would require a new abstraction of up to 3.2 Ml/d from the Afon Dysynni near to Pont y Garth, Gwynedd, with the water being transferred via a new 6km raw water main for treatment at Pen y Bont WTW, near Bryncrug. The capital works would involve:

- a new 3.2 Ml/d abstraction intake on the Afon Dysynni at Pont y Garth;
- a new pumping station at Pont y Garth;
- a 6km raw water transfer main to Pen y Bont WTW (likely to follow existing minor roads);
- new connections at Pen y Bont WTW.

The new abstraction would operate in conjunction with the existing licenced abstraction on the Afon Fathew, with the Fathew abstraction being used in winter and the Dysynni primarily being used in the summer to ensure security of supply. The Afon Dysynni would therefore be the principal dry weather source that will be used once the 'hands off flow' conditions are in force on the Nant Braich y Rhiw and there is insufficient resource in the Afon Fathew to meet demand.

Likely Impact Pathways

Construction

The construction works are relatively small-scale. The pipeline is likely to be located almost entirely within existing roads and so direct effects on terrestrial habitats (and associated species) are likely to be limited; however, works within the Afon Dysynni (new intake) and its catchment will be required. The principal environmental risks are therefore likely to be

- contamination of surface waters by site-derived pollutants;
- disturbance of species (e.g. from site lighting, noise, visual impact, vibration, etc.).

Given the scale of the works, these risks can almost certainly be avoided or controlled through the normal project planning process and standard best-practice measures (see Appendix G).

Operation

The precise operation of the new abstraction would be determined and agreed through the licensing process. However, the new abstraction would operate in conjunction with the existing licenced abstraction on the Afon Fathew, with the Dysynni abstraction primarily being used in the summer to ensure security of supply. As a worst case assessment it has been assumed that the full 3.2Ml/d would be abstracted in the

summer. This would be approximately 5.8% of the Q95 flow in the Dysynni at the Pont-y-Garth monitoring station (55.4 Ml/d), 1.3% of the Q50 flow (250.6 Ml/d), and 0.8% of the average flow (380.5 Ml/d).

The main risk of an operational effect will therefore be on any abstraction-sensitive features downstream of the abstraction point. The effects on flows will be minimal, however, and the 2015 Meirionnydd Catchment Abstraction Management Strategy (CAMS) states that water is available for abstraction without restrictions within the Dysynni.

Screening of European Sites

There are 13 European sites downstream or within 20km of this option, or otherwise linked by a potential effect pathway. The sites, their interest features, and location relative to the option are set out in **Table 4.1**.

Table 4.1 European sites within 20 km of option, or otherwise connected

Site and Interest Features	~Distance / Connectivity
Craig yr Aderyn (Bird`s Rock) SPA ▸ Red-billed chough *Pyrrhocorax pyrrhocorax*	0.05 km
Cadair Idris SAC ▸ Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* ▸ Northern Atlantic wet heaths with *Erica tetralix* ▸ European dry heaths ▸ *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) ▸ Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels ▸ Blanket bogs (* if active bog) ▸ Alkaline fens ▸ Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*) ▸ Calcareous rocky slopes with chasmophytic vegetation ▸ Siliceous rocky slopes with chasmophytic vegetation ▸ Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles ▸ Marsh fritillary butterfly *Euphydryas (Eurodryas, Hypodryas) aurinia* ▸ Slender green feather-moss *Drepanocladus (Hamatocaulis) vernicosus*	3.7 km
Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC ▸ Sandbanks which are slightly covered by sea water all the time ▸ Estuaries ▸ Mudflats and sandflats not covered by seawater at low tide ▸ Coastal lagoons ▸ Large shallow inlets and bays ▸ Reefs ▸ Salicornia and other annuals colonizing mud and sand ▸ Atlantic salt meadows (*Glauco-Puccinellietalia* maritimae) ▸ Submerged or partially submerged sea caves ▸ Bottlenose dolphin *Tursiops truncatus* ▸ Otter *Lutra lutra* ▸ Grey seal *Halichoerus grypus*	4.4 km / DS
Northern Cardigan Bay / Gogledd Bae Ceredigion SPA ▸ Red-throated diver *Gavia stellata*	4.4 km / DS
West Wales Marine / Gorllewin Cymru Forol cSAC ▸ Harbour porpoise *Phocoena phocoena*	4.4 km / DS
Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC	7.1 km

Site and Interest Features	~Distance / Connectivity
▶ Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation ▶ Northern Atlantic wet heaths with *Erica tetralix* ▶ European dry heaths ▶ Tilio-Acerion forests of slopes, screes and ravines ▶ Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles ▶ Bog woodland ▶ Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) ▶ Lesser horseshoe bat *Rhinolophus hipposideros*	
Cors Fochno and Dyfi Ramsar ▶ Crit. 1 - sites containing representative, rare or unique wetland types	7.1 km
Dyfi Estuary / Aber Dyfi SPA ▶ Greenland white-fronted goose *Anser albifrons flavirostris*	
Cors Fochno SAC ▶ Active raised bogs ▶ Degraded raised bogs still capable of natural regeneration ▶ Depressions on peat substrates of the *Rhynchosporion*	10.4km
Coed Cwm Einion SAC ▶ Tilio-Acerion forests of slopes, screes and ravines	10.8 km
Afon Eden - Cors Goch Trawsfynydd SAC ▶ Active raised bogs ▶ Freshwater pearl mussel *Margaritifera margaritifera* ▶ Atlantic salmon *Salmo salar* ▶ Otter *Lutra lutra* ▶ Floating water-plantain *Luronium natans*	14.7 km
Morfa Harlech a Morfa Dyffryn SAC ▶ Embryonic shifting dunes ▶ Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes") ▶ Dunes with *Salix* repens ssp. *argentea* (*Salicion arenariae*) ▶ Humid dune slacks ▶ Petalwort *Petalophyllum ralfsii*	15.6 km
Rhinog SAC ▶ Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* ▶ Northern Atlantic wet heaths with *Erica tetralix* ▶ European dry heaths ▶ Alpine and Boreal heaths ▶ Blanket bogs (* if active bog) ▶ Depressions on peat substrates of the *Rhynchosporion* ▶ Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles ▶ Floating water-plantain *Luronium natans*	17.8 km

*Priority features
DS – Downstream site

Several of these sites will be unaffected by the option, primarily due to the absence of impact pathways; these sites are identified in **Table 4.2**, and are not considered further within the assessment of this option (note, for these sites it is considered that there will be 'no effects' (as opposed to 'no likely significant effects') and so there will be no possibility of 'in combination' effects).

Table 4.2 Screening of European sites

Site	Consider further?	Rationale
Craig yr Aderyn (Bird`s Rock) SPA	Yes	Site immediately adjacent to construction area.
Cadair Idris SAC	No	Upland site upstream of the proposed option, so site not exposed to construction or operation effects. The mobile interest feature of the site (marsh fritillary) is a very sedentary species, with adults rarely dispersing more than 100m and relying on a network of nearby habitat patches; the population within Cadair Idris SAC will not therefore be dependent on the habitats near the proposed development. The option will have no effect on this site.
Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC	Yes	Downstream site.
Northern Cardigan Bay / Gogledd Bae Ceredigion SPA	Yes	Downstream site (although interest feature not particularly sensitive)
West Wales Marine / Gorllewin Cymru Forol cSAC	Yes	Downstream site (although interest feature not particularly sensitive)
Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC	Yes	Woodland and cave sites within separate catchment from option, so site habitats not exposed to construction or operation effects. The mobile interest feature associated with site (lesser horseshoe bat) is potentially vulnerable to construction.
Cors Fochno and Dyfi Ramsar	No	Raised bog and estuary within separate catchment from option; site not exposed to construction or operation effects. The option will have no effect on this site.
Dyfi Estuary / Aber Dyfi SPA	Yes	This estuarine site is within separate catchment from option, and so the site itself is not exposed to construction or operation effects. The mobile interest feature (white fronted goose) may use habitats associated with the Afon Dysynni.
Afon Eden - Cors Goch Trawsfynydd SAC	Yes	This is a riverine site within separate catchment from option, so the site is not exposed to construction or operation effects. The mobile interest features may periodically utilise habitats associated with the Afon Dysynni.
Cors Fochno SAC	No	Raised bog within separate catchment from option; not exposed to construction or operation effects. The option will have no effect on this site.
Coed Cwm Einion SAC	No	Woodland site in separate catchment from option; not exposed to construction or operation effects. The option will have no effect on this site.
Morfa Harlech a Morfa Dyffryn SAC	No	Sand dune site in separate catchment from option; not exposed to construction or operation effects. The option will have no effect on this site.
Rhinog SAC	No	Upland site upstream of the proposed option, so site not exposed to construction or operation effects. The option will have no effect on this site.

The likely effects of the option on those sites where potential impact pathways are identified (i.e. the possibility of significant effects cannot be self-evidently excluded) are considered in the following 'appropriate assessment' sections.

Incorporated Measures

Appropriate site- and feature-specific avoidance measures and development criteria are set out in Appendix G of this HRA. The WRMP requires that these measures be employed at the project-level unless scheme-specific HRAs or 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 more appropriate. Additional, feature-specific measures are identified (and accounted for) within the following appropriate assessments for each European site. No specific measures (over the requirements for normal project-level planning and best-practice) are considered necessary at the plan-level for any other European sites potentially exposed to the likely effects of the option (see screening above).

Appropriate Assessment – Craig yr Aderyn (Bird's Rock) SPA

Context

Craig Yr Aderyn / Bird's Rock is a high crag (250m AOD) on the south side of the Dysynni valley, consisting of rocky crags, acid grassland, heath and bracken. It is designated for its breeding and roosting population of **chough**, which are present throughout the year. Non-breeding birds roost during the summer and there are high numbers outside the breeding season. Chough can be sensitive to disturbance, particularly during the nesting period, although the main factor influencing the number of breeding and roosting birds is the maintenance of unimproved short-grazed turf for foraging, across and near the site.

Conservation Objectives

The assessment takes into account the conservation objectives for the site, which are set out in the Core Management Plan (CCW 2008a).

Incorporated Measures

In addition to normal project-level planning and best-practice (see Appendix G):

- construction of the scheme will avoid the breeding period (March – August) to minimise the risk of disturbance to chough.

The WRMP requires that these measures be employed at the project-level unless scheme-specific HRAs or 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 more appropriate.

Assessment of Effects – Construction

The currently proposed pipeline route runs within existing roads near the site. Although choughs are likely to be habituated to some disturbance from the road it is possible that construction works may cause additional noise or visual disturbance, particularly if birds are foraging in fields adjacent to works. This may require additional assessment once the precise parameters of the project are clear, but these potential impacts could be easily mitigated by timing works to avoid the breeding season (when temporary displacement due to disturbance has a greater potential to result in a significant or significant adverse effect). However, there are no over-riding reasons why these works cannot be accommodated without adverse effects occurring, and the implementation of the mitigation noted above (i.e. construction of the scheme will avoid the breeding period (March – August) to minimise the risk of disturbance to chough) will ensure that adverse effects do not occur.

Assessment of Effects – Operation

Chough are not considered sensitive to the effects of water-resource permissions; no effects are anticipated as a result of the scheme operation.

Conclusion

Based on the available information it is clear that this option can be delivered with 'no adverse effect' on Bird's Rock SPA (alone), and that it is likely that 'significant effects' could be avoided entirely through project planning. Potential 'in combination' effects with TYA009a and other plans and projects are considered in Section 4.6.

Appropriate Assessment – Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC

Context

The Afon Dysynni discharges to the Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC at Tonfanau; this SAC is a large coastal and marine site that covers the northern part of Cardigan bay and the seas around the Llyn peninsula. It supports a range of interest features although these are not evenly distributed throughout the SAC. NRW mapping data[26] indicates that the habitat features present at the mouth of the Afon Dysynni are subtidal and intertidal **Reefs**, and **Coastal lagoons**.

- Coastal lagoons: the Coastal lagoon feature is the Morfa Gwyllt lagoon on the south side of the mouth of the River Dysynni, which is a saline lagoon (the only one on the Cardigan Coast) that is supplied primarily by seawater percolation and rainfall (i.e. it is largely isolated from the nearby Dysynni).
- Reefs: the Reefs feature near the Dysynni is the Sarn y Bwch sub-tidal shingle ridge, which is thought to be a former glacial moraine and which extends south-west from the coast near Tonfanau approximately 10km offshore.

The mobile interest features of the site (**Bottlenose dolphin; Otter; and Grey seal**) will periodically use the area near the Dysynni also.

- Bottlenose dolphin: Bottlenose dolphins have a predominantly inshore distribution, with Cardigan Bay being particularly attractive for the species, possibly due to the shallow benthic areas associated with the sarnau. The *Atlas of the Marine Mammals of Wales*[27] (Baines & Evans 2012) suggests that Tremadog Bay and the inshore waters down to the Mawddach estuary is a particular 'hotspot' for this species within Cardigan Bay.
- Grey seal: Grey seals are widely distributed around Wales (although in low densities compared to Scottish populations, for example), typically using secluded or inaccessible areas of the coast for breeding particularly in Pembrokeshire, southern Ceredigion, the Lleyn and Anglesey. These areas are also used outside the breeding season for moulting, feeding and haul-out sites, along with other areas around the coast (e.g. offshore sandbanks). The area around the Dysynni provide some habitat features that may be used by this species, although these are not extensive in comparison to other areas of the SAC.
- Otters: otters are relatively common along the rivers and coastlines of Gwynydd and are likely to use the areas around the Dysynni periodically.

The remaining features (**Sandbanks which are slightly covered by sea water all the time; Estuaries; Mudflats and sandflats not covered by seawater at low tide; Large shallow inlets and bays; *Salicornia* and other annuals colonizing mud and sand; Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*);** and **Submerged or partially submerged sea caves**) are all located some distance from the mouth of the Dysynni and so will not be exposed to the potential effects of the scheme[28] (any effects will be entirely attenuated by marine influences). There will be 'no effect' on these features (and so no risk of 'in combination' effects).

Conservation Objectives

The assessment takes into account the conservation objectives for the site, which are set out in the Core Management Plan (NRW 2018a).

[26] NRW (2017) *Pen Llyn a'r Sarnau SAC Regulation 35 Report: non-interactive A3 map* [online]. Available at: https://naturalresources.wales/media/681450/pen-llyn-ar-sarnau-non-interactive-a3-map.pdf [Accessed 13/07/17].

[27] Baines M.E. & Evans P.G.H. (2012). *Atlas of the Marine Mammals of Wales*. CCW Marine Monitoring Report No. 68. 2nd edition. CCW, Bangor

[28] Note, the estuarine and intertidal features associated with the Afon Dysynni (i.e. the Broadwater SSSI) do not form part of the SAC.

Incorporated Measures

No site- or feature-specific measures are identified for this site beyond the normal project-level planning and best-practice (see Appendix G).

Assessment of Effects – Construction

Construction of the option could affect the SAC if site-derived pollutants are not appropriately controlled. The most vulnerable feature will the subtidal **Reefs** offshore of Tonfanau (the Morfa Gwyllt coastal lagoon is not connected to the Dysynni), which will support biotopes that may be sensitive to sedimentation or toxic contamination. The mobile species may also be vulnerable if there are effects on their prey species. This risk can clearly be avoided or controlled through the normal project planning process and standard best-practice measures (see Appendix G), although construction will be short-term only and any site-derived pollutants entering the river will almost certainly be attenuated by the river flows and tidal flux before they interact significantly with the offshore reef areas. Adverse effects (alone) will not therefore occur, and in reality 'no significant effects' would be expected. Potential 'in combination' effects with TYA009a and other plans and projects are considered in Section 4.6.

Assessment of Effects – Operation

The scheme would require a new abstraction licence, although the 2015 Meirionnydd Catchment Abstraction Management Strategy (CAMS) states that water is available for abstraction without restrictions within the Dysynni, and NRW have confirmed that water is available. The precise parameters of the licence cannot be identified or assessed at this level, since this will be undertaken as part of the consenting process and scheme design. However, the effects of the proposed abstraction on flows within the Dysynni is predicted to be negligible; the abstraction would be approximately 5.8% of the Q95 flow in the Dysynni at the Pont-y-Garth monitoring station (55.4 Ml/d), 1.3% of the Q50 flow (250.6 Ml/d), and 0.8% of the average flow (380.5 Ml/d). Actual effects on flows at the mouth of the Dysynni will be less, as the Pont-y-Garth monitoring station is several kilometres upstream and other tributaries (including the Fathew) join the Dysynni below this point.

Notwithstanding this, NRW have indicated in their Regulation 35 Advice for Lleyn Peninsula and the Sarnau SAC that some of the interest features are potentially vulnerable to abstraction effects, notably **Atlantic Salt Meadows; Estuaries; Large shallow inlets and bays; Mudflats and sandflats not covered by seawater at low tide; Otter; Reefs**; and ***Salicornia* and other annuals colonising mud and sand**. Of these, only the **Reefs** and **Otter** features are potentially exposed to the effects of abstraction from the Dysynni[29]. **Bottlenose dolphin** and **grey seal** are not considered sensitive to water resource permissions.

The sarnau are glacial moraines and are composed entirely of boulders, cobbles, and pebbles mixed with various grades of sediment. They are surrounded by sediment plains and are exposed to tidal currents and wave action with low-lying parts periodically covered and un-covered by sand; they are therefore fairly dynamic habitats. Freshwater inputs are likely to have a subtle influence on the biogenic composition of the reefs around the mouth of the Dysynni, although the extent of any influence is likely to be limited due to the dominance of tidal processes in the offshore areas. The small effect of the abstraction on river flows will be effectively undetectable within tidal areas, and so significant changes to the composition of the **Reef** feature would not be expected. With regard to **Otter**, potential effects on this feature will be indirect, associated with effects on prey species; the effect of the abstraction on these will be negligible. No specific plan-level mitigation is considered necessary to ensure operational effects on the features of this SAC are avoided; as water is available within the catchment (based on the CAMS) the normal licensing process (and associated HRA) will be sufficient to ensure adverse effects do not occur.

[29] As noted, the Morfa Gwyllt saline lagoon on the south side of the mouth of the River Dysynni is supplied primarily by seawater percolation and rainfall and is largely isolated from the Dysynni; freshwater flows from the Dysynni are not therefore critical to the integrity of this feature, and the operation of the option will have no effect on this feature. The remaining features are not located within the likely zone of influence, based on the Regulation 35 data.

Conclusion

Based on the available information it is clear that this option can be delivered with 'no adverse effect' (alone) on Pen Llyn a'r Sarnau/ Lleyn Peninsula and the Sarnau SAC. Potential 'in combination' effects with TYA009a and other plans and projects are considered in Section 4.6.

Appropriate Assessment – Northern Cardigan Bay / Gogledd Bae Ceredigion SPA

Context

Northern Cardigan Bay / Gogledd Bae Ceredigion SPA is a marine site downstream of the Afon Dysynni, designated for its wintering population of **red-throated diver** (peak mean of 1,186 individuals (2000/01-2003/04)). This species forages for small fish and molluscs in relatively shallow water (0 – 10m deep), and so the shallow subtidal shingle reefs of the Pen Llŷn a'r Sarnau SAC / Lleyn Peninsula and the Sarnau SAC (the 'sarnau') provide important feeding areas during the winter. There are three principle reefs within the SPA, of which the smallest is offshore near the mouth of the Afon Dysynni. Red-throated divers are particularly sensitive to disturbance, although will also be sensitive to environmental changes that affect their food supply. The principal risks to this species will therefore be associated with any effects on their foraging areas or prey species that occur as a result of the scheme.

Conservation Objectives

The assessment takes into account the draft conservation objectives that have been published for this recently designated site (NRW 2015).

Incorporated Measures

No site- or feature-specific measures are identified for this site beyond the normal project-level planning and best-practice (see Appendix G).

Assessment of Effects – Construction

Construction works will be required within the Afon Dysynni (new intake at Pont y Garth) and its catchment, and so there is a small risk of contamination of surface waters by site-derived pollutants. However, given the scale of the works, this risk can almost certainly be avoided or controlled through the normal project planning process and standard best-practice measures (see Appendix G). Furthermore, any site-derived pollutants entering the river will almost certainly be attenuated by the river flows and tidal flux before they interact with the offshore reef areas. The construction works will have no direct effects (disturbance etc.) on the SPA interest features. Effects due to construction would not be anticipated.

Assessment of Effects – Operation

Some of the subtidal and intertidal reefs used for foraging by red-throated divers are located near the mouth of the Afon Dysynni. Freshwater inputs are likely to have subtle influence on the reef habitats and species in the immediate vicinity of the river mouth, although this influence will be limited due to the dominance of tidal processes. It is very unlikely that any associated variations in the reef habitats or species substantially influence red-throated diver foraging behaviour within the SPA (see the assessment for Pen Llyn a'r Sarnau/ Lleyn Peninsula and the Sarnau SAC, above). Furthermore, the impacts on flows from the Afon Dysynni due to the abstraction will be negligible. As a result, operational effects on the interest features of the SPA would not be anticipated.

Conclusion

Based on the available information it is clear that this option can be delivered with 'no adverse effect' (alone) on Northern Cardigan Bay / Gogledd Bae Ceredigion SPA. Potential 'in combination' effects with TYA009a and other plans and projects are considered in Section 4.6.

Appropriate Assessment – West Wales Marine / Gorllewin Cymru Forol cSAC

Context

The West Wales Marine / Gorllewin Cymru Forol cSAC is a marine site downstream of the Afon Dysynni, designated for its population of **harbour porpoise**, the most common and widespread cetacean species in Welsh waters. The species is known to use tidal conditions for foraging and often occurs in areas of high tidal energy around headlands and channels, although it utilises the entire continental shelf waters and not just coastal areas. Several studies have mapped harbour porpoise activity around the Welsh coast (e.g. Baines & Evans 2012), and Heinänen & Skov (2015) produced a distribution model of porpoise density based on their relationships with environmental parameters such seabed type and the presence of upwelling, fronts and eddies, and was the primary evidence base for the proposed harbour porpoise SACs[30]. These studies identify 'hotspots' of porpoise activity off North and West Anglesey; around the southwest coast of the Lleyn Peninsula; in southern Cardigan Bay; and in the Bristol Channel. These studies do not suggest that the inshore areas around the Afon Dysynni are particularly important, although the subtidal reefs (see Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC, above) may provide some foraging opportunities. The principal risks to this species will therefore be associated with any effects on their foraging areas or prey species that occur as a result of the scheme.

Conservation Objectives

The assessment takes into account the draft conservation objectives that have been published for this site (NRW 2016).

Incorporated Measures

No site- or feature-specific measures are identified for this site beyond the normal project-level planning and best-practice (see Appendix G).

Assessment of Effects – Construction

The construction works will have no direct effects (disturbance etc.) on the SAC interest features. Construction works will be required within the Afon Dysynni (new intake at Pont y Garth) and its catchment, and so there is a small risk of contamination of surface waters by site-derived pollutants. However, given the scale of the works, this risk can almost certainly be avoided or controlled through the normal project planning process and standard best-practice measures (see Appendix G). Furthermore, any site-derived pollutants entering the river will almost certainly be attenuated by the river flows and tidal flux before they interact with the offshore areas. Effects due to construction would not therefore be anticipated.

Assessment of Effects – Operation

The inshore waters around the mouth of the Afon Dysynni are not identified as particular hotspots for harbour porpoise, although they can be observed here. Freshwater inputs are likely to have subtle influence on the reef habitats and species in the immediate vicinity of the river mouth, although this influence will be limited due to the dominance of tidal processes. However, it is very unlikely that any associated variations in the reef habitats or species will substantially influence harbour porpoise foraging behaviour, and there is no evidence of particular activity 'hotspots' near the Dysynni which might be connected with prey variations associated with the freshwater inputs. Furthermore, the impacts on flows from the Afon Dysynni due to the abstraction will be negligible, and harbour porpoise are not identified as being sensitive to water resource abstractions by NRW. As a result, operational effects would not be anticipated.

Conclusion

Based on the available information it is clear that this option can be delivered with 'no adverse effect' (alone) on the West Wales Marine / Gorllewin Cymru Forol cSAC. Potential 'in combination' effects with TYA009a and other plans and projects are considered in Section 4.6.

[30] This was the primary evidence base for the proposed harbour porpoise SACs around Wales.

Appropriate Assessment – Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC

Context

The Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC is a large complex of oak-dominated woodlands and associated habitats stretching from southern Snowdonia to Cadair Idris. **Lesser horseshoe bats** have over 20 known roosts within the SAC and forage widely within the SAC's woodlands, associated habitats and the surrounding countryside. The SAC includes maternity roost sites in various types of buildings and structures; and winter hibernation sites, especially in mines.

The closest unit of the SAC is approximately 7km from the abstraction at Pont y Garth. Lesser horseshoe bats generally have fairly limited foraging and commuting ranges during the summer (typically less than 5km from a roost, and usually within 2.5km), although longer distance migrations occur when moving to and from hibernation areas. They mainly forage in broadleaf woodlands, as well as in other woodlands and areas of high habitat diversity; however, the species is not a bold flyer, usually avoiding open areas or navigating close to hedgerows or treelines that provide some cover.

Conservation Objectives

The assessment takes into account the conservation objectives for the site, which are set out in the Core Management Plan (CCW 2008b).

Incorporated Measures

No site- or feature-specific measures are identified for this site beyond the normal project-level planning and best-practice (see Appendix G).

Assessment of Effects – Construction

None of the SAC habitats will be affected by the proposals due to the absence of impact pathways (distance, separate catchments). There is a small risk of construction works affecting lesser horseshoe bats if favoured commuting routes or features (e.g. hedges, woodlands) are affected by the proposals (e.g. through removal, or from site lighting etc.), but the likelihood of this is very low as

- the proposed works are almost entirely situated within existing roads; and
- it is very unlikely that bats from the SAC will make significant use of the habitats around the development area given the distance.

Furthermore, any risk of effects can certainly be avoided or controlled through the normal project planning process and standard best-practice measures (see Appendix G), and it is likely that the scheme would have 'no effect' (as opposed to 'no likely significant effect') on this site with these applied. As a result, the conclusion of the appropriate assessment stages is that the option (with normal best practice) will have no effects on this site, and so 'no adverse effects alone or in combination'.

Assessment of Effects – Operation

None of the SAC habitats will be affected by the proposals due to the absence of impact pathways (distance, separate catchments). Lesser horseshoe bats are not considered sensitive to the effects of water-resource permissions; no effects are anticipated as a result of the scheme operation.

Conclusion

Based on the available information it is clear that this option can be delivered with 'no adverse effect' on Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC, alone or in combination.

Appropriate Assessment – Dyfi Estuary / Aber Dyfi SPA

Context

The Dyfi Estuary / Aber Dyfi SPA is an estuarine site approximately 7.8km south of the Afon Dysynni valley that is designated for its wintering population of **Greenland white-fronted geese**. The site itself is in a separate surface water catchment from option, and so is not exposed to construction or operation effects, although the white-fronted geese could potentially use grassland habitats within the Dysynni valley for foraging or roosting when wintering at the Dyfi Estuary; if usage is substantial the undesignated habitats of the Dysynni might be considered 'functionally linked' to the SPA and so important for the maintenance of its integrity.

The Dyfi white-fronted goose population is one of two regularly monitored flocks in Wales and has been subject to recent (2016/2017) tagging studies by the WWT and RSPB Cymru to provide detailed mapping of local feeding and roost areas within the estuary over winter. Evidence from this study and other observations[31] suggests that the flock associated with this SPA feeds and roosts almost exclusively within the Dyfi SSSI, which is part of Dyfi Estuary/Afon Dyfi SPA and which includes nearby sites at Cors Fochno and Ynyshir RSPB Reserve. It is likely that individual birds from the SPA occasionally use habitats within the Dysynni valley (and there are historical records of white-fronted geese from the Dysysnni near Twywn, probably associated with the Broadwater SSSI) but there is no evidence that habitats of the Dysynni valley provide a significant functionally-linked habitat resource that is important for the integrity of the SPA or its goose population.

Conservation Objectives

The assessment takes into account the conservation objectives for the site, which are set out in the Core Management Plan (CCW 2008c).

Incorporated Measures

In addition to normal project-level planning and best-practice (see Appendix G):

- construction of the scheme will avoid the winter period (October – March) to minimise the risk of disturbance to wintering Greenland white-fronted geese, unless scheme-specific surveys or analyses demonstrate that any effects associated with construction works can be avoided (e.g. through construction site supervision / monitoring), will be 'not significant' (i.e. geese will not be exposed to construction effects), or will have no adverse effect on the integrity of the SPA.

The WRMP requires that these measures be employed at the project-level unless scheme-specific HRAs or 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 more appropriate.

Assessment of Effects – Construction

The main construction-related risk would be the potential disturbance and / or displacement of geese from feeding or roosting sites due to construction activities. This is not impossible if geese happen to be present near the working areas during the construction period. However, the scheme characteristics (proposed works are almost entirely situated within existing roads; short-term only) will help minimise the risk and magnitude of any potential effects. Furthermore, the available evidence suggests that geese from the SPA do not make significant use of habitats away from the core areas (the Dyfi Estuary and adjacent sites). On this basis, significant adverse effects would not be expected, and can in any case be avoided or controlled through the normal project planning process and standard best-practice measures (see Appendix G).

[31] Greenland White-fronted Goose Study. (2017). *Dyfi Estuary Site Inventory* [online]. Available at: http://greenlandwhitefront.org/gb-site-inventory/england-wales/78-dyfi-estuary-dyfed/ [Accessed 11/09/17].

Assessment of Effects – Operation

White-fronted geese will not be particularly exposed or sensitive to the operational effects of the scheme. The species feeds primarily in terrestrial habitats (grasslands, peatlands, agricultural land) with intertidal areas in estuaries used mainly for roosting and preening. The option will have minor effects on flows within the Afon Dysynni, which could theoretically affect riparian and intertidal habitats associated with the river (e.g. within Broadwater SSSI), although any changes (which are likely to be inconsequential in any case) will not affect the suitability of the Dysynni valley for this species. No effects are anticipated as a result of the scheme operation.

Conclusion

Based on the available information it is clear that this option can be delivered with 'no adverse effect' on Dyfi Estuary / Aber Dyfi SPA (alone), and that it is likely that 'significant effects' could be avoided entirely through project planning. Potential 'in combination' effects with TYA009a and other plans and projects are considered in Section 4.6.

Appropriate Assessment – Afon Eden - Cors Goch Trawsfynydd SAC

Context

The Afon Eden - Cors Goch Trawsfynydd SAC comprises a relatively unmodified river and its peatland headwaters around Llyn Trawsfynydd. The SAC ends at the tidal limit of the Mawddach estuary at Llanelltyd. The site is approximately 15km north-east of the option, located in a separate surface water catchment from option, so the site (and hence the **Active raised bogs** and **Floating water-plantain** interest features) is not therefore exposed to construction or operation effects. There is a theoretical risk that mobile species associated with the site (**Atlantic salmon** (and hence **Freshwater pearl mussel**) and **Otter**) could potentially use habitats that are affected by construction or operation of the scheme, e.g.

- salmon may use areas of the Pen Llŷn a'r Sarnau SAC / Lleyn Peninsula and the Sarnau SAC for feeding and staging during migration;
- otters associated with the SAC will range extensively along and between catchments, and may periodically use the Dysynni.

If usage of these areas is substantial and critical to the species' life cycles they may be considered 'functionally linked' to the SAC and so important for the maintenance of its integrity. However, it is important to recognise that the habitats potentially affected by the option are not particularly unique locally and it is very unlikely that the salmon or otter populations associated with the SAC will be sufficiently exposed to any effects for the integrity of the SAC to be undermined.

Conservation Objectives

The assessment takes into account the conservation objectives for the site, which are set out in the Core Management Plan (CCW 2008d).

Incorporated Measures

No site- or feature-specific measures are identified for this site beyond the normal project-level planning and best-practice (see Appendix G).

Assessment of Effects – Construction

Effects on surface waters

Construction works will be required within the Afon Dysynni (new intake at Pont y Garth) and its catchment, and so there is a small risk of contamination of surface waters by site-derived pollutants. This could affect salmon using downstream areas around the mouth of the river, or otters using the catchment, either directly (if pollutants are toxic) or indirectly through effects on prey species or habitats. However, given the scale of

the works, this risk can be avoided or controlled through the normal project planning process and standard best-practice measures (see Appendix G). It is also unlikely that the salmon or otter populations associated with the SAC will be sufficiently exposed to any effects for the integrity of the SAC to be undermined due to short-term nature of the works and natural attenuation by river flows and tidal flux; and the broad availability of alternative habitats locally.

Other construction effects

Otters are potentially sensitive to disturbance associated with construction activities (e.g. noise, vibration, excavations, lighting). This risk can be avoided or controlled through the normal project planning process and standard best-practice measures (see Appendix G). It should also be noted that any disturbance effects will be short-term only, and only likely to affect individual otters that may or may not be associated with the SAC; the otter populations associated with the SAC will not be sufficiently exposed to any effects for the integrity of the SAC to be undermined.

Assessment of Effects – Operation

The option will have minor effects on flows within the Afon Dysynni, which could theoretically affect riparian and intertidal habitats associated with the river (e.g. within Broadwater SSSI) or the immediate offshore areas.

With regard to salmon, freshwater inputs are likely to have subtle influence on the reef habitats and species in the immediate vicinity of the river mouth, although this influence will be limited due to the dominance of tidal processes and it is very unlikely that any associated variations in the reef habitats or species will substantially influence salmon foraging behaviour or use of this area. Similarly, the scheme will have little effect on the riparian habitats and hence areas used by otters. As with construction, it is unlikely that the salmon or otter populations associated with the SAC will be sufficiently exposed to any effects for the integrity of the SAC to be undermined, and no significant effects would be anticipated.

Conclusion

Based on the available information it is clear that this option can be delivered with 'no adverse effect' (alone) on Afon Eden - Cors Goch Trawsfynydd SAC, and in practice it is likely that there will be 'no significant effects' due to the limited exposure and sensitivity of the site features to the effects of the option. Potential 'in combination' effects with TYA009a and other plans and projects are considered in Section 4.6.

4.3 Option TYA009a: New Raw Water Storage at Pen y Bont WTW

Summary of Scheme

This option would require a new raw water storage reservoir (~0.5 ha.) located adjacent to the Pen-y-Bont WTW at Bryncrug. This would be used to buffer raw water supply and improve the resilience of Pen-y-Bont to poor raw water quality and dry weather/peak demand conditions when the run-of-river abstractions may not supply sufficient quality/quantity inflow to the WTW. The option would operate within the terms of the existing abstraction licence from Afon Fathew, which is a tributary of the Afon Dysynni. The capital works would involve:

- a new 8 Ml raw water reservoir adjacent to Pen-y-Bont;
- new connections to Pen y Bont WTW.

Note, due to the proximity of this option to TYA004 the assessment below references the assessment for this option where appropriate, to minimise repetition.

Likely Impact Pathways

Construction

The construction works are relatively small-scale. The reservoir will be located within existing pasture so direct effects on terrestrial habitats (and associated species) will be limited. The principal environmental risks are therefore likely to be

- contamination of surface waters by site-derived pollutants;
- disturbance of species (e.g. from site lighting, noise, visual impact, vibration, etc.).

Given the scale of the works, these risks can almost certainly be avoided or controlled through the normal project planning process and standard best-practice measures (see Appendix G).

Operation

This option would be complementary to Option TYA004, and is designed to add resilience to the Twywn Aberdyfi WRZ. The new reservoir would be filled from the existing Afon Fathew abstraction in winter (this would be within the terms of the existing licence); this would then be used to supply Pen y Bont WTW during periods when the condition of raw water in the normal stream sources is poor (typically after periods of wet weather). The Afon Dysynni abstraction (i.e. TYA004) is therefore the principal dry weather source that will be used once the hand-off flow conditions are in force on the Nant Braich y Rhiw and there is insufficient resource in the Afon Fathew to meet demand. It is unlikely that both schemes will operate concurrently (i.e. both supplying water to Pen y Bont WTW at the same time). As the scheme is within the terms of the existing licence operational effects would not be expected.

Screening of European Sites

There are 12 European sites downstream or within 20km of this option, or otherwise linked by a potential effect pathway. The sites, their interest features, and location relative to the option are set out in **Table 4.3**.

Table 4.3 European sites within 20 km of option, or otherwise connected

Site and Interest Features	~Distance / Connectivity
Craig yr Aderyn (Bird`s Rock) SPA ▸ Red-billed chough *Pyrrhocorax pyrrhocorax*	4.1km
Cadair Idris SAC ▸ Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* ▸ Northern Atlantic wet heaths with *Erica tetralix* ▸ European dry heaths ▸ *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) ▸ Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels ▸ Blanket bogs (* if active bog) ▸ Alkaline fens ▸ Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*) ▸ Calcareous rocky slopes with chasmophytic vegetation ▸ Siliceous rocky slopes with chasmophytic vegetation ▸ Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles ▸ Marsh fritillary butterfly *Euphydryas (Eurodryas, Hypodryas) aurinia* ▸ Slender green feather-moss *Drepanocladus (Hamatocaulis) vernicosus*	8.2 km
Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC	4.4 km / DS

Site and Interest Features	~Distance / Connectivity
▶ Sandbanks which are slightly covered by sea water all the time ▶ Estuaries ▶ Mudflats and sandflats not covered by seawater at low tide ▶ Coastal lagoons ▶ Large shallow inlets and bays ▶ Reefs ▶ Salicornia and other annuals colonizing mud and sand ▶ Atlantic salt meadows (*Glauco-Puccinellietalia* maritimae) ▶ Submerged or partially submerged sea caves ▶ Bottlenose dolphin *Tursiops truncatus* ▶ Otter *Lutra lutra* ▶ Grey seal *Halichoerus grypus*	
Northern Cardigan Bay / Gogledd Bae Ceredigion SPA ▶ Red-throated diver *Gavia stellata*	4.4 km / DS
West Wales Marine / Gorllewin Cymru Forol cSAC ▶ Harbour porpoise *Phocoena phocoena*	4.4 km / DS
Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC ▶ Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation ▶ Northern Atlantic wet heaths with *Erica tetralix* ▶ European dry heaths ▶ Tilio-Acerion forests of slopes, screes and ravines ▶ Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles ▶ Bog woodland ▶ Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) ▶ Lesser horseshoe bat *Rhinolophus hipposideros*	11.5 km
Cors Fochno and Dyfi Ramsar ▶ Crit. 1 - sites containing representative, rare or unique wetland types	7.1 km
Dyfi Estuary / Aber Dyfi SPA ▶ Greenland white-fronted goose *Anser albifrons flavirostris*	7.1 km
Cors Fochno SAC ▶ Active raised bogs ▶ Degraded raised bogs still capable of natural regeneration ▶ Depressions on peat substrates of the *Rhynchosporion*	10.4km
Coed Cwm Einion SAC ▶ *Tilio-Acerion* forests of slopes, screes and ravines	10.8 km
Afon Eden - Cors Goch Trawsfynydd SAC ▶ Active raised bogs ▶ Freshwater pearl mussel *Margaritifera margaritifera* ▶ Atlantic salmon *Salmo salar* ▶ Otter *Lutra lutra* ▶ Floating water-plantain *Luronium natans*	18.7 km
Morfa Harlech a Morfa Dyffryn SAC ▶ Embryonic shifting dunes ▶ Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes") ▶ Dunes with *Salix* repens ssp. *argentea* (*Salicion arenariae*) ▶ Humid dune slacks ▶ Petalwort *Petalophyllum ralfsii*	18.7 km

*Priority features

DS – Downstream site

Several of these sites will be unaffected by the option, primarily due to the absence of impact pathways; these sites are identified in **Table 4.4**, and are not considered further within the assessment of this option (note, for these sites it is considered that there will be 'no effects' (as opposed to 'no likely significant effects') and so there will be no possibility of 'in combination' effects).

Table 4.4 Initial screening of European sites

Site	Consider further?	Rationale
Craig yr Aderyn (Bird`s Rock) SPA	Yes	Site within 5km of construction area.
Cadair Idris SAC	No	Upland site upstream of the proposed option, so site not exposed to construction or operation effects. The mobile interest feature of the site (marsh fritillary) is a very sedentary species, with adults rarely dispersing more than 100m and relying on a network of nearby habitat patches; the population within Cadair Idris SAC will not therefore be dependent on the habitats near the proposed development. The option will have no effect on this site.
Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC	Yes	Downstream site.
Northern Cardigan Bay / Gogledd Bae Ceredigion SPA	Yes	Downstream site (although interest feature not particularly sensitive)
West Wales Marine / Gorllewin Cymru Forol cSAC	Yes	Downstream site (although interest feature not particularly sensitive)
Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC	Yes	Woodland and cave sites within separate catchment from option, so site habitats not exposed to construction or operation effects. The mobile interest feature associated with site (lesser horseshoe bat) is potentially vulnerable to construction.
Cors Fochno and Dyfi Ramsar	No	Raised bog and estuary within separate catchment from option; site not exposed to construction or operation effects. The option will have no effect on this site.
Dyfi Estuary / Aber Dyfi SPA	No	This estuarine site is within separate catchment from option, and so the site itself is not exposed to construction or operation effects. The mobile interest feature (white fronted goose) will not make significant use of the habitats adjacent to Pen-y-Bont WTW.
Afon Eden - Cors Goch Trawsfynydd SAC	Yes	This is a riverine site within separate catchment from option, so the site is not exposed to construction or operation effects. The mobile interest features may periodically utilise habitats associated with the Afon Dysynni.
Cors Fochno SAC	No	Raised bog within separate catchment from option; not exposed to construction or operation effects. The option will have no effect on this site.
Coed Cwm Einion SAC	No	Woodland site in separate catchment from option; not exposed to construction or operation effects. The option will have no effect on this site.
Morfa Harlech a Morfa Dyffryn SAC	No	Sand dune site in separate catchment from option; not exposed to construction or operation effects. The option will have no effect on this site.
Rhinog SAC	No	Upland site upstream of the proposed option, so site not exposed to construction or operation effects. The option will have no effect on this site.

The likely effects of the option on those sites where potential impact pathways are identified (i.e. the possibility of significant effects cannot be excluded) are considered in the following 'appropriate assessment' sections.

Incorporated Measures

Appropriate site- and feature-specific avoidance measures and development criteria are set out in Appendix G of this HRA. The WRMP requires that these measures be employed at the project-level unless scheme-specific HRAs or 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 more appropriate. The measures noted in Appendix G are taken into account in the following appropriate assessments.

Appropriate Assessment – Craig yr Aderyn (Bird's Rock) SPA

Context

The characteristics of Craig Yr Aderyn / Bird's Rock are summarised in Section 4.3; in summary, the site is designated for its breeding and roosting population of **chough**, which will use unimproved short-grazed turf for foraging.

Conservation Objectives

The assessment takes into account the conservation objectives for the site, which are set out in the Core Management Plan (CCW 2008a).

Incorporated Measures

No site- or feature-specific measures are identified for this site beyond the normal project-level planning and best-practice (see Appendix G).

Assessment of Effects – Construction

Based on aerial photography, the proposed reservoir is located within grazed pasture to the north-east of the WTW, approximately 4 km from the SPA. Direct disturbance of birds in the SPA will not occur due to construction, although displacement is possible if birds make use of fields near the construction area for foraging. However, it is extremely unlikely that the field adjacent to the WTW provides a unique or otherwise notable foraging resource locally for chough, such that displacement could significantly affect the population. The scheme may require additional assessment once the precise parameters of the project are clear, but potential impacts could be easily mitigated (e.g. by timing works to avoid the breeding season). There are no over-riding reasons why these works cannot be accommodated without significant effects occurring.

Operation

Chough are not considered sensitive to the effects of water-resource permissions; no effects are anticipated as a result of the scheme operation. There will be a small loss of potential foraging habitat, but this is self-evidently inconsequential given the habitat type (pasture), its location, and the wider availability of this resource locally.

Conclusion

Based on the available information it is clear that this option can be delivered with 'no adverse effects' alone or in combination, and in reality there are unlikely to be any effects as a result of the scheme on Bird's Rock SPA.

Appropriate Assessment – Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC

Context

The characteristics of the Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC are summarised in Section 4.3, and the observations for TYA004 are relevant to Option TYA009a also. In summary, features

associated with the mouth of the Afon Dysynni (subtidal and intertidal **Reefs**), plus some mobile features (principally **otter**) may be exposed to the effects of the option. The remaining features will not be exposed.

Conservation Objectives

The assessment takes into account the conservation objectives for the site, which are set out in the Core Management Plan (NRW 2018a).

Incorporated Measures

No site- or feature-specific measures are identified for this site beyond the normal project-level planning and best-practice (see Appendix G).

Assessment of Effects – Construction

Construction of the option could affect the SAC if site-derived pollutants are not appropriately controlled. The most vulnerable feature will the subtidal Reefs offshore of Tonfanau (the Morfa Gwyllt coastal lagoon is not connected to the Dysynni), which will support biotopes that may be sensitive to sedimentation or toxic contamination. The mobile species may also be vulnerable if there are effects on their prey species. This risk can clearly be avoided or controlled through the normal project planning process and standard best-practice measures (see Appendix G), although construction will be short-term only and any site-derived pollutants entering the river will almost certainly be attenuated by the river flows and tidal flux before they interact significantly with the offshore reef areas. Significant effects would not therefore be expected.

Operation

The scheme would operate within the terms of the existing licence and so operational effects would not be expected. Refill will occur in the winter period at high flows.

Conclusion

Based on the available information it is clear that this option can be delivered with 'no adverse effect' on Pen Llyn a'r Sarnau/ Lleyn Peninsula and the Sarnau SAC (alone); potential 'in combination' effects with TYA004 are considered in Section 4.6.

Appropriate Assessment – Northern Cardigan Bay / Gogledd Bae Ceredigion SPA

Context

The characteristics of the Northern Cardigan Bay / Gogledd Bae Ceredigion SPA are summarised in Section 4.3, and the observations for TYA004 are relevant to Option TYA009a also. In summary, the SPA is designated for its wintering population of **red-throated diver** which is likely to forage around the shallow subtidal shingle reefs of the Pen Llŷn a'r Sarnau SAC / Lleyn Peninsula and the Sarnau SAC (the 'sarnau'). The principal risks to this species will therefore be associated with any effects on their foraging areas or prey species that occur as a result of the scheme.

Conservation Objectives

The assessment takes into account the draft conservation objectives that have been published for this recently designated site (NRW 2015).

Incorporated Measures

No site- or feature-specific measures are identified for this site beyond the normal project-level planning and best-practice (see Appendix G).

Assessment of Effects – Construction

The construction effects of the option on this site will be as per Option TYA004; any risk of impacts can almost certainly be avoided or controlled through the normal project planning process and standard best-practice measures (see Appendix G), and effects due to construction would not be anticipated.

Assessment of Effects – Operation

The scheme would operate within the terms of the existing licence and so operational effects would not be expected. Refill will occur in the winter period at high flows.

Conclusion

Based on the available information it is clear that this option can be delivered with 'no adverse effect' on Northern Cardigan Bay / Gogledd Bae Ceredigion SPA, (alone); potential 'in combination' effects with TYA004 are considered in Section 4.6. In practice it is likely that there will be 'no significant effects' due to the limited exposure and sensitivity of the site features to the effects of the option.

Appropriate Assessment – West Wales Marine / Gorllewin Cymru Forol cSAC

Context

The characteristics of the West Wales Marine / Gorllewin Cymru Forol cSAC are summarised in Section 4.3, and the observations for TYA004 are relevant to Option TYA009a also. In summary, the site is designated for its population of **harbour porpoise**, which may use the subtidal reefs of the Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC (see above) for foraging.

Conservation Objectives

The assessment takes into account the draft conservation objectives that have been published for this site (NRW 2016).

Incorporated Measures

No site- or feature-specific measures are identified for this site beyond the normal project-level planning and best-practice (see Appendix G).

Assessment of Effects – Construction

The construction effects of the option on this site will be as per Option TYA004; any risk of impacts can almost certainly be avoided or controlled through the normal project planning process and standard best-practice measures (see Appendix G), and effects due to construction would not be anticipated.

Assessment of Effects – Operation

The scheme would operate within the terms of the existing licence and so operational effects would not be expected. Refill will occur in the winter period at high flows.

Conclusion

Based on the available information it is clear that this option can be delivered with 'no adverse effect' on the West Wales Marine / Gorllewin Cymru Forol cSAC (alone); potential 'in combination' effects with TYA004 are considered in Section 4.6. In practice it is likely that there will be 'no significant effects' due to the limited exposure and sensitivity of the site features to the effects of the option

Appropriate Assessment – Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC

Context

The characteristics of the Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC are summarised in Section 4.3, and the observations for TYA004 are relevant to Option TYA009a also. In summary, **Lesser horseshoe bats** make use of habitats outside the SAC boundary although the distance between the SAC and Pen-y-Bont WTW (>11km) makes significant interaction unlikely.

Conservation Objectives

The assessment takes into account the conservation objectives for the site, which are set out in the Core Management Plan (CCW 2008b).

Incorporated Measures

No site- or feature-specific measures are identified for this site beyond the normal project-level planning and best-practice (see Appendix G).

Assessment of Effects – Construction

The construction effects of the option on this site will be as per Option TYA004; the habitats affected by the option will not provide a unique or otherwise notable resource for bats from the SAC and any risk of impacts can almost certainly be avoided or controlled through the normal project planning process and standard best-practice measures (see Appendix G). Effects due to construction would not be anticipated.

Assessment of Effects – Operation

None of the SAC habitats will be affected by the proposals due to the absence of impact pathways (distance, separate catchments). Lesser horseshoe bats are not considered sensitive to the effects of water-resource permissions; no effects are anticipated as a result of the scheme operation.

Conclusion

Based on the available information it is clear that this option can be delivered with ‘no adverse effect’ on Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC (alone); potential ‘in combination’ effects with TYA004 are considered in Section 4.6. In practice it is likely that there will be ‘no effects’ due to the limited exposure and sensitivity of the site features to the effects of the option.

Appropriate Assessment – Afon Eden - Cors Goch Trawsfynydd SAC

Context

The characteristics of the Afon Eden - Cors Goch Trawsfynydd SAC are summarised in Section 4.3, and the observations for TYA004 are relevant to Option TYA009a also. In summary, there is a theoretical risk that mobile species associated with the site (**Atlantic salmon** (and hence **Freshwater pearl mussel**) and **Otter**) could potentially use habitats that are affected by construction or operation of the scheme.

Conservation Objectives

The assessment takes into account the conservation objectives for the site, which are set out in the Core Management Plan (CCW 2008d).

Incorporated Measures

No site- or feature-specific measures are identified for this site beyond the normal project-level planning and best-practice (see Appendix G).

Assessment of Effects – Construction

The construction effects of the option on this site will be as per Option TYA004; any risk of impacts can almost certainly be avoided or controlled through the normal project planning process and standard best-practice measures (see Appendix G). Effects due to construction would not be anticipated.

Assessment of Effects – Operation

The scheme would operate within the terms of the existing licence and so operational effects would not be expected. Refill will occur in the winter period at high flows.

Conclusion

Based on the available information it is clear that this option can be delivered with 'no adverse effect' on Afon Eden - Cors Goch Trawsfynydd SAC (alone); potential 'in combination' effects with TYA004 are considered in Section 4.6. In practice it is likely that there will be 'no effects' due to the limited exposure and sensitivity of the site features to the effects of the option

4.4 Options PEM024a / PEM024b: Canaston Pumping Station

Summary of Schemes

Options PEM024a and PEM024b are variations of the same scheme and so both are assessed in this section as their potential effects on European sites will be largely identical, although only one will be implemented in practice.

The options are essentially relatively minor asset upgrades that would allow finer control of abstraction volumes from the Afon Cleddau, and hence reduce unnecessary over-release of regulation water from Llys-y-Fran reservoir. Currently, Canaston Bridge raw water pumping station (RWPS) on the Eastern Cleddau supplies raw water to Greenhill service reservoir (SRV) for industrial use and to Bolton Hill WTW for treatment. The RWPS has three separate pump houses:

- Greenhill pumps, which take water from a river intake and pump directly to Greenhill SRV;
- Low-lift pumps, which take water from a separate but adjacent river intake to an on-site 25Ml balancing pond, and;
- High-lift pumps, which take water from the balancing pond and can supply Greenhill SRV and / or Bolton Hill WTW.

The high-lift pumps are fixed speed and can deliver either 34 Ml/d or 51 Ml/d as a flow rate, dependent on whether a single pump is used, or two are used in combination. The maximum rate of pumping from the high-lifts in any day is whichever pumping rate is sufficient to meet the demand on the high-lift pumps. If 35 Ml is required across Greenhill and Bolton Hill on a given day, a single high-lift pump will not be able to meet the demand, and so two high-lift pumps will need to run together, at a rate of 51 Ml/d, for some of the day.

However, the abstraction licence requires that regulation releases from Llys y Fran reservoir match the maximum rate of abstraction. In the above example (35 Ml total demand in a given day across Greenhill SRV and Bolton Hill WTW) the required regulation release would be 51 Ml/d despite a total abstraction of only 35 Ml, because the regulation needs to be at the maximum rate of abstraction; this effectively 'wastes' 16 Ml/d (regulation at 51 Ml minus abstraction of 35 Ml). The abstraction quantities from Canaston Bridge in a dry year have been modelled, and then post-processed to determine the amount of water that is typically over-released due to the difference between the maximum rate of abstraction and the daily total abstraction. This work demonstrated that 9 Ml is typically lost on every day that the regulation release is made. This loss of resource significantly impacts the storage position in Llys y Fran at the end of a drought and has a resultant impact on level of service in Pembrokeshire.

Options PEM024a and PEM024b aim to minimise this over-release of water by configuring the pumps so that the rate of abstraction from the river is close to constant in a given day during periods of resource optimisation, which minimises the difference between the maximum rate of abstraction and the total daily

abstraction. This will require a new low-lift pump set with a variable pump rate between 30 Ml/d and 55 Ml/d, and either

- replacement of the fixed speed high-lift pumps with variable-speed pumps (PEM024a); or
- an increase in the bankside storage volume to attenuate the impact of the high-lift pump abstraction rate, such that the low-lift pumps can pump at a constant rate equivalent to the total abstraction (PEM024b).

This would then allow water to be conserved within the Llys y Fran reservoir by matching compensation releases to actual abstraction. No changes to the abstraction licence would be required.

Likely Impact Pathways

Construction

The construction works for both options are relatively small-scale, but would be in close proximity to the Afonydd Cleddau/ Cleddau Rivers SAC at Canaston Bridge. The principal environmental risks are therefore likely to be

- contamination of surface waters by site-derived pollutants;
- disturbance of sensitive species (e.g. from site lighting, noise, visual impact, vibration, etc.).

Given the scale of the works, these risks can almost certainly be avoided or controlled through the normal project planning process and standard best-practice measures (see Appendix G).

Operation

The operation of the scheme would be within the terms of the existing licence, and is designed to minimise the unnecessary over-release of regulation flows from Llys y Fran. It will result in 'less' water passing down the Afon Syfynwy/Eastern Cleddau River as the releases match the actual abstraction more closely, although licence conditions for compensation and regulation flows will be still be met and so (from an HRA perspective) the operational effects of altered releases will be 'not significant' (as the licences have been previously assessed through the Review of Consents and are considered valid for the planning period).

Screening of European Sites

There are 12 European sites downstream or within 20km of this option, or otherwise linked by a potential effect pathway. The sites, their interest features, and location relative to the option are set out in **Table 4.5**.

Table 4.5 European sites within 20 km of option, or otherwise connected

Site and Interest Features	~Distance / Connectivity
Afonydd Cleddau/ Cleddau Rivers SAC ▸ Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation ▸ Active raised bogs ▸ Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) ▸ Sea lamprey *Petromyzon marinus* ▸ Brook lamprey *Lampetra planeri* ▸ River lamprey *Lampetra fluviatilis* ▸ Bullhead *Cottus gobio* ▸ Otter *Lutra lutra*	0 km
Pembrokeshire Marine/ Sir Benfro Forol SAC	0.6 km / DS

Site and Interest Features	~Distance / Connectivity
▸ Sandbanks which are slightly covered by sea water all the time ▸ Estuaries ▸ Mudflats and sandflats not covered by seawater at low tide ▸ Coastal lagoons ▸ Large shallow inlets and bays ▸ Reefs ▸ Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) ▸ Submerged or partially submerged sea caves ▸ Sea lamprey Petromyzon marinus ▸ River lamprey *Lampetra fluviatilis* ▸ Allis shad *Alosa alosa* ▸ Twaite shad *Alosa fallax* ▸ Otter *Lutra lutra* ▸ Grey seal *Halichoerus grypus* ▸ Shore dock *Rumex rupestris*	
Pembrokeshire Bat Sites and Bosherston Lakes/ Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston SAC ▸ Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. ▸ Lesser horseshoe bat *Rhinolophus hipposideros* ▸ Greater horseshoe bat *Rhinolophus ferrumequinum* ▸ Otter *Lutra lutra*	3.5 km
Yerbeston Tops SAC ▸ Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) ▸ Marsh fritillary butterfly *Euphydryas (Eurodryas, Hypodryas) aurinia*	4.8 km
Bae Caerfyrddin/ Carmarthen Bay SPA ▸ Black (common) scoter *Melanitta nigra*	11.9 km
Carmarthen Bay and Estuaries/ Bae Caerfyrddin ac Aberoedd SAC ▸ Sandbanks which are slightly covered by sea water all the time ▸ Estuaries ▸ Mudflats and sandflats not covered by seawater at low tide ▸ Large shallow inlets and bays ▸ Salicornia and other annuals colonizing mud and sand ▸ Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) ▸ Sea lamprey *Petromyzon marinus* ▸ River lamprey *Lampetra fluviatilis* ▸ Allis shad *Alosa alosa* ▸ Twaite shad *Alosa fallax* ▸ Otter *Lutra lutra*	11.9 km
Bristol Channel Approaches / Dynesfeydd Môr Hafren cSAC ▸ Harbour porpoise *Phocoena phocoena*	11.9 km / DS
Carmarthen Bay Dunes/ Twyni Bae Caerfyrddin SAC ▸ Embryonic shifting dunes ▸ Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes") ▸ Fixed coastal dunes with herbaceous vegetation ("grey dunes") ▸ Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*) ▸ Humid dune slacks ▸ Narrow-mouthed whorl snail *Vertigo angustior* ▸ Petalwort *Petalophyllum ralfsii* ▸ Fen orchid *Liparis loeselii*	18.2 km
Gweunydd Blaencleddau SAC	17.4 km

Site and Interest Features	~Distance / Connectivity
▶ Northern Atlantic wet heaths with *Erica tetralix* ▶ Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) ▶ Blanket bogs (* if active bog) ▶ Transition mires and quaking bogs ▶ Alkaline fens ▶ Southern damselfly *Coenagrion mercuriale* ▶ Marsh fritillary butterfly *Euphydryas* (*Eurodryas*, *Hypodryas*) *aurinia*	
Limestone Coast of South West Wales/ Arfordir Calchfaen de Orllewin Cymru SAC ▶ Vegetated sea cliffs of the Atlantic and Baltic Coasts ▶ Fixed coastal dunes with herbaceous vegetation ("grey dunes") ▶ European dry heaths ▶ Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) ▶ Caves not open to the public ▶ Submerged or partially submerged sea caves ▶ Greater horseshoe bat *Rhinolophus ferrumequinum* ▶ Petalwort *Petalophyllum ralfsii* ▶ Early gentian *Gentianella anglica*	17.3 km
North Pembrokeshire Woodlands/ Coedydd Gogledd Sir Benfro SAC ▶ Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles ▶ Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) ▶ Barbastelle *Barbastella barbastellus*	18.7 km
Preseli SAC ▶ Northern Atlantic wet heaths with *Erica tetralix* ▶ European dry heaths ▶ Depressions on peat substrates of the *Rhynchosporion* ▶ Alkaline fens ▶ Southern damselfly *Coenagrion mercuriale* ▶ Marsh fritillary *butterfly Euphydryas (Eurodryas, Hypodryas) aurinia* ▶ Slender green feather-moss *Drepanocladus (Hamatocaulis) vernicosus*	16.4 km

*Priority features
DS – Downstream site

Several of these sites will be unaffected by the option, primarily due to the absence of impact pathways; these sites are identified in **Table 4.6**, and are not considered further within the assessment of this option (note, for these sites it is considered that there will be 'no effects' (as opposed to 'no likely significant effects') and so there will be no possibility of 'in combination' effects).

Table 4.6 Initial screening of European sites

Site	Consider further?	Rationale
Afonydd Cleddau/ Cleddau Rivers SAC	Yes	Site immediately adjacent to construction area.
Pembrokeshire Marine/ Sir Benfro Forol SAC	Yes	Site downstream of construction area.
Pembrokeshire Bat Sites and Bosherston Lakes/ Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston SAC	Yes	Site within 5km; mobile species potentially vulnerable to constructions.
Yerbeston Tops SAC	No	Upland site within separate catchment from option; not exposed to construction or operation effects. The option will have no effect on this site.

Site	Consider further?	Rationale
Bae Caerfyrddin/ Carmarthen Bay SPA	No	Marine site is not a downstream receptor; site features predominantly marine and not exposed to construction or operation effects. The option will have no effect on this site.
Carmarthen Bay and Estuaries/ Bae Caerfyrddin ac Aberoedd SAC	No	This marine site is not a downstream receptor; the site features are predominantly marine and not exposed to construction or operation effects. The option will have no effect on this site.
Bristol Channel Approaches / Dynesfeydd Môr Hafren cSAC	No	Marine site partly downstream of construction area (>25km), but features (harbour porpoise) not particularly exposed or sensitive to likely effects. The option will have no effect on the interest features of this site.
Carmarthen Bay Dunes/ Twyni Bae Caerfyrddin SAC	No	Sand dune site in separate catchment from option; not exposed to construction or operation effects. The option will have no effect on this site.
Gweunydd Blaencleddau SAC	No	Upland site upstream of the proposed option, so site not exposed to construction or operation effects. The option will have no effect on this site.
Limestone Coast of South West Wales/ Arfordir Calchfaen de Orllewin Cymru SAC	Yes	Coastal site not exposed to effects, although supports mobile species which may periodically use features associated with Pembrokeshire Bat Sites and Bosherston Lakes/ Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston SAC.
North Pembrokeshire Woodlands/ Coedydd Gogledd Sir Benfro SAC	Yes	Woodland site in separate catchment from option; not exposed to construction or operation effects, but supports mobile species which may periodically use features associated with Pembrokeshire Bat Sites and Bosherston Lakes/ Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston SAC.
Preseli SAC	No	Upland site upstream of the proposed option, so site not exposed to construction or operation effects. The option will have no effect on this site.

The likely effects of the option on those sites where potential impact pathways are identified (i.e. the possibility of significant effects cannot be excluded) are considered through 'appropriate assessment' in the following sections.

Incorporated Measures

Appropriate site- and feature-specific avoidance measures and development criteria are set out in Appendix G of this HRA. The WRMP requires that these measures be employed at the project-level unless scheme-specific HRAs or 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 more appropriate. Additional, feature-specific measures are identified (and accounted for) within the following appropriate assessments for each European site. No specific measures (over the requirements for normal project-level planning and best-practice) are considered necessary at the plan-level for any other European sites potentially exposed to the likely effects of the option (see screening above).

Appropriate Assessment – Afonydd Cleddau/ Cleddau Rivers SAC

Context / Feature Screening

The Afonydd Cleddau / Cleddau Rivers SAC essentially comprises two main rivers (the Eastern Cleddau and the Western Cleddau) which meet in the Daugleddau Estuary, below the tidal limit of both rivers. Both rivers are predominantly lowland in character, flowing through agricultural land with significant areas of permanent pasture, broadleaved woodland and other semi-natural vegetation. The Western Cleddau rises south of Fishguard, flowing for 30km between its source at Mathry to the tidal limit of the Daugleddau Estuary at Haverfordwest; the Eastern Cleddau rises in the Preseli Hills, and flows for 26km to its tidal limit at Blackpool Bridge. The tidal limits mark the boundaries of the Afonydd Cleddau / Cleddau Rivers SAC with the Pembrokeshire Marine/ Sir Benfro Forol SAC, which covers the Daugleddau Estuary.

The abstraction and pumping station at Canaston Bridge are located on the Eastern Cleddau, approximately 700m upstream of the tidal limit at Blackpool Bridge. The scheme will not affect interest features located

upstream of the abstraction and pumping station[32], and so will have no effect on the **Active raised bogs** feature; in addition, the exposure of the **Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation** is also likely to be limited (based on the current management plan, this feature is not thought to be present downstream of Canaston Bridge). With regard to the other features:

- **Sea lamprey, River lamprey, Brook lamprey, Bullhead** and **Otter** are all likely to use the river near or downstream of Canaston Bridge during their lifecycles (although Brook lamprey and Bullhead would typically be found higher in the catchment).
- The extent of the **Alluvial forests** feature is not certain, although there is an area of woodland immediately downstream of the pumping station which is included in the SAC and is likely to have some components of this feature.

Conservation Objectives

The assessment takes into account the conservation objectives for the site, which are set out in the Core Management Plan (NRW 2017a).

Incorporated Measures

In addition to normal project-level planning and best-practice (see Appendix G):

- construction of the scheme will avoid the main migration period for lamprey species (late October – April) to minimise the risk of displacement or barrier effects due to noise, vibration or site-derived pollutants, unless scheme-specific analyses demonstrate that any effects associated with construction works will be 'not significant' or will have no adverse effect on the integrity of the SACs.

The WRMP requires that these measures be employed at the project-level unless scheme-specific HRAs or 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 more appropriate.

Assessment of Effects – Construction

Effects on surface waters

Construction works will be required close to the river (new pumps and potentially an upsized attenuation pond) and so there is a risk of contamination of surface waters by site-derived pollutants. This could affect Sea lamprey, River lamprey, Brook lamprey, Bullhead and Otter using the river, either directly (if pollutants are toxic) or indirectly through effects on prey species or habitats. Alluvial forests could also be affected, depending on the nature of the pollutant and the exposure of the feature. However, this risk can clearly be avoided or controlled through the normal project planning process (e.g. timing works to minimise the potential exposure of species with seasonal migrations) and standard best-practice pollution control measures (see Appendix G).

Physical disturbance / displacement

The mobile species of the SAC (Sea lamprey, River lamprey, Brook lamprey, Bullhead and Otter) will be sensitive to physical disturbance associated with construction activities (e.g. noise and vibration (all species), active excavations (otter), lighting (otter)). Generally, exposure to these effects would be limited: any disturbance would be localised and short-term only, and for most species the accessibility and availability of alternative habitat areas nearby, and behavioural avoidance responses, would ensure that populations would not be sufficiently exposed to any effects for the integrity of the SAC to be undermined.

[32] As noted, although the option will result in reductions in compensation flow volumes from Llys y Fran as the releases match the actual abstraction more closely, the licence conditions for compensation flows will be still be met and so (from an HRA perspective) the operational effects of altering the compensation releases will be 'not significant' (as the licences have been previously assessed through the Review of Consents and are considered valid for the planning period).

The main exception to this is Sea lamprey and River lamprey, which will be particularly vulnerable to barrier effects due to noise and vibration during the key migration periods, when avoidance or use of other habitats is not possible. River lamprey typically begin migrating upstream in late autumn and winter, to spawn in April; sea lamprey migrate into freshwaters slightly later (late winter / spring before spawning between April and June; Maitland (2003)). On this basis, it would be appropriate to ensure that works are planned for outside this period, and this is therefore incorporated as an avoidance measure (see above and Appendix G). It is clear that other potential construction effects can be avoided or controlled through the normal project planning process and standard best-practice measures.

Assessment of Effects – Operation

As noted, although the operation of the options will alter compensation releases from Llys y Fran this will have 'no adverse effect' on European sites or interest features as the releases will remain within the terms of the existing licence, which was assessed under the Review of Consents and which is considered valid for the planning period.

The use of new variable speed abstraction pumps may alter the risk of entrainment in the abstraction, although Hydrolox screens are currently in place at the intake to minimise this, and changes in entrainment risk (if any) could be managed using similar established measures.

Conclusion

Based on the available information it is clear that this option can be delivered with 'no adverse effect' on the Afonydd Cleddau / Cleddau Rivers SAC (alone). Potential in combination effects with other plans and projects are considered in Section 4.6.

Appropriate Assessment – Pembrokeshire Marine/ Sir Benfro Forol SAC

Context / Feature Screening

The Pembrokeshire Marine/ Sir Benfro Forol SAC covers the Daugleddau Estuary, below the tidal limit of the Afonydd Cleddau. The abstraction and pumping station at Canaston Bridge are located approximately 700m upstream of the tidal limit at Blackpool Bridge and hence the SAC.

NRW mapping data[33] indicates that the habitat features present in the Daugleddau Estuary below Canaston are **Estuaries; Mudflats and sandflats not covered by seawater at low tide; *Salicornia* and other annuals colonizing mud and sand;** and **Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)**. The estuary will also support the mobile species of the site that are also associated with freshwater habitats (**Sea lamprey; River lamprey; Allis shad; Twaite shad;** and **Otter**). These features will be potentially exposed to the effects of the options. The estuary also has **Coastal lagoons** located at Radford Pill and Westfield Pill, approximately 4km from Canaston Bridge, and at St Ishmaels near the mouth of the Milford Haven, although the exposure and sensitivity of these features to the effects of the options will be low.

The remaining marine features (**Sandbanks which are slightly covered by sea water all the time; Large shallow inlets and bays; Reefs; Submerged or partially submerged sea caves; Grey seal**) are located offshore or in the outer reaches of the Milford Haven, and so will not be exposed to the potential effects of the scheme (any effects will be entirely attenuated by marine influences). There will be 'no effect' on these features (and so no risk of 'in combination' effects). Similarly, **Shore dock** is associated with habitats that are not exposed to the effects of the scheme.

Conservation Objectives

The assessment takes into account the conservation objectives for the site, which are set out in the Core Management Plan (NRW 2018b).

[33] e.g. NRW (2017) *Pembrokeshire Marine Indicative Map of the Annex 1 habitats* [online]. Available at: https://naturalresources.wales/media/675189/pembrokeshire-marine-milford-haven-3ii-map.pdf [Accessed 13/07/17].

Incorporated Measures

In addition to normal project-level planning and best-practice (see Appendix G):

- construction of the scheme will avoid the main migration period for lamprey species (late October – April) to minimise the risk of displacement or barrier effects due to noise, vibration or site-derived pollutants, unless scheme-specific analyses demonstrate that any effects associated with construction works will be 'not significant' or will have no adverse effect on the integrity of the SACs.

The WRMP requires that these measures be employed at the project-level unless scheme-specific HRAs or 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 more appropriate.

Assessment of Effects – Construction

The impact pathways for construction effects on the interest features of this SAC are the same as for the Afonydd Cleddau/ Cleddau Rivers SAC (i.e. effects on water quality (etc.) due to site-derived pollutants; and the potential for disturbance of mobile species when using habitats outside the SAC boundary. As a result, the avoidance and mitigation measures proposed for the Afonydd Cleddau/ Cleddau Rivers SAC will safeguard this SAC also, and so adverse effects would not be expected.

Assessment of Effects – Operation

As with the Afonydd Cleddau/ Cleddau Rivers SAC, the operation of the scheme will have 'no adverse effect' on European sites or interest features as the compensation releases will remain within the terms of the existing licence, which was assessed under the Review of Consents and is considered valid for the planning period.

Conclusion

Based on the available information it is clear that this option can be delivered with 'no adverse effect' on the Pembrokeshire Marine/ Sir Benfro Forol SAC. Potential in combination effects with other plans and projects are considered in Section 4.6.

Appropriate Assessment – Pembrokeshire Bat Sites and Bosherston Lakes/ Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston SAC

Context / Feature Screening

The Pembrokeshire Bat Sites and Bosherston Lakes/ Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston SAC comprises a shallow marl lake system (Bosherton Lake) near St. Govan's Head and a series of functionally-linked bat roosts across the peninsula. Bosherton Lake itself is over 20km from Canaston Bridge with no hydrological linkages and so the habitat interest features of the site (**Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp**.) will not be exposed to the effects of the scheme (so there will be 'no effects' on this feature). Similarly, the **Otter** feature is primarily associated with the lake and so exposure will be limited.

The remaining features (**Greater horseshoe bat**; and **Lesser Horseshoe bat**) are associated with a number of roost sites across south Pembrokeshire, the closest of which is the Slebech Stable Yard Loft, Cellars and Tunnels SSSI which is located adjacent to the Daugleddau Estuary at Slebech Park, approximately 3.7km west of Canaston Bridge. This SSSI includes a Greater horseshoe bat maternity roost in the stable yard loft, and hibernation sites in nearby cellars and tunnels that are used by both bat species.

Conservation Objectives

The assessment takes into account the conservation objectives for the site, which are set out in the Core Management Plan (CCW 2008e).

Incorporated Measures

In addition to normal project-level planning and best-practice (see Appendix G):

- construction works should avoid removal of scrub/trees, or damage to stream corridors and other linear features, to prevent possible fragmentation of habitats which may be used by local bat populations, unless surveys or additional investigations establish that they are unlikely to be significant or critical resources for bats from this SAC.

The WRMP requires that these measures be employed at the project-level unless scheme-specific HRAs or 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 more appropriate.

Assessment of Effects – Construction

The proposed development is located within the typical foraging range of horseshoe bat species using Slebech Park, and the importance of the Slebech Stable Yard Loft, Cellars and Tunnels SSSI as a hibernation site is likely to ensure that the landscape around this site (particularly the wooded riparian corridors of the Afonydd Cleddau) is well-used during seasonal migrations also. The local landscape has important feeding areas connected to bat flyways and a range of temporary roosting sites, including along the tidal Cleddau.

It is possible that the development proposed at Canaston Bridge could affect the use of habitats by bats associated with the SAC, for example through:

- direct and permanent removal of important habitat features (e.g. tree lines) to accommodate scheme infrastructure; or
- temporary displacement effects associated with construction, such as from the spillage of site-lighting on to habitat features.

However, the works required for the options will be fairly restricted in scale and likely to affect the existing operational site only. It is clear (from aerial photos) that significant habitat features (e.g. mature trees, linear features) which may be used by bat species could be avoided during construction, and any construction effects will obviously be temporary and can almost certainly be avoided with scheme-specific surveys and planning, and established best-practice. It is clear that these options can both be delivered with 'no adverse effect' on the bat interest features of this SAC, and it is likely that scheme-specific investigations and avoidance measures can ensure that there are 'no likely significant effects' at the project delivery stage.

Assessment of Effects – Operation

Bats are not identified as 'water resource dependent' features and the operation of the scheme would have no significant effects on their use of the landscape.

Conclusion

Based on the available information it is clear that this option can be delivered with 'no adverse effect' on the Pembrokeshire Bat Sites and Bosherston Lakes/ Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston SAC, (alone). Potential in combination effects with other plans and projects are considered in Section 4.6.

Other sites designated for bat species

Two other sites within 20km are designated for their bat species:

- Limestone Coast of South West Wales/ Arfordir Calchfaen de Orllewin Cymru SAC
- North Pembrokeshire Woodlands/ Coedydd Gogledd Sir Benfro SAC

Bats from these sites will also be potentially vulnerable to construction effects (particularly as they may use the Slebech Stable Yard Loft, Cellars and Tunnels SSSI during their life-cycle); however, the normal best-

practice measures identified above will be sufficient to ensure that there will be no adverse effects, and it is almost certain that there will be no significant effects on these sites at the project-level.

4.5 Resilience Option 2A: Transfer from Hereford WRZ

Summary of Scheme

Welsh Water has assessed the susceptibility of the Vowchurch Water Resource Zone (WRZ) to severe droughts and identified that the River Dore and the associated gravel aquifer may not provide the required yield to meet customer demands during a 1 in every 200 years drought event. To address this resilience risk, this option involves laying a new main between the Hereford and Vowchurch WRZs to allow some of the Vowchurch demand to be met from Broomy Hill water treatment works (WTW) when needed.

This option would require:

- the installation of a 12km (approx.) main between Broomy Hill WTW and Kingstone service reservoir (SR); and
- an upgrade of Broomy Hill water pumping station (WPS) to supply 2.5 Ml/d to Kingstone SR.

A total of 0.5 Ml/d would be supplied from Aconbury SR using an existing main. No changes to the abstraction licences would be required.

Likely Impact Pathways

Construction

Construction of the transfer main would require a crossing of the River Wye / Afon Gwy SAC near Hereford. This crossing is likely to be made by directional drill or similar non-invasive techniques. The principal environmental risks are therefore likely to be

- contamination of surface waters by site-derived pollutants;
- disturbance of sensitive species (e.g. from site lighting, noise, visual impact, vibration, etc.).

Operation

The scheme is the transfer of 'spare' water available under existing licences, and so no operational effects will occur.

Screening of European Sites

There are 7 European sites downstream or within 20km of this option, or otherwise linked by a potential effect pathway. The sites, their interest features, and location relative to the option are set out in **Table 4.7**.

Table 4.7 European sites within 20 km of option, or otherwise connected

Site and Interest Features	~Distance / Connectivity
River Wye/ Afon Gwy SAC	0 km

Site and Interest Features	~Distance / Connectivity
▶ Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation ▶ Transition mires and quaking bogs ▶ White-clawed (or Atlantic stream) crayfish Austropotamobius pallipes ▶ Sea lamprey Petromyzon marinus ▶ Brook lamprey Lampetra planeri ▶ River lamprey Lampetra fluviatilis ▶ Allis shad Alosa alosa ▶ Twaite shad Alosa fallax ▶ Atlantic salmon Salmo salar ▶ Bullhead Cottus gobio ▶ Otter Lutra lutra	
River Usk/ Afon Wysg SAC ▶ Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation ▶ Sea lamprey Petromyzon marinus ▶ Brook lamprey Lampetra planeri ▶ River lamprey Lampetra fluviatilis ▶ Allis shad Alosa alosa ▶ Twaite shad Alosa fallax ▶ Atlantic salmon Salmo salar ▶ Bullhead Cottus gobio ▶ Otter Lutra lutra	16.3 km
Usk Bat Sites/ Safleoedd Ystlumod Wysg SAC ▶ European dry heaths ▶ Degraded raised bogs still capable of natural regeneration ▶ Blanket bogs (* if active bog) ▶ Calcareous rocky slopes with chasmophytic vegetation ▶ Caves not open to the public ▶ Tilio-Acerion forests of slopes, screes and ravines ▶ Lesser horseshoe bat Rhinolophus hipposideros	17.3 km
Coed y Cerrig SAC ▶ Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)	4.8 km
Severn Estuary Ramsar ▶ 1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique wetland types ▶ 3 - supports populations of plant/animal species important for maintaining regional biodiversity Crit. 3 - supports populations of plant/animal species important for maintaining regional biodiversity ▶ 4 - supports plant/animal species at a critical stage in their life cycles, or provides refuge Crit. 4 - supports plant/animal species at a critical stage in their life cycles, or provides refuge ▶ 5 - regularly supports 20,000 or more waterbirds Crit. 5 - regularly supports 20,000 or more waterbirds ▶ 6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds Crit. 6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds ▶ 8 - important source of food for fishes, spawning ground, nursery and/or migration path Crit. 8 - important source of food for fishes, spawning ground, nursery and/or migration path	DS
Severn Estuary SPA ▶ Tundra swan Cygnus columbianus bewickii ▶ Common shelduck Tadorna tadorna ▶ Gadwall Anas strepera ▶ Common redshank Tringa totanus ▶ Greater white-fronted goose Anser albifrons albifrons ▶ Dunlin Calidris alpina alpina ▶ Waterfowl assemblage	DS
Severn Estuary/ Môr Hafren SAC	DS

Site and Interest Features	~Distance / Connectivity
▶ Sandbanks which are slightly covered by sea water all the time ▶ Estuaries ▶ Mudflats and sandflats not covered by seawater at low tide ▶ Reefs ▶ Atlantic salt meadows (Glauco-Puccinellietalia maritimae) ▶ Sea lamprey Petromyzon marinus ▶ River lamprey Lampetra fluviatilis ▶ Twaite shad Alosa fallax	

*Priority features
DS – Downstream site

Several of these sites will be unaffected by the option, primarily due to the absence of impact pathways; these sites are identified in **Table 4.8**, and are not considered further within the assessment of this option (note, for these sites it is considered that there will be 'no effects' (as opposed to 'no likely significant effects') and so there will be no possibility of 'in combination' effects).

Table 4.8 Screening of European sites

Site	Consider further?	Rationale
River Wye/ Afon Gwy SAC	Yes	Site crossed by pipeline route.
River Usk/ Afon Wysg SAC	No	No reasonable impact pathways (separate catchment).
Usk Bat Sites/ Safleoedd Ystlumod Wysg SAC	Yes	Site within 20km; mobile species potentially vulnerable to construction.
Coed y Cerrig SAC	No	No reasonable impact pathways (separate catchment).
Severn Estuary Ramsar	Yes	Site is a downstream receptor but is over 98 km from the likely crossing point and so effects on the site habitats associated with construction will not occur due to the natural attenuation of any pollutants. However, the site is designated for mobile species (including Eels) which will use the River Wye and so potentially be exposed to effects during migration.
Severn Estuary SPA	No	Site is a downstream receptor but is over 98 km from the likely crossing point and so effects on the site habitats associated with construction will not occur due to the natural attenuation of any pollutants. The mobile features of the site will not be exposed due to their behavioural preferences.
Severn Estuary/ Môr Hafren SAC	Yes	Site is a downstream receptor but is over 98 km from the likely crossing point and so effects on the site habitats associated with construction will not occur due to the natural attenuation of any pollutants. However, the site is designated for mobile species (including River lamprey and Twaite shad) which will use the River Wye and so be potentially be exposed to effects during migration.

The likely effects of the option on those sites where potential impact pathways are identified (i.e. the possibility of significant effects cannot be excluded) are considered through 'appropriate assessment' in the following sections.

Incorporated Measures

Appropriate site- and feature-specific avoidance measures and development criteria are set out in Appendix G of this HRA. The WRMP requires that these measures be employed at the project-level unless scheme-specific HRAs or 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 more appropriate. Additional, feature-specific measures are identified (and accounted for) within the following appropriate assessments for each European site. No specific measures (over the requirements for normal project-level planning and

best-practice) are considered necessary at the plan-level for any other European sites potentially exposed to the likely effects of the option (see screening above).

Appropriate Assessment – River Wye/ Afon Gwy SAC

Context / Feature Screening

The River Wye/ Afon Gwy SAC is a large river in a geologically mixed catchment with a channel that is largely unmodified for much of its length, including gorges and significant areas of riparian woodland. The river undergoes a transition from oligotrophic conditions in its Welsh headwaters (associated with infertile upland landscapes around Plynlimon and mid-Wales) to mesotrophic conditions in its lower reaches. The upper reaches are characterised by bryophyte-dominated vegetation, and the lower reaches by extensive *Ranunculus* beds.

Information on the precise distribution of the SAC interest features is often limited, particularly where species are at the edge of their range or patchily distributed. **Table 4.9** summarises the feature distributions, based on the NRW Core Management Plan (NRW 2017) and NE information on conservation objectives and site improvement (NE 2018a, 2018b).

Table 4.9 Feature distributions

Feature	Broad distribution within SAC
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation	*Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation is widely distributed throughout the SAC, but is particularly prevalent in the middle and lower reaches, where the plant communities are typical of mesotrophic rivers and streams. It is more unusual in the headwaters, where oligotrophic conditions dominate.
Transition mires and quaking bogs	This feature is only found within Colwyn Brook Marshes (North & South) SSSI; this component SSSI is located on the headwaters of the River Edw, near Builth Wells.
White-clawed crayfish	There has been a major decline in the distribution and abundance of white-clawed crayfish in the Wye catchment, and the species may now be largely absent from the main river channel in its middle reaches. The River Wye (Tributaries) SSSI is thought to form the core range, with significant populations now confined to the Welsh rivers Sgithwen, Cletwr, Edw, Llynfi Dulas and Builth Road Dula.
Sea lamprey	Primarily associated with the lower reaches of the River Wye, but recorded spawning to Rhyader on the main channel of the River Wye. Key spawning sites are thought to be in lower reaches of the Wye.
Brook lamprey	Considered present in most reaches of the river, although likely to be more prevalent in the headwaters.
River lamprey	As for brook lamprey, although river lamprey may be the more abundant species in the main channel and the lower reaches of larger tributaries
Twaite shad	Known to spawn in the lower reaches of the River Wye around Monmouth, and will migrate through other reaches; has been recorded in the lower 0.6 km of the River Irfon SSSI, above the confluence with the Wye; only infrequently recorded above this point. Known spawning sites at Builth Wells.
Allis shad	Allis shad are thought to be uncommon within the Wye, although difficulties in distinguishing this species from the Twaite shad ensure that accurate information on distribution is not available. For monitoring and management purposes it is assumed that the distribution is the same as for Twaite shad.
Atlantic salmon	The Atlantic salmon is the focus for much of the management activity carried out on the Wye. It is widely distributed throughout the SAC and is present in all site units, other than the Colwyn Brook Marshes (North & South) SSSI. The principal spawning areas are in the headwaters of the river, some distance upstream of Hereford.
Bullhead	Bullheads are very widely distributed throughout the whole of the River Wye SAC, and are present in most site units.
Otter	Present within all units of the River Wye SAC, with higher densities in the mid-Wales reaches and the coastal reaches around the Severn Estuary and Gwent levels.

With regard to the Wye at Hereford (the approximate location of any crossing), all of the features except **Transition mires and quaking bogs** and **White-clawed crayfish** are likely to be present in these reaches for all or part of the year, although although **Brook lamprey** and **Bullhead** would typically be more common higher in the catchment.

The NE Site Improvement Plan (NE 2018b) identifies a range of threats and pressures that have the potential to affect the SAC and feature integrity; of these, 'water pollution' is the aspect most likely to occur as a result of the pipeline scheme if appropriate measures are not employed during construction. In addition, the features of the SAC will be potentially vulnerable to other environmental changes associated with the scheme, including changes in noise, vibration, or visual or electromagnetic stimuli, which can disturb and / or displace species or create barrier effects. These environmental changes generally operate over short-ranges only (several hundred metres or less), although consequential effects (e.g. if barriers to migration are created) can be substantial.

Conservation Objectives

The assessment takes into account the conservation objectives for the site, which are set out in the NRW Core Management Plan (NRW 2017b) and the Natural England Conservation Objectives (NE 2016a).

Incorporated Measures

In addition to normal project-level planning and best-practice (see Appendix G):

- construction of the scheme near the Wye will avoid the main migration period for salmon, and shad and lamprey species (September – May) to minimise the risk of displacement or barrier effects due to noise, vibration or site-derived pollutants; and
- the river crossing will be completed using a non-invasive crossing method that does not require in-channel disturbance (e.g. Horizontal Directional Drill (HDD) or similar).

The WRMP requires that these measures be employed at the project-level unless scheme-specific HRAs or 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 more appropriate.

Assessment of Effects – Construction

Effects on surface waters

Construction works may be required close to the river (depending on the precise crossing method selected) and open cut construction techniques will be required elsewhere in the catchment, and so there is a risk of contamination of surface waters by site-derived pollutants. This could affect all of the site features, with the exception of Transition mires and quaking bogs and White-clawed crayfish, which are not likely to be exposed to any environmental changes that occur in the middle reaches of the river near Hereford.

The crossing of the river will almost certainly be non-invasive (see 'Incorporated Measures', above) and so the risks of water pollution are not substantial and can be clearly be avoided or controlled through the normal project planning process (e.g. timing works to minimise the potential exposure of species with seasonal migrations) and standard best-practice pollution control measures (see Appendix G and 'Incorporated Measures' above). There is a risk with HDD (or similar) of 'lubricant breakout', where the drill lubricant fluids (typically suspensions of fine-grained clays) escape from the bore and contaminate surrounding habitats; this risk is well-understood and can be reliably managed using specific techniques according to the drilling method used.

Physical disturbance / displacement

The mobile species of the SAC (Atlantic salmon, Twaite shad, Allis, shad, Sea lamprey, River lamprey, Brook lamprey, Bullhead and Otter) will be sensitive to physical disturbance associated with construction activities (e.g. noise and vibration (all species), active excavations (otter), lighting (otter)).

The effects of anthropogenic noise on fish are broadly categorised into behavioural and physiological effects, and sensitivity to sound levels differs between species. Physiological effects (i.e. direct damage to organs etc. associated with hearing such as the swim bladder) are generally considered unlikely unless the fish are in very close proximity to sudden, loud noises (they have generally been recorded during seismic geological investigations), and most potential effects are therefore associated with behavioural responses (avoidance etc.).

There are very few data on the responses of particular species or species groups to noise levels, or on thresholds that may elicit a behavioural response; in reality, this is likely to be strongly dependent on the local environment and the background noise levels. However, some evidence that can be used to infer the likelihood of effects is provided by Nedwell *et al*. (2003): here, caged trout were monitored for behavioural responses during vibropiling undertaken in Southampton Water, with monitored cages located between ~50m and ~400m from the source. This study found no evidence of any reactions to vibropiling, even at the closest monitoring location (~50m from source). Salmon are thought to be more sensitive to noise than brown trout (Nedwell *et al*. 2006), although modelling and monitoring of construction noise (Nedwell *et al*. 2008) indicated that the underwater noise from land-based rock pecker operations were unlikely to cause a disturbance to migratory salmon over 200m away.

It is obviously not possible to define the potential extent or magnitude of any exposure at this stage (this can only be undertaken once detailed construction proposals are set out); however it is likely that a HDD (or similar) would require launch and reception chambers within a couple of hundred metres of the river, and would probably have a maximum drill depth of around 10 – 15m (although these aspects are obviously highly variable according to techniques employed). However, it is evident that the 'zone of influence' of any such environmental changes will be limited, and so any effects on the river environment would be localised and short-term only. It is also evident that HDD and similar techniques are commonly employed without adverse effects on ecological receptors.

For most species at most stages in their life-cycle, the accessibility and availability of alternative habitat areas nearby and behavioural avoidance responses would ensure that populations would not be sufficiently exposed to any effects for the integrity of the SAC to be undermined. The main exception to this is diadramous fish species (Atlantic salmon, Twaite shad, Allis, shad, Sea lamprey, River lamprey) which will be particularly vulnerable to barrier effects due to noise and vibration during the key migration periods, when avoidance or use of other habitats is not possible.

Given the uncertainty regarding the precise parameters of construction near the Wye it is appropriate to ensure that works are planned for outside the key migration periods (i.e. September – May), and this is therefore incorporated as an avoidance measure for works in close proximity to the Wye (see above and Appendix G) that will be employed unless scheme-specific investigations suggest this is not necessary. **Table 4.10** summarises the key migration periods of these species based on Maitland (2003), Hendry & Cragg-Hine (2003) and Maitland & Hatton-Ellis (2003).

Table 4.10 Indicative key migration periods

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sea lamprey												
River lamprey												
Twaite shad												
Allis shad												
Atlantic salmon												
Eel*												

Approximate period of migration from sea to river

Approximate spawning period (not shown for eels, although this is thought to be March / April

Approximate period of migration from river to sea (note, not all species undertake mass migrations)

* Note, Eels are not a feature of the River Wye/Afon Gwy SAC but is associated with the Severn Estuary Ramsar (see below) and so is included here for simplicity.

Assessment of Effects – Operation

The scheme will have no operational effects on this SAC.

Conclusion

Based on the available information it is clear that this option can be delivered with 'no adverse effect' on the River Wye/ Afon Gwy SAC (alone). Potential in combination effects with other plans and projects are considered in Section 4.6.

Appropriate Assessment – Severn Estuary SAC / Severn Estuary Ramsar

Conservation Objectives

The assessment takes into account the conservation objectives for the sites, which are set out in the Core Management Plan (CCW 2009) and the Natural England Conservation Objectives (NE 2016b, NE 2016c). The conservation objectives for the Ramsar site features are assumed to be as for the equivalent SPA or SAC features.

Assessment

The habitat features of the SAC (**Sandbanks which are slightly covered by sea water all the time; Estuaries; Mudflats and sandflats not covered by seawater at low tide; Reefs; Atlantic salt meadows (Glauco-Puccinellietalia maritimae)**) or and Ramsar site[34] will not be exposed to any environmental changes as a result of the option (even assuming best-practice control measures are not employed) due to the distance downstream from the likely construction area (over 90km) and the consequent attenuation of any site-derived pollutants. However, the diadramous fish species of the SAC (Sea lamprey; River lamprey; Twaite shad) and the Ramsar (as for the River Wye/ Afon Gwy SAC, plus Eel) will use the River Wye for spawning and so are potentially exposed to construction effects during migration.

However, the measures employed to safeguard the River Wye/ Afon Gwy SAC will also safeguard the species associated with the Severn Estuary SAC / Severn Estuary Ramsar when using the River Wye, and so no additional effects would be expected. Based on the available information it is clear that this option can

[34] As for the SAC, excluding the 'Reefs' feature.

be delivered with 'no adverse effect' on the Severn Estuary SAC / Severn Estuary Ramsar. Potential in combination effects with other plans and projects are considered in Section 4.6.

Appropriate Assessment – Usk Bat Sites/ Safleoedd Ystlumod Wysg SAC

Context / Feature Screening

The Usk Bat Sites/ Safleoedd Ystlumod Wysg SAC is a large complex of series of **lesser horseshoe bat** roosts and associated upland habitats, woodlands and cave systems located around the valley of the River Usk near to Abergavenny. The closest unit of the SAC to the likely route of the pipeline is Foxwood SSSI, approximately 17.3 km away. The habitat interest features of the site (**European dry heaths; Degraded raised bogs still capable of natural regeneration; Blanket bogs (* if active bog); Calcareous rocky slopes with chasmophytic vegetation; Caves not open to the public; Tilio-Acerion forests of slopes, screes and ravines**) will not be exposed to the effects of the scheme due to the distance (so there will be 'no effects' on these features).

The closest SAC unit to the likely route of the pipeline (Foxwood SSSI) is approximately 17.3 km away, which provides hibernation caves and woodland foraging. Lesser horseshoe bats generally have fairly limited foraging and commuting ranges during the summer (typically less than 5km from a roost, and usually within 2.5km), although longer distance migrations occur when moving to and from hibernation areas; the species is widespread across the Usk and Wye valleys in south Wales. They mainly forage in broadleaf woodlands, as well as in other woodlands and areas of high habitat diversity; however, the species is not a bold flyer, usually avoiding open areas or navigating close to hedgerows or treelines that provide some cover. However, Lesser horseshoe bats are widespread across the Usk and Wye valleys and there are likely to be roost sites closer to the construction area than this.

Conservation Objectives

The assessment takes into account the conservation objectives for the sites, which are set out in the Core Management Plan (CCW 2008f).

Incorporated Measures

No site- or feature-specific measures are identified for this site beyond the normal project-level planning and best-practice (see Appendix G).

Assessment of Effects – Construction

None of the SAC habitats will be affected by the proposals due to the absence of impact pathways (distance, separate catchments). There is a small risk of construction works affecting lesser horseshoe bats if favoured commuting routes or features (e.g. hedges, woodlands) are affected by the proposals (e.g. through removal, or from site lighting etc.), but the likelihood of this is very low as

- the proposed works are relatively discrete; and
- it is very unlikely that bats from the SAC will make significant use of the habitats around the development area given the distance.

Furthermore, any risk of effects can certainly be avoided or controlled through the normal project planning process and standard best-practice measures (see Appendix G), and it is likely that the scheme would have 'no effect' (as opposed to 'no likely significant effect') on this site with these applied. As a result, the conclusion of the appropriate assessment stages is that the option (with normal best practice) will have no effects on this site, and so 'no adverse effects alone or in combination'.

Assessment of Effects – Operation

No effects will occur as a result of the scheme operation.

Conclusion

Based on the available information it is clear that this option can be delivered with 'no adverse effect' on the Usk Bat Sites/ Safleoedd Ystlumod Wysg SAC, alone or in combination.

4.6 In Combination Effects

The assessment of 'in combination' effects in the following sections covers potential interactions between the preferred options and other schemes as individual projects, and the wider potential interactions associated with other strategies and plans. However, it must be recognised that not every potential future 'in combination' effect can be determined at the plan level, and that project-level HRA will still be required to ensure either no significant effects or no adverse effects at delivery.

Effects between Preferred Options

In combination effects between Options TYA004 and TYA009a are possible since the same sites will be exposed to the effects of the options; these effects are considered further below. There will be no 'in combination' effects between the Pembrokeshire options (as only one of these will be employed) nor between the Tywyn Aberdyfi options, the Pembrokeshire option and the Vowchurch option as the WRZs are some distance apart and no European sites are exposed to the effects of options from more than one WRZ.

Options TYA004 / TYA009a

Options TYA004 and TYA009a involve construction schemes in the same area, and will both affect the Afon Dysynni through their operation. **Tables 4.11** and **4.12** identify those European sites where a reasonable impact pathway exists through construction or operation for both options, and which could therefore be exposed to significant effects 'in combination'; it does not include sites where one or both options will have 'no effect' (since there cannot, in these instances, be 'in combination' effects). It then provides as summary of the 'alone' assessment and identifies whether any significant 'in combination' effects are likely. The assessment draws on the site context information provided in Sections 4.3 and 4.4; this is not repeated here.

With regard to construction, 'in combination' effects are only likely to be possible if both options are delivered in a similar timeframe, where interest features are affected either simultaneously or sequentially by both options.

With regard to operation, Option TYA009a will be within the terms of the existing licence which is valid for the planning period based on the Review of Consents, this option will have 'no adverse effects' alone; however, it will be possible for the new abstraction required under TYA004 to have 'in combination' effects with the existing permissions regime, including the licence utilised for TYA009a (as well as other non-Welsh Water abstraction or discharge consents). The detailed examination of possible 'in combination' effects with the existing consents regime can only be undertaken by NRW through its permitting procedures, and cannot be replicated by the HRA of the WRMP. However, it is clear that the effects on flows will be minimal and the 2015 Meirionnydd Catchment Abstraction Management Strategy (CAMS) states that water is available for abstraction without restrictions within the Dysynni; on this basis, TYA004 is not considered likely to have any adverse effects on the integrity of any European sites.

Table 4.11 Summary of 'in combination' assessment – construction

Site	Summary of plan-level 'alone' assessment	Summary of 'in combination' assessment
Craig yr Aderyn (Bird`s Rock) SPA	No adverse effects (note, in practice, potential effects will be entirely avoidable with normal best-practice)	No 'in combination' effects anticipated; areas affected will not provide critical habitat resources for chough from this SPA and any potential effects associated with concurrent construction periods can be easily avoided with normal best-practice.
Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC	No adverse effects (note, in practice, potential effects are likely to be nil and entirely avoidable with normal best-practice)	No 'in combination' effects anticipated; any potential effects easily avoided with normal best-practice.

Site	Summary of plan-level 'alone' assessment	Summary of 'in combination' assessment
Northern Cardigan Bay / Gogledd Bae Ceredigion SPA	No adverse effects (note, in practice, potential effects are likely to be nil and entirely avoidable with normal best-practice)	No 'in combination' effects anticipated; any potential effects easily avoided with normal best-practice.
West Wales Marine / Gorllewin Cymru Forol cSAC	No adverse effects (note, in practice, potential effects are likely to be nil and entirely avoidable with normal best-practice)	No 'in combination' effects anticipated; any potential effects easily avoided with normal best-practice.
Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC	No adverse effects (note, in practice, potential effects are likely to be nil and entirely avoidable with normal best-practice)	No 'in combination' effects anticipated; areas affected will not provide critical habitat resources for chough from this SPA and any potential effects associated with concurrent construction periods can be easily avoided with normal best-practice.
Afon Eden - Cors Goch Trawsfynydd SAC	No adverse effects (note, in practice, potential effects are likely to be nil and entirely avoidable with normal best-practice)	No 'in combination' effects anticipated; any potential effects easily avoided with normal best-practice.

Table 4.12 Summary of 'in combination' assessment – operation

Site	Summary of plan-level 'alone' assessment	Summary of 'in combination' assessment
Craig yr Aderyn (Bird`s Rock) SPA	No effects.	n/a
Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC	No adverse effects. There is a theoretical potential for effects on features associated with the mouth of the Dysynni (i.e. Reefs) but any effects will be negligible due to the limited influence of freshwater inputs in offshore areas, and the small scale of the changes in flows from the Dysynni. In practice, potential effects are likely to be nil.	No 'in combination' effects anticipated. The 2015 Meirionnydd Catchment Abstraction Management Strategy (CAMS) states that water is available for abstraction without restrictions within the Dysynni.
Northern Cardigan Bay / Gogledd Bae Ceredigion SPA	No adverse effects. Potential for effects on habitat features associated with the mouth of the Dysynni (i.e. Reefs) that may be used by the SPA interest features, but any effects will be negligible and localised (see Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC, above) and the SPA interest features will not be particularly exposed and sensitive to any changes (given area of SPA and foraging characteristics). In practice, potential effects are likely to be nil.	No 'in combination' effects anticipated. TYA009a will operate within the terms of the existing licence and the 2015 Meirionnydd Catchment Abstraction Management Strategy (CAMS) states that water is available for abstraction without restrictions within the Dysynni.
West Wales Marine / Gorllewin Cymru Forol cSAC	No adverse effects. Potential for effects on habitat features associated with the mouth of the Dysynni (i.e. Reefs) that may be used by the cSAC interest features, but any effects will be negligible and localised (see Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC, above) and the cSAC interest features will not be particularly exposed and sensitive to any changes (given area of SAC and their foraging behaviours). In practice, potential effects are likely to be nil.	No 'in combination' effects anticipated. TYA009a will operate within the terms of the existing licence and the 2015 Meirionnydd Catchment Abstraction Management Strategy (CAMS) states that water is available for abstraction without restrictions within the Dysynni.
Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC	No effects.	n/a

Site	Summary of plan-level 'alone' assessment	Summary of 'in combination' assessment
Afon Eden - Cors Goch Trawsfynydd SAC	No adverse effects. Potential for effects on habitat features associated with the mouth of the Dysynni (i.e. Reefs) that may be used by the SAC interest features, but any effects will be negligible and localised (see Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC, above) and the SAC interest features will not be particularly exposed and sensitive to any changes (given the wider availability of similar habitat in the marine areas). In practice, potential effects are likely to be nil.	No 'in combination' effects anticipated. TYA009a will operate within the terms of the existing licence and the 2015 Meirionnydd Catchment Abstraction Management Strategy (CAMS) states that water is available for abstraction without restrictions within the Dysynni.

Effects with major projects

Known major projects that are likely to increase demand have been taken into account during the development of the WRMP[35] and determination of future deficits; this is in addition to the growth scenarios used to determine the effects of local plans/housing growth (etc). By modelling these major projects when determining deficits and proposals, the WRMP can ensure that LSE 'in combination' with these projects is unlikely (in terms of water resources availability). These projects are also unlikely to have 'in combination' effects in relation to construction, assuming normal construction best practice, due to the relative locations of these projects and the Preferred Options.

The potential for currently identified NSIPs to operate in combination with the options are summarised in **Tables 4.13** – **4.15** below.

Table 4.13 Current NSIPs and known major projects with the potential for 'in combination' effects with TYA004 / TYA009a

Project	Status	Summary	Interaction with TYA004
Wylfa Newydd Nuclear Power Station	Pre-Application	New nuclear power station on Anglesey; significant construction / operational effects likely on habitats etc off the north Anglesey coast; HRA ongoing.	New nuclear power station with potentially significant operational effects on marine sites off the north Anglesey coast. The zone of influence will not extend to the marine sites within the TYA004 ZoI (including **Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC; Northern Cardigan Bay / Gogledd Bae Ceredigion SPA**; and **West Wales Marine / Gorllewin Cymru Forol cSAC**). There is a theoretical risk of mobile species associated with these sites being affected by both schemes, although the effects of TYA004 on these species will be negligible and in combination effects would not be expected.
Tidal Energy Ltd, Deltastream Demonstration Array, St David's Head, Pembrokeshire.	Pre-application	Proposed array of tidal stream devices, although Tidal Energy Ltd. is in administration and no further information on the scheme is available.	Tidal Energy Ltd. is in administration and no further information on the scheme is available.
Minestro Deep Green Holyhead Deep – 80MW	Pre-application	Proposed extension of Holyhead Deep tidal kite array to increase capacity of 80MW; site intended to be developed in three phases as part of a deploy-and-monitor approach. Minestro has submitted a scoping report to UK consenting authorities Marine Management Organisation (MMO) and Natural Resources Wales (NRW), asking	Scheme will not have direct effects on the habitats within within the TYA004 ZoI (including those associated with **Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC; Northern Cardigan Bay / Gogledd Bae Ceredigion SPA; and West Wales Marine / Gorllewin Cymru Forol cSAC**). There is a theoretical risk of mobile species associated with these sites being affected by both schemes, although the effects of TYA004 on these species will be entirely negligible and in combination effects would not be expected.

[35] See the *Demand Forecasts for Water Resources Management Plan 2010 Technical Report*, which is included in the appendices to the WRMP.

Project	Status	Summary	Interaction with TYA004
		for their scoping opinion for development of an 80 MW site in Holyhead Deep.	

Table 4.14 Current NSIPs and known major projects with the potential for 'in combination' effects with PEM024a / PEM024b

Project	Status	Summary	Interaction with PEM024a / PEM024b
Tidal Energy Ltd, Deltastream Demonstration Array, St David's Head, Pembrokeshire.	Pre-application	Proposed array of tidal stream devices, although Tidal Energy Ltd. is in administration and no further information on the scheme is available.	Tidal Energy Ltd. is in administration and no further information on the scheme is available.
South Hook Combined Heat & Power Station	Decided	New Combined Heat & Power Station located on the northern edge of Milford Haven, approximately 30km downstream of the abstraction at Canaston Bridge. Scheme has been granted permission following an EIA and HRA.	The HRA for the South Hook scheme identified four European sites with features that are also potentially exposed to the effects of PEM024a / PEM024b, as follows: ▶ Afonydd Cleddau/ Cleddau Rivers SAC ▶ Pembrokeshire Marine/ Sir Benfro Forol SAC ▶ Pembrokeshire Bat Sites and Bosherston Lakes/ Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston SAC ▶ Limestone Coast of South West Wales/ Arfordir Calchfaen de Orllewin Cymru SAC Options PEM024a / b will not have any significant operational effects on these sites alone (as the licence has been confirmed as valid through the Review of Consents). The 'in combination' assessment for the HRA of the South Hook scheme did not explicitly consider the existing consents regime, although if the consents are currently having 'no adverse effect' alone or in combination then that is effectively the current baseline. However, modelling work undertake for the HRA of the South Hook scheme suggests that the 'zone of influence' of operational and construction effects (principally discharges to Milford Haven, including warm water discharges) will not extend substantially upstream beyond the town of Milford Haven itself; as this point is at least 25km downstream of Canaston Bridge, and in a marine environment, it is certain that the zones of influence of the South Hook scheme and PEM024a / b will not intersect, and so coincident in combination effects on the habitat features of Afonydd Cleddau/ Cleddau Rivers SAC or Pembrokeshire Marine/ Sir Benfro Forol SAC will not occur. The mobile species of these SACs, and of Pembrokeshire Bat Sites and Bosherston Lakes/ Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston SAC and Limestone Coast of South West Wales/ Arfordir Calchfaen de Orllewin Cymru SAC, are theoretically vulnerable to in combination effects where these affect species at different points in their range or lifecycle. However, as noted the only mechanism for effects from PEM024a /b is through construction, and it is clear that these potential effects can be easily avoided using normal measures. As a result 'in combination' effects would not be anticipated. The HRA of the South Hook scheme also concluded that there would be no adverse effects on the mobile species of these SACs.

Table 4.15 Current NSIPs and known major projects with the potential for 'in combination' effects with VOW2a

Project	Status	Summary	Interaction with VOW2a
Tidal Lagoon, Swansea Bay.	Decided	Tidal lagoon and associated electricity generating infrastructure with a nominal capacity of 240MW.	The HRA for the Swansea Bay Tidal Lagoon (SBTL) concluded that there would be no adverse effects (alone or in combination) on the Severn Estuary SAC / SPA / Ramsar, although the operational licences are still being considered with the potential for adverse effects on fish populations not considered to be fully resolved. The VOW2a will (with or without mitigation) have no effect on the habitats of the Severn Estuary sites and so 'in combination' effects would not occur in the estuary. Effects are only possible due to interactions at different stages in the fish life-cycle (e.g. if VOW2a affected migrating fish so reducing breeding success, and the Tidal Lagoon then compounded this by negatively affecting populations when using in-shore areas); however, effects on migrating (etc) fish due to VOW2a can be reliably prevented with the incorporated measures, and so no adverse effects would be expected in combination. It is possible that the lagoon scheme will not be in place before the VOW2a scheme is completed, in which case there will be no possibility of in combination effects.
Tidal Lagoon, Newport.	Pre-application	Tidal lagoon electricity generating station with a potential generating capacity of 1800MW up to a possible 2800 MW. A seawall attached to the foreshore, at its western extent.	The effects of this scheme cannot be predicted, although significant effects on the Severn Estuary SAC / SPA / Ramsar are certain. However, the 'in combination' assessment for this scheme and VOW2a is as for the SBTL above.
Tidal Lagoon, Cardiff.	Pre-application	Tidal lagoon electricity generating station with a potential generating capacity of 1800MW up to a possible 2800 MW. A seawall attached to the foreshore, at its western extent.	The effects of this scheme cannot be predicted, although significant effects on the Severn Estuary SAC / SPA / Ramsar are certain. However, the 'in combination' assessment for this scheme and VOW2a is as for the SBTL above.
Hinkley Point C New Nuclear Power Station	Decided	The proposal is for a nuclear power station with two nuclear reactors capable of generating a total of up to 3,260MW of electricity at Hinkley Point C and associated development.	The HRA for the Hinkley Point C (HPC) concluded that there would be no adverse effects (alone or in combination) on the Severn Estuary SAC / SPA / Ramsar. The VOW2a will (with or without mitigation) have no effect on the habitats of the Severn Estuary sites and so 'in combination' effects would not occur in the estuary. Effects are only possible due to interactions at different stages in the fish life-cycle (as for SBTL above); however, effects on migrating (etc) fish due to VOW2a can be reliably prevented with the incorporated measures, and so no adverse effects would be expected in combination.
Oldbury New Nuclear Power Station	Pre-application	A Nuclear Power Station using Pressurised Water Reactor (PWR) technology. Comprising of up to three nuclear reactors with a combined expected output of about 3300 MW.	The effects of this scheme cannot be predicted, although significant effects on the Severn Estuary SAC / SPA / Ramsar are very likely. However, the 'in combination' assessment for this scheme and VOW2a is as for the SBTL above.
Avon Power Station	Pre-application	New gas fired power station comprising high efficiency combined cycle gas turbines of up to 1500MW, with additional fast response generators (peaking plant) providing a combined capacity of up to 1800MW.	The effects of this scheme cannot be predicted, although significant effects on the Severn Estuary SAC / SPA / Ramsar are very likely. However, the 'in combination' assessment for this scheme and VOW2a is as for the SBTL above.

Project	Status	Summary	Interaction with VOW2a
West Somerset Tidal Lagoon	Pre-application	Tidal Lagoon and associated electricity generating infrastructure with a generating capacity of circa 2.8GW per annum. A continuous breakwater wall spanning from Culvercliff in Minehead to Lilstock (approximately 21 km long).	The effects of this scheme cannot be predicted, although significant effects on the Severn Estuary SAC / SPA / Ramsar are certain. However, the 'in combination' assessment for this scheme and VOW2a is as for the SBTL above.
Seabank 3 CCGT	Pre-application	Two additional high efficiency combined cycle gas turbines (CCGT) with a combined capacity of up to 1,400MW that integrate with existing gas and electricity transmission infrastructure and will run in parallel with the existing 1,100MW of generation capacity giving a total output for the combined Station of up to 2,500MW.	The effects of this scheme cannot be predicted, although significant effects on the Severn Estuary SAC / SPA / Ramsar are very likely. However, the 'in combination' assessment for this scheme and VOW2a is as for the SBTL above.

Minor projects

It has not been possible to produce a definitive list of existing (minor) planning applications near the likely construction areas, and in reality the timescales for construction of the Options are such that generating a list at this stage would be of little value. Since the WRMP has been based on the most recent ONS growth projections and developed with reference to local plans, the combined effect of any minor developments on water demand has been accounted for within the WRMP projections. As a result, it is considered that there will be no impacts in terms of water resource availability (i.e. it is unlikely that a substantial water-using development or industry would come online that had not been considered by the WRMP). It is possible that there will be 'in combination' scheme-specific construction effects associated with future planning applications, although this can only be assessed nearer the time of construction.

Effects with other strategic plans and water resource demand

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. Potential 'in combination' effects in respect of water-resource demands due to other plans or projects are 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).

Obviously 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 side 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 prepared 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. It is also informally reviewed on an annual basis.

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 other strategic plans and development pressure

Regional and local plans have been reviewed at a high level to determine whether there are any likely significant 'in combination' effects (see Appendix F), 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 delivery of the WRMP Options and the absence of detail on allocation proposals makes any 'in combination' assessment difficult and potentially meaningless. However, the WRMP Options are not of a scale or type that would make 'in combination' effects likely.

New water and existing consents

Where 'new water' is required (i.e. a new or modified abstraction) 'in combination' water-resource demands are possible with existing abstractions. As noted, the WRMP does not explicitly consider the potential 'in combination' effects of non-Welsh Water abstraction or discharge consents since this is addressed by the EA RoC process or the licence application process (which will be subject to HRA). However, it must be recognised that the water potentially available from a source is determined by the EA, NRW and Welsh Water, based on various assessments and data sources including the relevant CAMS; options are only proposed where there is a reasonable likelihood of water being available. In most instances the potential 'in combination' effects can only be meaningfully assessed as part of the investigation works that are required for a new licence or amendment (for example, if new boreholes are required to assist with the modelling of a groundwater resource), and it should be noted that:

- the 2015 Meirionnydd Catchment Abstraction Management Strategy (CAMS) states that water is available for abstraction without restrictions within the Dysynni; and
- the Pembrokeshire options will operate within the terms of the existing licences regards abstraction and compensation releases.

Welsh Water's Drought Plan

The Drought Plan identifies those European sites that may be at risk and provides a mechanism for additional studies to quantify this risk and identify potential solutions that avoid or minimise adverse effects. However, it must be recognised that the Drought Plan is only ever deployed *in extremis*, when conditions are such that European sites are likely to be affected independently of the Drought Plan's operation. Welsh Water is currently revising its Drought Plan, which is itself subject to HRA. Whilst the Drought Plan and WRMP are written to complement each other the Drought Plan may result in significant or adverse effects on water resource sensitive sites on its own due to the fundamental nature of the plan and the options.

However, potential 'in combination' effects between the Drought Plan and the WRMP cannot be meaningfully identified and assessed at this level. This is because the WRMP options cannot, in theory, operate in combination with the DP options: if the WRMP options are implemented then they will become a part of the baseline against which the effects of the DP options will be assessed (with the DP options then permitted or not at the application stage); until the point of implementation, the DP options would operate 'alone' in a drought situation. Furthermore, the implementation of a WRMP option will invariably require that the DP for that WRZ be revised, since the fundamental operational parameters of the WRZ will have changed[36]. Finally, the impacts will depend entirely on the nature of the drought situation.

In theory, if a WRMP option results in less 'spare' water being available to water-resource sensitive sites then drought conditions may occur more frequently, and require a longer period for recovery from any temporary effects (depending on the hydrological functioning of the system); however, this type of effect is managed through licence conditions and minimum flow requirements which are designed to protect sites under a range of conditions, and DP options to alter such flow requirements would only be deployed after substantial additional study.

[36] In addition, it should be noted that many of the Drought Plan options are essentially the same as WRMP options, and therefore are mutually exclusive.

Other Water Company WRMPs

The draft WRMPs from the neighbouring water companies (Wessex Water, Bristol Water, Severn Trent Water and United Utilities) have been reviewed for potential 'in combination' effects with the DCWW Options. The locations of the Tywyn Aberdyfi and Pembrokeshire Preferred Options (west Wales) will ensure that 'in combination' effects with the options of other WRMPs will not occur. With regard to the VOW2a option, the HRAs of the nearest Water Company WRMPs (Wessex Water, Bristol Water, Severn Trent Water) were reviewed to determine whether any European sites are potentially exposed to effects from VOW2a and one or more preferred options associated with other WRMPs. In summary:

- Wessex Water are predicting a supply-demand surplus for the planning period.
- Bristol Water is implementing leakage schemes only (a programme of small-scale 'detect and fix' works which cannot be specified, or assessed, at the plan-level); however, the only sites / features potentially exposed to the effects of these schemes and VOW2a are the diadramous fish species of the Severn Estuary SAC and Severn Estuary Ramsar. Adverse effects 'in combination' will not occur due to the small scale of any leakage reduction schemes that BW undertake (regardless of any mitigation BW may implement); and the measures that DCWW will employ for VOW2a, which can be relied on to avoid effects occurring. In practice, the effects of either VOW2a or the BW leakage options are likely to be nil.
- None of Severn Trent's preferred options will affect European sites that are also exposed to potential effects associated with the DCWW plan.

Based on the draft Preferred Options proposed, and the HRAs of these WRMPs, it is considered that there is no potential for any 'in combination' effects with other water company WRMPs.

5. Conclusions

The WRMP Options for addressing the predicted deficits in the Tywyn Aberdyfi and Pembrokeshire WRZs, and improving the drought resilence of Vowchurch WRZ, have been subject to 'screening' and 'appropriate assessment'. These assessments are summarised below, and have concluded that the WRMP Options can clearly be delivered without adverse effects on any European sites, alone or in combination.

5.1 Options TYA004 / TYA009a

The assessment identified impact pathways and hence the possibility of significant effects on interest features associated with seven European sites:

- Craig yr Aderyn (Bird`s Rock) SPA
- Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC
- Northern Cardigan Bay / Gogledd Bae Ceredigion SPA
- West Wales Marine / Gorllewin Cymru Forol cSAC
- Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC
- Dyfi Estuary / Aber Dyfi SPA
- Afon Eden - Cors Goch Trawsfynydd SAC.

Appropriate assessment at the plan-level has determined that **these options will not result in adverse effects on any sites or interest features (alone)** that cannot obviously be avoided with established best-practice and mitigation measures (see Appendix G), which are referenced in the WRMP. In most cases the effects are likely to be 'not significant' and it is likely that scheme-level HRA will confirm either 'no effect' or 'no significant effect' for most European sites, although this conclusion can only be made at the project level with the benefit of a scheme-specific 'in combination' assessment.

5.2 Options PEM024a / PEM024b

The assessment identified impact pathways and hence the possibility of significant effects on interest features associated with five European sites:

- Afonydd Cleddau/ Cleddau Rivers SAC
- Pembrokeshire Marine/ Sir Benfro Forol SAC
- Pembrokeshire Bat Sites and Bosherston Lakes/ Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston SAC
- Limestone Coast of South West Wales/ Arfordir Calchfaen de Orllewin Cymru SAC
- North Pembrokeshire Woodlands/ Coedydd Gogledd Sir Benfro SAC.

Appropriate assessment at the plan-level has determined that t**he option will not result in adverse effects on any sites or interest features (alone)** that cannot obviously be avoided with established best-practice and mitigation measures (see Appendix G), which are referenced in the WRMP. In most cases the effects are likely to be 'not significant' and it is likely that scheme-level HRA will confirm either 'no effect' or 'no significant effect' for most European sites, although this conclusion can only be made at the project level with the benefit of a scheme-specific 'in combination' assessment.

5.3 Resilience Option VOW2a

The assessment identified impact pathways and hence the possibility of significant effects on interest features associated with four European sites:

- River Wye/ Afon Gwy SAC
- Usk Bat Sites/ Safleoedd Ystlumod Wysg SAC
- Severn Estuary Ramsar
- Severn Estuary/ Môr Hafren SAC.

Appropriate assessment at the plan-level has determined that t**he option will not result in adverse effects on any sites or interest features (alone)** that cannot obviously be avoided with established best-practice and mitigation measures (see Appendix G), which are referenced in the WRMP. Specific measures are identified to resolve a residual uncertainty associated with the crossing of the River Wye, but this can be achieved with established construction techniques and associated controls that are known to be effective. In it is likely that scheme-level HRA will confirm either 'no effect' or 'no significant effect' for most of the above European sites, although this conclusion can only be made at the project level with the benefit of a scheme-specific 'in combination' assessment.

5.4 In Combination Effects

The HRA has assessed potential 'in combination' effects with other projects, plans or programmes, including:

- within-plan effects - i.e. separate options within the WRMP affecting the same European site(s);
- 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.

This assessment concluded that the Final WRMP Options, and the Final WRMP as a whole, would not have any 'in combination' effects due to the absence of impact pathways and the explicit consideration of the water-resource demands associated with known plans or projects in the WRMP development.

There are residual uncertainties regards possible 'in combination' effects at the project-scale (due to the time before option implementation and hence the impossibility of identifying all potential 'in combination' plans and projects at the WRMP-level), and it will be necessary for project-level HRAs to consider these at the point of delivery; however, there is no evidence to suggest that the WRMP Options will have any 'in combination' effects that are of a scale that cannot be reliably avoided or mitigated using normal project-level controls.

5.5 Conclusion

DCWW has a statutory duty to prepare its WRMP and is therefore the Competent Authority for any HRA. DCWW has commissioned Wood (formerly Amec Foster Wheeler) to undertake the data collection and interpretation required to support an HRA of its WRMP for the period 2020– 2050, and to determine whether any aspects of the WRMP (alone or in-combination) could have significant or significant adverse effects on the integrity of any European sites.

Based on the available evidence, none of the Final WRMP Options are likely to result in adverse effects on any European sites or interest features (alone or in combination) that cannot obviously be avoided with established best-practice and mitigation measures, which are summarised in Appendix G. The identification of supply-demand deficits has been completed in accordance with the *Water Resource Planning Guidelines*

(EA / NRW (2016), updated in 2018[37]) and so the assumptions underpinning the WRMP are sound, and potential 'in combination' effects in respect of water-resource demands associated with known plans or projects, or the existing consents regime, will not occur as these demands are explicitly considered when developing the WRMP. The only residual uncertainties relate to the specifics of scheme delivery (e.g. timing; precise working areas; etc.) and can only be resolved through scheme-level assessments; however, there is no evidence to suggest that the WRMP Options will have any effects that are of a scale or type that cannot be reliably avoided or mitigated using the normal project-level controls identified.

Therefore, DCWW's assessment of the Final WRMP 2019 against the requirements of Regulation 63 of the *Conservation of Habitats and Species Regulations 2017* can reasonably conclude that **the WRMP will have no adverse effects, alone or in combination, on any European sites**. This conclusion does not remove the need for consideration of Regulation 63 at the project-level, which will be required to address those aspects and uncertainties that cannot be meaningfully assessed at the plan-level, such as potential 'in combination' effects with forthcoming plans or projects that may coincide with option delivery.

[37] Available at: https://cdn.naturalresources.wales/media/686174/interim-wrpg-update-july18-final-changes-highlighted.pdf

Bibliography

CCW (2008a) *Core Management Plan including Conservation Objectives for Craig Yr Aderyn (Bird's Rock) SPA* [online]. Available at: https://naturalresources.wales/media/674084/Craig%20yr%20Aderyn%20SPA%20core%20plan%20(Eng).pdf. [Accessed Aug 2017].

CCW (2008b) *Core Management Plan including Conservation Objectives for Meirionnydd Oakwoods and Bat Sites SAC* [online]. Available at: https://naturalresources.wales/media/672832/MOW%20SAC%20Plan%2017-4-08.pdf. [Accessed Aug 2017].

CCW (2008c) *Core Management Plan including Conservation Objectives for Dyfi Estuary / Aber Dyfi SPA* [online]. Available at: https://naturalresources.wales/media/671834/Dyfi%20SPA-Plan%20English.pdf. [Accessed Aug 2017].

CCW (2008d) *Core Management Plan including Conservation Objectives for Afon Eden - Cors Goch Trawsfynydd SAC* [online]. Available at: https://naturalresources.wales/media/670687/Afon%20Eden%20WES32%20plan%20English.pdf. [Accessed Aug 2017].

CCW (2008e) *Core Management Plan including Conservation Objectives for Pembrokeshire Bat Sites and Bosherston Lakes SAC* [online]. Available at: https://naturalresources.wales/media/673193/pembs-bat-sites-and-bosh-lakes-english.pdf. [Accessed Aug 2017].

CCW (2008f) *Core Management Plan (including Conservation Objectives) for Mynydd Llangatwg (Mynydd Llangattock) Site of Special Scientific Interest (SSSI), Siambre Ddu SSSI, Buckland Coach House and Ice House SSSI and Foxwood SSSI, which together comprise Usk Bat Sites Special Area of Conservation (SAC)* [online]. Available at: https://naturalresources.wales/media/674281/Usk%20Bat%20Sites%20Management%20Plan%20Feb%2008.pdf. [Accessed Aug 2018].

CCW (2009) *The Severn Estuary / Môr Hafren European Marine Site comprising: The Severn Estuary / Môr Hafren Special Area of Conservation (SAC) The Severn Estuary Special Protection Area (SPA) The Severn Estuary / Môr Hafren Ramsar Site Natural England & the Countryside Council for Wales' advice given under Regulation 33(2)(a) of the Conservation (Natural Habitats, &c.) Regulations 1994, as amended.* [online]. Available at: https://naturalresources.wales/media/673887/severn-estuary-sac-spa-and-ramsar-reg-33-advice-from-ne-and-ccw-june-09.pdf. [Accessed Aug 2018]

EA / NRW (2016) *Final Water Resources Planning Guideline* [online]. Available at: https://naturalresources.wales/media/678424/ea-nrw-and-defra-wg-ofwat-technical-water-resources-planning-guidelines.pdf. [Accessed August 2016]

EA / NRW (2018) *Water Resources Planning Guideline: Interim update* [online]. Available at: https://cdn.naturalresources.wales/media/686174/interim-wrpg-update-july18-final-changes-highlighted.pdf. [Accessed August 2018].

Environment Agency (2007). *Stage 1 and 2 Assessment of New PIR Permissions under the Habitats Regulations*. Appendix 7 to Environment Guidance.

Hendry K & Cragg-Hine D (2003). *Ecology of the Atlantic Salmon*. Conserving Natura 2000 Rivers Ecology Series No. 7. English Nature, Peterborough.

Lansdown RV & Wade PM (2003). Ecology of the Floating Water-plantain, *Luronium natans*. Conserving Natura 2000 Rivers Ecology Series No. 9. English Nature, Peterborough.

Maitland PS & Hatton-Ellis TW (2003). *Ecology of the Allis and Twaite Shad*. Conserving Natura 2000 Rivers Ecology Series No. 3. English Nature, Peterborough

Maitland PS (2003) *Ecology of the River, Brook and Sea Lamprey*. Conserving Natura 2000 Rivers Ecology Series No. 5. English Nature, Peterborough

Maitland PS (2003). Ecology of the River, Brook and Sea Lamprey. Conserving Natura 2000 Rivers Ecology Series No. 5. English Nature, Peterborough.

Musgrove, A.J., Langston, R.H.W, Baker, H, and Ward, R.M. (2003). *Estuarine Waterbirds at Low Tide: the WeBS Low Tide Counts 1992-93 to 1998-99*. Thetford: WSG/BTO/WWT/RSPB/JNCC

NE (2016a) *European Site Conservation Objectives for River Wye SAC (UK0012642)* [online]. Available at: http://publications.naturalengland.org.uk/file/5412246543925248. [Accessed Sep 2018].

NE (2016b) *European Site Conservation Objectives for Severn Estuary/Môr Hafren Special Area of Conservation Site Code: UK0013030* [online]. Available at: http://publications.naturalengland.org.uk/file/5702728180826112. [Accessed Sep 2018].

NE (2016c) *European Site Conservation Objectives for Severn Estuary SPA (UK9015022)* [online]. Available at: http://publications.naturalengland.org.uk/file/5667392700022784. [Accessed Sep 2018].

NE (2018a) *Designated Sites View: River Wye SSSI / River Wye SAC* [online]. Available at: https://designatedsites.naturalengland.org.uk/SiteDetail.aspx?SiteCode=s1006327. [Accessed Sep 2018].

NE (2018b) *Site Improvement Plan: River Wye (SIP199)* [online]. Available at: http://publications.naturalengland.org.uk/publication/5178575871279104. [Accessed Sep 2018].

Nedwell J., Parvin, SJ, Brooker AG. and Lambert DR. (2008). *Modelling and measurement of underwater noise associated with the proposed Port of Southampton capital dredge and redevelopment of berths 201/202 and assessment of the disturbance to salmon*. Report by Subacoustech Ltd, Southampton, Ref. 805R0444.

Nedwell J., Turnpenny A., Langworthy J. and Edwards B., (2003). *Measurements of underwater noise during piling at the Red Funnel Terminal, Southampton, and observations of its effect on caged fish*. Report by Subacoustech Ltd, Southampton, Ref. 558 R 0207

Nedwell JR1, Turnpenny AW, Lovell JM, Edwards B. (2006). An investigation into the effects of underwater piling noise on salmonids. *J. Acoust. Soc. Am*. **2006; 120** (5 Pt 1):2550-4.

NRW (2015) *Northern Cardigan Bay / Gogledd Bae Ceredigion proposed SPA Draft conservation objectives.* [online]. Available at: https://naturalresources.wales/media/675730/northern-cardigan-bay-pspa-draft-conservation-objectives-final.pdf. [Accessed Aug 2017]

NRW (2016) *Harbour Porpoise (Phocoena phocoena) possible Special Area of Conservation: West Wales Marine / Gorllewin Cymru Forol Draft Conservation Objectives and Advice on Activities.* [online]. Available at: http://jncc.defra.gov.uk/pdf/WestWalesMarineConservationObjectivesAndAdviceOnActivities.pdf. [Accessed Aug 2017]

NRW (2017a) *Core Management Plan Including Conservation Objectives for Afonydd Cleddau / Cleddau Rivers Sac (Special Area Of Conservation)* [online]. Available at: https://naturalresources.wales/media/682866/afonydd-cleddau-plan-english.pdf. [Accessed Sep 2018].

NRW (2017b) *Core Management Plan (Including Conservation Objectives) for River Wye Special Area of Conservation* [online]. Available at: https://naturalresources.wales/media/682835/river-wye-sac-core-management-plan-approved.pdf [Accessed Sep 2018].

NRW (2018b) *Pembrokeshire Marine / Sir Benfro Forol Special Area of Conservation Advice provided by Natural Resources Wales in fulfilment of Regulation 37 of the Conservation of Habitats and Species Regulations 2017.* [online]. Available at: https://naturalresources.wales/media/684530/pembrokeshire-marine-council-regulation-37.pdf. [Accessed Aug 2018].

NRW (2018a) *Pen Llŷn a'r Sarnau / Lleyn Peninsula and the Sarnau Special Area of Conservation Advice provided by Natural Resources Wales in fulfilment of Regulation 37 of the Conservation of Habitats and*

Species Regulations 2017. [online]. Available at: https://naturalresources.wales/media/684531/pen-llyn-ar-sarnau-r37.pdf. [Accessed Aug 2018].

Stroud, D.A., Bainbridge, I.P., Maddock, A., Anthony, S., Baker, H., Buxton, N., Chambers, D., Enlander, I., Hearn, R.D., Jennings, K.R., Mavor, R., Whitehead, S. & Wilson, J.D. (eds.) (2016). *The status of UK SPAs in the 2000s: the Third Network Review. JNCC*, Peterborough

Stroud, DA, Chambers, D, Cook, S, Buxton, N, Fraser, B, Clement, P, Lewis, P, McLean, I, Baker, H & Whitehead, S (eds). (2001). *The UK SPA network: its scope and content.* JNCC, Peterborough.

Appendix A
Summary of European Site Designations

Table A1 European sites and associated designations

Designation	Abbreviation	Summary
European sites	-	Strictly, 'European sites' are: any Special Area of Conservation (SAC) from the point at which the European Commission and the UK Government agree the site as a 'Site of Community Importance' (SCI); any classified Special Protection Area (SPA); any candidate SAC (cSAC); and (exceptionally) any other site or area that the Commission believes should be considered as an SAC but which has not been identified by the Government. 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') apply; and to possible SACs (pSACs) and listed Ramsar Sites, to which the provisions of the Habitats Regulations are applied a matter of Government policy when considering development proposals that may affect them. "European site" is therefore used as an umbrella term for all of the above designated sites.
Special Area of Conservation	SAC	Designated under the EU *Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora*, and implemented in the UK through the *Conservation of Habitats and Species Regulations 2017* (as amended), and the *Conservation (Natural Habitats, & c.) Regulations (Northern Ireland) 1995* (as amended).
Site of Community Importance	SCI	Sites of Community Importance (SCIs) are sites that have been adopted by the European Commission but not yet formally designated by the government of each country. Although not formally designated they are nevertheless fully protected by *Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora*, the *Conservation of Habitats and Species Regulations 2017* (as amended), and the *Conservation (Natural Habitats, & c.) Regulations (Northern Ireland) 1995* (as amended).
Candidate SAC	cSAC	Candidate SACs (cSACs) are sites that have been submitted to the European Commission, but not yet formally adopted. Although these sites are still undergoing designation and adoption they are still fully protected by *Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora*, the *Conservation of Habitats and Species Regulations 2017* (as amended) and the *Conservation (Natural Habitats, & c.) Regulations (Northern Ireland) 1995* (as amended).
Possible SACs	pSAC	Sites that have been formally advised to UK Government, but not yet submitted to the European Commission. The Governments in England, Scotland and Wales extend the same protection to these sites in respect of new development as that afforded to SACs as a matter of policy.
Draft SACs	dSAC	Areas that have been formally advised to UK government as suitable for selection as SACs, but have not been formally approved by government as sites for public consultation. These are not protected (unless covered by some other designation) and it is likely that their existence will not be established through desk study except through direct contact with the relevant statutory authority; however, the statutory authority is likely to take into account the proposed reasons for designation when considering potential impacts on them.
Special Protection Area	SPA	Designated under *EU Council Directive 79/409/EEC on the Conservation of Wild Birds* (the 'old Wild Birds Directive') and *Directive 2009/147/EC on the Conservation of Wild Birds* (the 'new Wild Birds Directive, which repeals the 'old Wild Birds Directive'), and protected by Article 6 of *Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora.* These directives are implemented in the UK through the *Wildlife & Countryside Act 1981* (as amended), the *Conservation of Habitats and Species Regulations 2017* (as amended), the *Wildlife (Northern Ireland) Order 1985*, the *Nature Conservation and Amenity Lands (Northern Ireland) Order 1985* and *The Conservation (Natural Habitats, &C.) (Northern Ireland) Regulations 1995* (as amended) and the *Offshore Marine Conservation (Natural Habitats & c.) Regulations 2007*.

Designation	Abbreviation	Summary
Potential SPA	pSPA	These are sites that are still undergoing designation and have not been designated by the Secretary of State; however, ECJ case law indicates that these sites are protected under Article 4(4) of *Directive 2009/147/EC* (which in theory provides a higher level of protection than the Habitats Directive, which does not apply until the sites are designated as SPAs), and as a matter of policy the Governments in England, Scotland and Wales extend the same protection to these sites in respect of new development as that afforded to SPAs, and they may be protected by some other designation (e.g. SSSI).
Ramsar	-	The *Convention on Wetlands of International Importance especially as Waterfowl Habitat* (Ramsar Convention or Wetlands Convention) was adopted in Ramsar, Iran in February 1971. The UK ratified the Convention in 1976. In the UK Ramsar sites are generally underpinned by notification of these areas as Sites of Special Scientific Interest (SSSIs) (or Areas of Special Scientific Interest (ASSIs) in Northern Ireland). Ramsar sites therefore receive statutory protection under the *Wildlife & Countryside Act 1981* (as amended), and the *Nature Conservation and Amenity Lands (Northern Ireland) Order 1985*. However, as a matter of policy the Governments in England, Scotland and Wales extend the same protection to listed Ramsar sites in respect of new development as that afforded to SPAs and SACs.

Appendix B
Sustainability Reductions and the Review of Consents

The WRMP accounts for any reductions or alterations to licences that are required under the Review of Consents (or the Water Framework Directive) when calculating 'Deployable Output' (DO). The Review of Consents (RoC) process was a detailed evidence-led examination of the effects (alone and in combination) of all abstraction licences and discharge consents that potentially affect European designated sites and features. This was then used as a basis for affirming or, if necessary, varying or revoking the existing consents (known as 'sustainability reductions') to protect these sites from adverse effects.

The sustainability reductions required by the RoC are fully accounted for within the modelled scenarios underpinning the WRMP (i.e. they explicitly form part of the assessment that determines which zones are in deficit). Under the RoC process and the WRMP process, the RoC changes (and non-changes to licences) are considered to be valid over the planning period (to 2044). Welsh Water use Water Available for Use (WAFU) from existing licences only (reduced through RoC and not reduced) when assessing the supply-demand balance over the planning period, incorporating increases in demand (the methods by which this is established are outlined in the WRMP). If deficits are shown, intervention options are required and implemented accordingly in the planning period.

This means that the Plan (and its underlying assumptions regarding the availability of water and sustainability of existing consents) is compliant with the RoC and so the Plan will only affect European sites through any new resource and production-side options it advocates to resolves deficits, and not through the existing permissions regime[38]. The examination of existing individual consents can only be undertaken by NRW (in Wales) or the Environment Agency (EA) through the RoC process and the HRA of the WRMP cannot and should not replicate this.

Having said that, new permissions could obviously operate 'in combination' with the existing regime. The water potentially available from a source is determined by the EA, NRW and Welsh Water, based on various assessments and set out in the Catchment Abstraction Management Strategies, and DCWW must rely on these assessments when identifying options as in most cases the detailed examination of a resources can only be undertaken as part of preparatory works for a new licence (for example, if new boreholes are required to assist with the modelling of a groundwater resource). In short, options are only proposed where there is a reasonable likelihood of water being available, based on information from NRW and the EA.

Welsh Water has received formal indication of the sustainability reductions and measures that NRW and the EA consider necessary to prevent the risk of any abstraction-related significant adverse effects on certain European sites. The RoC modifications required of Welsh Water are summarised in Table B1. No amendments or reductions are currently required under WFD.

Table B2 Licence amendments required under Review of Consents

Welsh Water Abstraction Point	WRZ	SAC	EAW Determination
Wye at Monmouth (Mayhill)	SEWCUS	River Wye	Flow impact and fish entrainment
Wye at Monmouth (Wye Transfer)	SEWCUS	River Wye	Flow impact and fish entrainment
Wye at Elan Reservoirs	SEWCUS	River Wye	Flow impact
Usk Reservoir	SEWCUS	River Usk	Flow impact
Usk at Llantrisant	SEWCUS	River Usk	Flow impact and fish entrainment

[38] It is recognised that, occasionally, the sustainability reductions agreed through the RoC process have been subsequently shown to be insufficient to address the effects of PWS abstraction on some sites (the most notable example is the River Ehen in Cumbria); Welsh Water are not aware of any current uncertainties regarding its abstractions or the RoC outcomes, although any such uncertainties that are subsequently identified can be addressed through the five-yearly WRMP review process.

Welsh Water Abstraction Point	WRZ	SAC	EAW Determination
Usk at Rhadyr (Prioress Mill)	SEWCUS	River Usk	Flow impact and fish entrainment
Brecon Boreholes	SEWCUS	River Usk	Flow impact
Usk at Brecon	SEWCUS	River Usk	Flow impact and fish entrainment
Eastern Cleddau at Pont Hywel	Pembrokeshire	Cleddau Rivers	Flow impact
Eastern Cleddau at Canaston	Pembrokeshire	Cleddau Rivers	Flow impact and fish entrainment
Western Cleddau at Crowhill	Pembrokeshire	Cleddau Rivers	Flow impact and fish entrainment
Talybont Reservoir	SEWCUS	River Usk	Flow impact
Llandegfedd Reservoir	SEWCUS	River Usk	Flow impact

Appendix C
European sites within 20km of the DCWW supply Area

Sites within 20km and Interest Features
Aberbargoed Grasslands SAC
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia
Afon Eden - Cors Goch Trawsfynydd SAC
Active raised bogs
Freshwater pearl mussel Margaritifera margaritifera
Atlantic salmon Salmo salar
Otter Lutra lutra
Floating water-plantain Luronium natans
Afon Gwyrfai a Llyn Cwellyn SAC
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation
Atlantic salmon Salmo salar
Otter Lutra lutra
Floating water-plantain Luronium natans
Afon Teifi/ River Teifi SAC
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation
Sea lamprey Petromyzon marinus
Brook lamprey Lampetra planeri
River lamprey Lampetra fluviatilis
Atlantic salmon Salmo salar
Bullhead Cottus gobio
Otter Lutra lutra
Floating water-plantain Luronium natans
Afon Tywi/ River Tywi SAC
Sea lamprey Petromyzon marinus
Brook lamprey Lampetra planeri
River lamprey Lampetra fluviatilis
Allis shad Alosa alosa
Twaite shad Alosa fallax
Bullhead Cottus gobio
Otter Lutra lutra
Afonydd Cleddau/ Cleddau Rivers SAC
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation
Active raised bogs
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)
Sea lamprey Petromyzon marinus
Brook lamprey Lampetra planeri
River lamprey Lampetra fluviatilis
Bullhead Cottus gobio
Otter Lutra lutra

Sites within 20km and Interest Features
Alyn Valley Woods/ Coedwigoedd Dyffryn Alun SAC
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)
Tilio-Acerion forests of slopes, screes and ravines
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)
Anglesey Terns / Morwenoliaid Ynys Môn pSPA
Sandwich tern Sterna sandvicensis
Roseate tern Sterna dougalli
Common tern Sterna hirundo
Arctic tern Sterna paradisaea
Avon Gorge Woodlands SAC
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)
Tilio-Acerion forests of slopes, screes and ravines
Bae Caerfyrddin/ Carmarthen Bay SPA
Black (common) scoter Melanitta nigra
Bae Cemlyn/ Cemlyn Bay SAC
Coastal lagoons
Perennial vegetation of stony banks
Berwyn a Mynyddoedd de Clwyd/ Berwyn and South Clwyd Mountains SAC
European dry heaths
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)
Blanket bogs (* if active bog)
Transition mires and quaking bogs
Calcareous and calcshist screes of the montane to alpine levels (Thlaspietea rotundifolii)
Calcareous rocky slopes with chasmophytic vegetation
Berwyn SPA
Red kite Milvus milvus
Hen harrier Circus cyaneus
Merlin Falco columbarius
Peregrine falcon Falco peregrinus
Blackmill Woodlands SAC
Old sessile oak woods with Ilex and Blechnum in the British Isles
Blaen Cynon SAC
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia
Brecon Beacons/ Bannau Brycheiniog SAC
European dry heaths
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels
Calcareous rocky slopes with chasmophytic vegetation
Siliceous rocky slopes with chasmophytic vegetation
Bredon Hill SAC
Violet click beetle Limoniscus violaceus
Bristol Channel Approaches / Dynesfeydd Môr Hafren cSAC
Harbour porpoise Phocoena phocoena
Burry Inlet 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
Burry Inlet SPA
Common shelduck Tadorna tadorna
Eurasian wigeon Anas penelope
Eurasian teal Anas crecca

Sites within 20km and Interest Features
Northern pintail Anas acuta
Northern shoveler Anas clypeata
Eurasian oystercatcher Haematopus ostralegus
Grey plover Pluvialis squatarola
Red knot Calidris canutus
Eurasian curlew Numenius arquata
Common redshank Tringa totanus
Ruddy turnstone Arenaria interpres
Dunlin Calidris alpina alpina
Waterfowl assemblage Waterfowl assemblage
Cadair Idris SAC
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea
Northern Atlantic wet heaths with Erica tetralix
European dry heaths
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels
Blanket bogs (* if active bog)
Alkaline fens
Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani)
Calcareous rocky slopes with chasmophytic vegetation
Siliceous rocky slopes with chasmophytic vegetation
Old sessile oak woods with Ilex and Blechnum in the British Isles
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus
Caeau Mynydd Mawr SAC
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia
Cardiff Beech Woods SAC
Asperulo-Fagetum beech forests
Tilio-Acerion forests of slopes, screes and ravines
Cardigan Bay/ Bae Ceredigion SAC
Sandbanks which are slightly covered by sea water all the time
Reefs
Submerged or partially submerged sea caves
Sea lamprey Petromyzon marinus
River lamprey Lampetra fluviatilis
Bottlenose dolphin Tursiops truncatus
Grey seal Halichoerus grypus
Carmarthen Bay and Estuaries/ Bae Caerfyrddin ac Aberoedd SAC
Sandbanks which are slightly covered by sea water all the time
Estuaries
Mudflats and sandflats not covered by seawater at low tide
Large shallow inlets and bays
Salicornia and other annuals colonizing mud and sand
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
Sea lamprey Petromyzon marinus
River lamprey Lampetra fluviatilis
Allis shad Alosa alosa
Twaite shad Alosa fallax

Sites within 20km and Interest Features
Otter Lutra lutra
Carmarthen Bay Dunes/ Twyni Bae Caerfyrddin SAC
Embryonic shifting dunes
Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")
Fixed coastal dunes with herbaceous vegetation ("grey dunes")
Dunes with Salix repens ssp. argentea (Salicion arenariae)
Humid dune slacks
Narrow-mouthed whorl snail Vertigo angustior
Petalwort Petalophyllum ralfsii
Fen orchid Liparis loeselii
Castlemartin Coast SPA
Red-billed chough Pyrrhocorax pyrrhocorax
Cernydd Carmel SAC
Turloughs
Northern Atlantic wet heaths with Erica tetralix
European dry heaths
Active raised bogs
Tilio-Acerion forests of slopes, screes and ravines
Clogwyni Pen Llyn/ Seacliffs of Lleyn SAC
Vegetated sea cliffs of the Atlantic and Baltic Coasts
Coed Cwm Einion SAC
Tilio-Acerion forests of slopes, screes and ravines
Coed y Cerrig SAC
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)
Coedwigoedd Dyffryn Elwy/ Elwy Valley Woods SAC
Tilio-Acerion forests of slopes, screes and ravines
Coedwigoedd Penrhyn Creuddyn/ Creuddyn Peninsula Woods SAC
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)
Tilio-Acerion forests of slopes, screes and ravines
Taxus baccata woods of the British Isles
Coedydd a Cheunant Rheidol/ Rheidol Woods and Gorge SAC
Old sessile oak woods with Ilex and Blechnum in the British Isles
Coedydd Aber SAC
Old sessile oak woods with Ilex and Blechnum in the British Isles
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)
Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation
Northern Atlantic wet heaths with Erica tetralix
European dry heaths
Tilio-Acerion forests of slopes, screes and ravines
Old sessile oak woods with Ilex and Blechnum in the British Isles
Bog woodland
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)
Lesser horseshoe bat Rhinolophus hipposideros
Coedydd Llawr-y-glyn SAC
Old sessile oak woods with Ilex and Blechnum in the British Isles
Coedydd Nedd a Mellte SAC
Tilio-Acerion forests of slopes, screes and ravines
Old sessile oak woods with Ilex and Blechnum in the British Isles

Sites within 20km and Interest Features
Coetiroedd Cwm Elan/ Elan Valley Woodlands SAC
European dry heaths
Tilio-Acerion forests of slopes, screes and ravines
Old sessile oak woods with Ilex and Blechnum in the British Isles
Cors Caron Ramsar
Crit. 2 - supports vulnerable, endangered, or critically endangered species or threatened eco. communities
Crit. 3 - supports populations of plant/animal species important for maintaining regional biodiversity
Crit. 6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds
Cors Caron SAC
Active raised bogs
Degraded raised bogs still capable of natural regeneration
Transition mires and quaking bogs
Depressions on peat substrates of the Rhynchosporion
Bog woodland
Otter Lutra lutra
Cors Fochno and Dyfi Ramsar
Crit. 1 - sites containing representative, rare or unique wetland types
Cors Fochno SAC
Active raised bogs
Degraded raised bogs still capable of natural regeneration
Depressions on peat substrates of the Rhynchosporion
Corsydd Eifionydd SAC
Transition mires and quaking bogs
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus
Corsydd Llyn/ Lleyn Fens SAC
Calcareous fens with Cladium mariscus and species of the Caricion davallianae
Alkaline fens
Geyer`s whorl snail Vertigo geyeri
Desmoulin`s whorl snail Vertigo moulinsiana
Corsydd Môn a Llyn/ Anglesey and Llyn Fens Ramsar
Crit. 1 - sites containing representative, rare or unique wetland types
Crit. 3 - supports populations of plant/animal species important for maintaining regional biodiversity
Corsydd Môn/ Anglesey Fens SAC
Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.
Northern Atlantic wet heaths with Erica tetralix
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)
Calcareous fens with Cladium mariscus and species of the Caricion davallianae
Alkaline fens
Geyer`s whorl snail Vertigo geyeri
Southern damselfly Coenagrion mercuriale
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia
Cotswold Beechwoods SAC
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)
Asperulo-Fagetum beech forests
Craig yr Aderyn (Bird`s Rock) SPA
Red-billed chough Pyrrhocorax pyrrhocorax
Crymlyn Bog Ramsar
Crit. 1 - sites containing representative, rare or unique wetland types

Sites within 20km and Interest Features
Crit. 2 - supports vulnerable, endangered, or critically endangered species or threatened eco. communities
Crit. 3 - supports populations of plant/animal species important for maintaining regional biodiversity
Crymlyn Bog/ Cors Crymlyn SAC
Transition mires and quaking bogs
Calcareous fens with Cladium mariscus and species of the Caricion davallianae
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)
Cwm Cadlan SAC
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)
Alkaline fens
Cwm Clydach Woodlands / Coedydd Cwm Clydach SAC
Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or Ilici-Fagenion)
Asperulo-Fagetum beech forests
Cwm Doethie - Mynydd Mallaen SAC
European dry heaths
Old sessile oak woods with Ilex and Blechnum in the British Isles
Dee Estuary/ Aber Dyfrdwy SAC
Estuaries
Mudflats and sandflats not covered by seawater at low tide
Annual vegetation of drift lines
Vegetated sea cliffs of the Atlantic and Baltic Coasts
Salicornia and other annuals colonizing mud and sand
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
Embryonic shifting dunes
Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")
Fixed coastal dunes with herbaceous vegetation ("grey dunes")
Humid dune slacks
Sea lamprey Petromyzon marinus
River lamprey Lampetra fluviatilis
Petalwort Petalophyllum ralfsii
Deeside and Buckley Newt Sites SAC
Old sessile oak woods with Ilex and Blechnum in the British Isles
Great crested newt Triturus cristatus
Downton Gorge SAC
Tilio-Acerion forests of slopes, screes and ravines
Drostre Bank SAC
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)
Dunraven Bay SAC
Shore dock Rumex rupestris
Dyfi Estuary / Aber Dyfi SPA
Greenland white-fronted goose Anser albifrons flavirostris
Elenydd - Mallaen SPA
Red kite Milvus milvus
Merlin Falco columbarius
Elenydd SAC
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea
European dry heaths
Calaminarian grasslands of the Violetalia calaminariae

Sites within 20km and Interest Features
Blanket bogs (* if active bog)
Floating water-plantain Luronium natans
Eryri/ Snowdonia SAC
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea
Northern Atlantic wet heaths with Erica tetralix
European dry heaths
Alpine and Boreal heaths
Siliceous alpine and boreal grasslands
Alpine and subalpine calcareous grasslands
Species-rich Nardus grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe)
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels
Blanket bogs (* if active bog)
Depressions on peat substrates of the Rhynchosporion
Petrifying springs with tufa formation (Cratoneurion)
Alkaline fens
Alpine pioneer formations of the Caricion bicoloris-atrofuscae
Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani)
Calcareous rocky slopes with chasmophytic vegetation
Siliceous rocky slopes with chasmophytic vegetation
Old sessile oak woods with Ilex and Blechnum in the British Isles
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus
Floating water-plantain Luronium natans
Exmoor Heaths SAC
Vegetated sea cliffs of the Atlantic and Baltic Coasts
Northern Atlantic wet heaths with Erica tetralix
European dry heaths
Blanket bogs (* if active bog)
Alkaline fens
Old sessile oak woods with Ilex and Blechnum in the British Isles
Glannau Aberdaron ac Ynys Enlli/ Aberdaron Coast and Bardsey Island SPA
Manx shearwater Puffinus puffinus
Red-billed chough Pyrrhocorax pyrrhocorax
Glannau Môn: Cors heli / Anglesey Coast: Saltmarsh SAC
Estuaries
Mudflats and sandflats not covered by seawater at low tide
Salicornia and other annuals colonizing mud and sand
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
Glannau Ynys Gybi/ Holy Island Coast SAC
Vegetated sea cliffs of the Atlantic and Baltic Coasts
Northern Atlantic wet heaths with Erica tetralix
European dry heaths
Glannau Ynys Gybi/ Holy Island Coast SPA
Red-billed chough Pyrrhocorax pyrrhocorax
Glan-traeth SAC
Great crested newt Triturus cristatus
Glaswelltiroedd Cefn Cribwr/ Cefn Cribwr Grasslands SAC
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia
Glynllifon SAC

Sites within 20km and Interest Features
Lesser horseshoe bat Rhinolophus hipposideros
Gower Ash Woods/ Coedydd Ynn Gwyr SAC
Tilio-Acerion forests of slopes, screes and ravines
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)
Gower Commons/ Tiroedd Comin Gwyr SAC
Northern Atlantic wet heaths with Erica tetralix
European dry heaths
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)
Southern damselfly Coenagrion mercuriale
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia
Grassholm SPA
Northern gannet Morus bassanus
Great Orme`s Head/ Pen y Gogarth SAC
Vegetated sea cliffs of the Atlantic and Baltic Coasts
European dry heaths
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)
Grogwynion SAC
European dry heaths
Calaminarian grasslands of the Violetalia calaminariae
Gweunydd Blaencleddau SAC
Northern Atlantic wet heaths with Erica tetralix
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)
Blanket bogs (* if active bog)
Transition mires and quaking bogs
Alkaline fens
Southern damselfly Coenagrion mercuriale
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia
Halkyn Mountain/ Mynydd Helygain SAC
European dry heaths
Calaminarian grasslands of the Violetalia calaminariae
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)
Great crested newt Triturus cristatus
Johnstown Newt Sites SAC
Great crested newt Triturus cristatus
Kenfig/ Cynffig SAC
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
Fixed coastal dunes with herbaceous vegetation ("grey dunes")
Dunes with Salix repens ssp. argentea (Salicion arenariae)
Humid dune slacks
Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.
Petalwort Petalophyllum ralfsii
Fen orchid Liparis loeselii
Limestone Coast of South West Wales/ Arfordir Calchfaen de Orllewin Cymru SAC
Vegetated sea cliffs of the Atlantic and Baltic Coasts
Fixed coastal dunes with herbaceous vegetation ("grey dunes")
European dry heaths
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)
Caves not open to the public

Sites within 20km and Interest Features
Submerged or partially submerged sea caves
Greater horseshoe bat Rhinolophus ferrumequinum
Petalwort Petalophyllum ralfsii
Early gentian Gentianella anglica
Liverpool Bay / Bae Lerpwl SPA
Red-throated diver Gavia stellata
Black (common) scoter Melanitta nigra
Waterfowl assemblage Waterfowl assemblage
Llangorse Lake/ Llyn Syfaddan SAC
Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation
Llwyn SAC
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)
Llyn Dinam SAC
Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation
Llyn Idwal Ramsar
Crit. 1 - sites containing representative, rare or unique wetland types
Crit. 2 - supports vulnerable, endangered, or critically endangered species or threatened eco. communities
Llyn Tegid Ramsar
Crit. 1 - sites containing representative, rare or unique wetland types
Crit. 2 - supports vulnerable, endangered, or critically endangered species or threatened eco. communities
Lyppard Grange Ponds SAC
Great crested newt Triturus cristatus
Mendip Limestone Grasslands SAC
European dry heaths
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)
Caves not open to the public
Tilio-Acerion forests of slopes, screes and ravines
Greater horseshoe bat Rhinolophus ferrumequinum
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 Estuary SPA
Great crested grebe Podiceps cristatus
Common shelduck Tadorna tadorna
Eurasian wigeon Anas penelope
Eurasian teal Anas crecca
Northern pintail Anas acuta
Ringed plover Charadrius hiaticula
European golden plover Pluvialis apricaria
Grey plover Pluvialis squatarola
Northern lapwing Vanellus vanellus
Eurasian curlew Numenius arquata
Common redshank Tringa totanus
Black-tailed godwit Limosa limosa islandica
Dunlin Calidris alpina alpina
Waterfowl assemblage Waterfowl assemblage
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

Sites within 20km and Interest Features
Crit. 6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds
Mersey Narrows and North Wirral Foreshore SPA
Great cormorant Phalacrocorax carbo
Eurasian oystercatcher Haematopus ostralegus
Grey plover Pluvialis squatarola
Sanderling Calidris alba
Bar-tailed godwit Limosa lapponica
Common redshank Tringa totanus
Little gull Larus minutus
Common tern Sterna hirundo
red knot Calidris canutus islandica
Dunlin Calidris alpina alpina
Waterfowl assemblage Waterfowl assemblage
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
Migneint-Arenig-Ddualllt SAC
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea
Natural dystrophic lakes and ponds
Northern Atlantic wet heaths with Erica tetralix
European dry heaths
Blanket bogs (* if active bog)
Old sessile oak woods with Ilex and Blechnum in the British Isles
Migneint-Arenig-Ddualllt SPA
Hen harrier Circus cyaneus
Merlin Falco columbarius
Peregrine falcon Falco peregrinus
Montgomery Canal SAC
Floating water-plantain Luronium natans
Morfa Harlech a Morfa Dyffryn SAC
Embryonic shifting dunes
Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")
Dunes with Salix repens ssp. argentea (Salicion arenariae)
Humid dune slacks
Petalwort Petalophyllum ralfsii
Mwyngloddiau Fforest Gwydir/ Gwydyr Forest Mines SAC
Calaminarian grasslands of the Violetalia calaminariae
Lesser horseshoe bat Rhinolophus hipposideros
Mynydd Cilan, Trwyn y Wylfa ac Ynysoedd Sant Tudwal SPA
Red-billed chough Pyrrhocorax pyrrhocorax
Mynydd Epynt SAC
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus
North Anglesey Marine / Gogledd Môn Forol cSAC
Harbour porpoise Phocoena phocoena
North Pembrokeshire Woodlands/ Coedydd Gogledd Sir Benfro SAC
Old sessile oak woods with Ilex and Blechnum in the British Isles
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)
Barbastelle Barbastella barbastellus
North Somerset and Mendip Bats SAC

Sites within 20km and Interest Features
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)
Caves not open to the public
Tilio-Acerion forests of slopes, screes and ravines
Lesser horseshoe bat Rhinolophus hipposideros
Greater horseshoe bat Rhinolophus ferrumequinum
North West Pembrokeshire Commons/ Comins Gogledd Orllewin Sir Benfro SAC
Northern Atlantic wet heaths with Erica tetralix
European dry heaths
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)
Transition mires and quaking bogs
Floating water-plantain Luronium natans
Northern Cardigan Bay / Gogledd Bae Ceredigion pSPA
Red-throated diver Gavia stellata
Pembrokeshire Bat Sites and Bosherston Lakes/ Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston SAC
Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.
Lesser horseshoe bat Rhinolophus hipposideros
Greater horseshoe bat Rhinolophus ferrumequinum
Otter Lutra lutra
Pembrokeshire Marine/ Sir Benfro Forol SAC
Sandbanks which are slightly covered by sea water all the time
Estuaries
Mudflats and sandflats not covered by seawater at low tide
Coastal lagoons
Large shallow inlets and bays
Reefs
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
Submerged or partially submerged sea caves
Sea lamprey Petromyzon marinus
River lamprey Lampetra fluviatilis
Allis shad Alosa alosa
Twaite shad Alosa fallax
Otter Lutra lutra
Grey seal Halichoerus grypus
Shore dock Rumex rupestris
Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC
Sandbanks which are slightly covered by sea water all the time
Estuaries
Mudflats and sandflats not covered by seawater at low tide
Coastal lagoons
Large shallow inlets and bays
Reefs
Salicornia and other annuals colonizing mud and sand
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
Submerged or partially submerged sea caves
Bottlenose dolphin Tursiops truncatus
Otter Lutra lutra
Grey seal Halichoerus grypus
Preseli SAC
Northern Atlantic wet heaths with Erica tetralix

Sites within 20km and Interest Features
European dry heaths
Depressions on peat substrates of the Rhynchosporion
Alkaline fens
Southern damselfly Coenagrion mercuriale
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus
Ramsey and St David`s Peninsula Coast SPA
Red-billed chough Pyrrhocorax pyrrhocorax
Rhinog SAC
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea
Northern Atlantic wet heaths with Erica tetralix
European dry heaths
Alpine and Boreal heaths
Blanket bogs (* if active bog)
Depressions on peat substrates of the Rhynchosporion
Old sessile oak woods with Ilex and Blechnum in the British Isles
Floating water-plantain Luronium natans
Rhos Goch SAC
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)
Active raised bogs
Transition mires and quaking bogs
Bog woodland
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)
Rhos Llawr-cwrt SAC
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus
Rhos Talglas SAC
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia
River Clun SAC
Freshwater pearl mussel Margaritifera margaritifera
River Dee and Bala Lake/ Afon Dyfrdwy a Llyn Tegid SAC
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation
Sea lamprey Petromyzon marinus
Brook lamprey Lampetra planeri
River lamprey Lampetra fluviatilis
Atlantic salmon Salmo salar
Bullhead Cottus gobio
Otter Lutra lutra
Floating water-plantain Luronium natans
River Usk/ Afon Wysg SAC
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation
Sea lamprey Petromyzon marinus
Brook lamprey Lampetra planeri
River lamprey Lampetra fluviatilis
Allis shad Alosa alosa
Twaite shad Alosa fallax
Atlantic salmon Salmo salar
Bullhead Cottus gobio

Sites within 20km and Interest Features
Otter Lutra lutra
River Wye/ Afon Gwy SAC
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation
Transition mires and quaking bogs
White-clawed (or Atlantic stream) crayfish Austropotamobius pallipes
Sea lamprey Petromyzon marinus
Brook lamprey Lampetra planeri
River lamprey Lampetra fluviatilis
Allis shad Alosa alosa
Twaite shad Alosa fallax
Atlantic salmon Salmo salar
Bullhead Cottus gobio
Otter Lutra lutra
Severn Estuary Ramsar
Crit. 1 - sites containing representative, rare or unique wetland types
Crit. 3 - supports populations of plant/animal species important for maintaining regional biodiversity
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
Crit. 8 - important source of food for fishes, spawning ground, nursery and/or migration path
Severn Estuary SPA
Tundra swan Cygnus columbianus bewickii
Common shelduck Tadorna tadorna
Gadwall Anas strepera
Common redshank Tringa totanus
Greater white-fronted goose Anser albifrons albifrons
Dunlin Calidris alpina alpina
Waterfowl assemblage Waterfowl assemblage
Severn Estuary/ Môr Hafren SAC
Sandbanks which are slightly covered by sea water all the time
Estuaries
Mudflats and sandflats not covered by seawater at low tide
Reefs
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
Sea lamprey Petromyzon marinus
River lamprey Lampetra fluviatilis
Twaite shad Alosa fallax
Skokholm and Skomer SPA
Short-eared owl Asio flammeus
Red-billed chough Pyrrhocorax pyrrhocorax
Skomer, Skokholm and the Seas off Pembrokeshire pSPA
Manx shearwater Puffinus puffinus
European storm-petrel Hydrobates pelagicus
Lesser black-backed gull Larus fuscus
Atlantic puffin Fratercula arctica
Seabird assemblage Seabird assemblage
St David`s / Ty Ddewi SAC
Vegetated sea cliffs of the Atlantic and Baltic Coasts
European dry heaths

Sites within 20km and Interest Features
Floating water-plantain Luronium natans
Sugar Loaf Woodlands SAC
Old sessile oak woods with Ilex and Blechnum in the British Isles
Tanat and Vyrnwy Bat Sites/ Safleoedd Ystlumod Tanat ac Efyrnwy SAC
Lesser horseshoe bat Rhinolophus hipposideros
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 SPA
Common shelduck Tadorna tadorna
Eurasian teal Anas crecca
Northern pintail Anas acuta
Eurasian oystercatcher Haematopus ostralegus
Grey plover Pluvialis squatarola
Red knot Calidris canutus
Bar-tailed godwit Limosa lapponica
Eurasian curlew Numenius arquata
Common redshank Tringa totanus
Sandwich tern Sterna sandvicensis
Common tern Sterna hirundo
Little tern Sterna albifrons
Black-tailed godwit Limosa limosa islandica
Dunlin Calidris alpina alpina
Waterfowl assemblage Waterfowl assemblage
The Stiperstones and The Hollies SAC
European dry heaths
Old sessile oak woods with Ilex and Blechnum in the British Isles
Traeth Lafan/ Lavan Sands, Conway Bay SPA
Great crested grebe Podiceps cristatus
Red-breasted merganser Mergus serrator
Eurasian oystercatcher Haematopus ostralegus
Eurasian curlew Numenius arquata
Common redshank Tringa totanus
Usk Bat Sites/ Safleoedd Ystlumod Wysg SAC
European dry heaths
Degraded raised bogs still capable of natural regeneration
Blanket bogs (* if active bog)
Calcareous rocky slopes with chasmophytic vegetation
Caves not open to the public
Tilio-Acerion forests of slopes, screes and ravines
Lesser horseshoe bat Rhinolophus hipposideros
Walmore Common Ramsar
Crit. 6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds
Walmore Common SPA
Tundra swan Cygnus columbianus bewickii
West Wales Marine / Gorllewin Cymru Forol cSAC
Harbour porpoise Phocoena phocoena

Sites within 20km and Interest Features
Wye Valley and Forest of Dean Bat Sites/ Safleoedd Ystlumod Dyffryn Gwy a Fforest y Ddena SAC
Lesser horseshoe bat Rhinolophus hipposideros
Greater horseshoe bat Rhinolophus ferrumequinum
Wye Valley Woodlands/ Coetiroedd Dyffryn Gwy SAC
Asperulo-Fagetum beech forests
Tilio-Acerion forests of slopes, screes and ravines
Taxus baccata woods of the British Isles
Lesser horseshoe bat Rhinolophus hipposideros
Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC
Sandbanks which are slightly covered by sea water all the time
Mudflats and sandflats not covered by seawater at low tide
Large shallow inlets and bays
Reefs
Submerged or partially submerged sea caves
Y Twyni o Abermenai i Aberffraw/ Abermenai to Aberffraw Dunes SAC
Embryonic shifting dunes
Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")
Fixed coastal dunes with herbaceous vegetation ("grey dunes")
Dunes with Salix repens ssp. argentea (Salicion arenariae)
Humid dune slacks
Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation
Petalwort Petalophyllum ralfsii
Shore dock Rumex rupestris
Yerbeston Tops SAC
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia
Ynys Seiriol / Puffin Island SPA
Great cormorant Phalacrocorax carbo

Appendix D
Water-resource dependent interest features

EA Class Name	WR Sensitive?	Change in water levels or table	Change in flow or velocity regime	Change in surface flooding	Changed water chemistry	Change in FW flow to estuary	Change in salinity regime	Reduced dilution capacity	Habitat loss	Entrapment
Fens and wet habitats										
Alkaline fens	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Inland salt meadows	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Northern Atlantic wet heaths with Erica tetralix	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Temperate Atlantic wet heaths with Erica ciliaris and Erica tetralix	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Coastal Habitats										
Annual vegetation of drift lines	N									
Embryonic shifting dunes	N									
Decalcified fixed dunes with Empetrum nigrum	N									
Fixed coastal dunes with herbaceous vegetation ("grey dunes")	N									
Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi)	N									
Inland dunes with open Corynephorus and Agrostis grasslands	N									
Perennial vegetation of stony banks	N									
Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")	N									
Coastal habitats (sensitive to abstraction)										
Dunes with Salix repens ssp. argentea (Salicion arenariae)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Humid dune slacks	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Coastal lagoons	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vegetated sea cliffs of the Atlantic and Baltic Coasts	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Estuarine & intertidal habitats										
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Estuaries	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Large shallow inlets and bays	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Mudflats and sandflats not covered by seawater at low tide	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Reefs	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Salicornia and other annuals colonizing mud and sand	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Spartina swards (Spartinion maritimae)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Submerged marine habitats										
Reefs	N									
Sandbanks which are slightly covered by sea water all the time	N									
Submerged or partially submerged sea caves	N									
Bogs and wet habitats										
Active raised bogs	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Blanket bogs (* if active bog)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Bog woodland	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Calcareous fens with Cladium mariscus and species of the Caricion davallianae	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Degraded raised bogs still capable of natural regeneration	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Depressions on peat substrates of the Rhynchosporion	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Transition mires and quaking bogs	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Riverine habitats & running waters										

EA Class Name	WR Sensitive?	Change in water levels or table	Change in flow or velocity regime	Change in surface flooding	Changed water chemistry	Change in FW flow to estuary	Change in salinity regime	Reduced dilution capacity	Habitat loss	Entrapment
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Petrifying springs with tufa formation (Cratoneurion)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Standing Waters (sensitive to acidification)										
Natural dystrophic lakes and ponds	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Mediterranean temporary ponds	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Turloughs	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dry Woodlands & scrub										
Asperulo-Fagetum beech forests	N									
Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or Ilici-Fagenio	N									
Old acidophilous oak woods with Quercus robur on sandy plains	N									
Old sessile oak woods with Ilex and Blechnum in the British Isles	N									
Stable xerothermophilous formations with Buxus sempervirens on rock slopes (Berberidion p.p.)	N									
Sub-Atlantic and medio-European oak or oak-hornbeam forests of the Carpinion betuli	N									
Taxus baccata woods of the British Isles	N									
Tilio-Acerion forests of slopes, screes and ravines	N									
Dry grassland										
Calaminarian grasslands of the Violetalia calaminariae	N									
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)	N									
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)	N									
Dry heathland habitats										
Dry Atlantic coastal heaths with Erica vagans	N									
European dry heaths	N									
Juniperus communis formations on heaths or calcareous grasslands	N									
Upland		N								
Alpine and Boreal heaths		N								
Alpine pioneer formations of the Caricion bicoloris-atrofuscae		N								
Calcareous rocky slopes with chasmophytic vegetation		N								
Siliceous rocky slopes with chasmophytic vegetation		N								
Calcareous and calcshist screes of the montane to alpine levels (Thlaspietea rotundifolii)		N								
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels		N								
Limestone pavements		N								
Mountain hay meadows		N								
Siliceous alpine and boreal grasslands		N								
Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani)										
Vascular plants of aquatic habitats										
Floating water-plantain Luronium natans	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Amphibia										
Great crested newt Triturus cristatus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Coastal plants										
Shore dock Rumex rupestris	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Marine mammals										

EA Class Name	WR Sensitive?	Change in water levels or table	Change in flow or velocity regime	Change in surface flooding	Changed water chemistry	Change in FW flow to estuary	Change in salinity regime	Reduced dilution capacity	Habitat loss	Entrapment
Bottlenose dolphin Tursiops truncatus	N									
Common seal Phoca vitulina	N									
Grey seal Halichoerus grypus	N									
Vascular plants lower plants and invertebrates of wet habitats										
Creeping marshwort Apium repens	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Depressions on peat substrates of the Rhynchosporion	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Fen orchid Liparis loeselii	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Freshwater pearl mussel Margaritifera margaritifera	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Narrow-mouthed whorl snail Vertigo angustior	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Round-mouthed whorl snail Vertigo genesii	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Southern damselfly Coenagrion mercuriale	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Marsh saxifrage Saxifraga hirculus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vascular plants of grassland										
Early gentian Gentianella anglica	N									
Killarney fern Trichomanes speciosum	N									
Mosses and Liverworts										
Petalwort Petalophyllum ralfsii	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Western rustwort Marsupella profunda	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Anadromous fish										
Allis shad Alosa alosa	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Atlantic salmon Salmo salar	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
River lamprey Lampetra fluviatilis	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Sea lamprey Petromyzon marinus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Twaite shad Alosa fallax	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Non-migratory fish & invertebrates of rivers										
White-clawed (or Atlantic stream) crayfish Austropotamobius pallipes	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Brook lamprey Lampetra planeri	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Bullhead Cottus gobio	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Freshwater pearl mussel Margaritifera margaritifera	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Spined loach Cobitis taenia	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Invertebrates of wooded habitats										
Stag beetle Lucanus cervus	N									
Violet click beetle Limoniscus violaceus	N									
Mammals of wooded habitats										
Barbastelle Barbastella barbastellus	N									
Calcareous and calcshist screes of the montane to alpine levels (Thlaspietea rotundifolii)	N									
Greater horseshoe bat Rhinolophus ferrumequinum	N									
Lesser horseshoe bat Rhinolophus hipposideros	N									
Mammals of riverine habitats										
Otter Lutra lutra	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Birds of uplands										
Eurasian curlew Numenius arquata	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

EA Class Name	WR Sensitive?	Change in water levels or table	Change in flow or velocity regime	Change in surface flooding	Changed water chemistry	Change in FW flow to estuary	Change in salinity regime	Reduced dilution capacity	Habitat loss	Entrapment
European golden plover Pluvialis apricaria	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Hen harrier Circus cyaneus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Black-legged kittiwake Rissa tridactyla	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Northern lapwing Vanellus vanellus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Lesser black-backed gull Larus fuscus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Manx shearwater Puffinus puffinus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Merlin Falco columbarius	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Peregrine falcon Falco peregrinus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Razorbill Alca torda	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red kite Milvus milvus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Short-eared owl Asio flammeus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Common snipe Gallinago gallinago	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
European storm-petrel Hydrobates pelagicus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Birds of open sea and offshore rocks										
Arctic tern Sterna paradisaea	N									
Black (common) scoter Melanitta nigra	N									
Common tern Sterna hirundo	N									
Great cormorant Phalacrocorax carbo	N									
Northern gannet Morus bassanus	N									
Common guillemot Uria aalge	N									
Herring gull Larus argentatus	N									
Lesser black-backed gull Larus fuscus	N									
Little tern Sterna albifrons	N									
Atlantic puffin Fratercula arctica	N									
Red-throated diver Gavia stellata	N									
Roseate tern Sterna dougalli	N									
Sandwich tern Sterna sandvicensis	N									
Greater scaup Aythya marila	N									
Seabird assemblage Seabird assemblage	N									
Birds of woodland & scrub										
European honey-buzzard Pernis apivorus	N									
European nightjar Caprimulgus europaeus	N									
Red kite Milvus milvus	N									
Wood lark Lullula arborea	N									
Birds of lowland heaths & brecks										
Dartford warbler Sylvia undata	N									
Hen harrier Circus cyaneus	N									
European honey-buzzard Pernis apivorus	N									
European nightjar Caprimulgus europaeus	N									
Stone-curlew Burhinus oedicnemus	N									
Wood lark Lullula arborea	N									
Birds of lowland wet grassland										
Barnacle goose Branta leucopsis [Eastern Greenland/Scotland/Ireland]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Bar-tailed godwit Limosa lapponica	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

EA Class Name	WR Sensitive?	Change in water levels or table	Change in flow or velocity regime	Change in surface flooding	Changed water chemistry	Change in FW flow to estuary	Change in salinity regime	Reduced dilution capacity	Habitat loss	Entrapment
Tundra swan Cygnus columbianus bewickii	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Black-tailed godwit Limosa limosa islandica	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dark-bellied brent goose Branta bernicla bernicla	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Light-bellied brent goose Branta bernicla hrota [Canada/Ireland]	N									
Eurasian curlew Numenius arquata	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dunlin Calidris alpina alpina	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dunlin Calidris alpina schinzii	N									
European golden plover Pluvialis apricaria	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Greylag goose Anser anser [Iceland/UK/Ireland]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Grey plover Pluvialis squatarola	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Hen harrier Circus cyaneus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red knot Calidris canutus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Northern lapwing Vanellus vanellus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Eurasian oystercatcher Haematopus ostralegus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pink-footed goose Anser brachyrhynchus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Common redshank Tringa totanus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ruff Philomachus pugnax	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Common snipe Gallinago gallinago	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Eurasian teal Anas crecca	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Whooper swan Cygnus cygnus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Birds of lowland dry grassland										
Stone-curlew Burhinus oedicnemus	N									
Birds of lowland freshwaters & their margins										
Pied avocet Recurvirostra avosetta	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Tundra swan Cygnus columbianus bewickii	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Great bittern Botaurus stellaris	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Common tern Sterna hirundo	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Great cormorant Phalacrocorax carbo	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Gadwall Anas strepera	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Great crested grebe Podiceps cristatus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Greylag goose Anser anser [Iceland/UK/Ireland]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Hen harrier Circus cyaneus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Lesser black-backed gull Larus fuscus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Little egret Egretta garzetta	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Eurasian marsh harrier Circus aeruginosus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Mediterranean gull Larus melanocephalus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pink-footed goose Anser brachyrhynchus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Northern pintail Anas acuta	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red-throated diver Gavia stellata	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ringed plover Charadrius hiaticula	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ruff Philomachus pugnax	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Common shelduck Tadorna tadorna	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Northern shoveler Anas clypeata	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Common snipe Gallinago gallinago	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

EA Class Name	WR Sensitive?	Change in water levels or table	Change in flow or velocity regime	Change in surface flooding	Changed water chemistry	Change in FW flow to estuary	Change in salinity regime	Reduced dilution capacity	Habitat loss	Entrapment
Eurasian teal Anas crecca	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Tufted duck Aythya fuligula	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Greater white-fronted goose Anser albifrons albifrons	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Greenland white-fronted goose Anser albifrons flavirostris	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Whooper swan Cygnus cygnus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Eurasian wigeon Anas penelope	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Waterfowl assemblage Waterfowl assemblage	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Farmland Birds										
Barnacle goose Branta leucopsis [Eastern Greenland/Scotland/Ireland]	N									
Bar-tailed godwit Limosa lapponica	N									
Tundra swan Cygnus columbianus bewickii	N									
Dark-bellied brent goose Branta bernicla bernicla	N									
Light-bellied brent goose Branta bernicla hrota [Canada/Ireland]	N									
Eurasian curlew Numenius arquata	N									
Dunlin Calidris alpina alpina	N									
Dunlin Calidris alpina schinzii	N									
European golden plover Pluvialis apricaria	N									
Greylag goose Anser anser [Iceland/UK/Ireland]	N									
Grey plover Pluvialis squatarola	N									
Hen harrier Circus cyaneus	N									
Red knot Calidris canutus	N									
Northern lapwing Vanellus vanellus	N									
Eurasian marsh harrier Circus aeruginosus	N									
Eurasian oystercatcher Haematopus ostralegus	N									
Pink-footed goose Anser brachyrhynchus	N									
Red kite Milvus milvus	N									
Common redshank Tringa totanus	N									
Stone-curlew Burhinus oedicnemus	N									
Greater white-fronted goose Anser albifrons albifrons	N									
Greenland white-fronted goose Anser albifrons flavirostris	N									
Whooper swan Cygnus cygnus	N									
Eurasian wigeon Anas penelope	N									
Birds of coastal habitats										
Arctic tern Sterna paradisaea	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pied avocet Recurvirostra avosetta	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Barnacle goose Branta leucopsis [Eastern Greenland/Scotland/Ireland]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Bar-tailed godwit Limosa lapponica	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Tundra swan Cygnus columbianus bewickii	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Black-tailed godwit Limosa limosa islandica	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dark-bellied brent goose Branta bernicla bernicla	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Light-bellied brent goose Branta bernicla hrota [Canada/Ireland]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red-billed chough Pyrrhocorax pyrrhocorax	N									
Black (common) scoter Melanitta nigra	N									
Common tern Sterna hirundo	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

EA Class Name	WR Sensitive?	Change in water levels or table	Change in flow or velocity regime	Change in surface flooding	Changed water chemistry	Change in FW flow to estuary	Change in salinity regime	Reduced dilution capacity	Habitat loss	Entrapment
Great cormorant Phalacrocorax carbo	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Eurasian curlew Numenius arquata	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dunlin Calidris alpina alpina	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dunlin Calidris alpina schinzii	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Northern gannet Morus bassanus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
European golden plover Pluvialis apricaria	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Great crested grebe Podiceps cristatus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Grey plover Pluvialis squatarola	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Common guillemot Uria aalge	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Hen harrier Circus cyaneus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Herring gull Larus argentatus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red knot Calidris canutus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Lesser black-backed gull Larus fuscus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Little egret Egretta garzetta	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Little tern Sterna albifrons	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Eurasian marsh harrier Circus aeruginosus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Mediterranean gull Larus melanocephalus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Merlin Falco columbarius	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Eurasian oystercatcher Haematopus ostralegus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Peregrine falcon Falco peregrinus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pink-footed goose Anser brachyrhynchus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Northern pintail Anas acuta	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Atlantic puffin Fratercula arctica	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Purple sandpiper Calidris maritima	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Common redshank Tringa totanus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ringed plover Charadrius hiaticula	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Roseate tern Sterna dougalli	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ruff Philomachus pugnax	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Sanderling Calidris alba	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Sandwich tern Sterna sandvicensis	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Greater scaup Aythya marila	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Common shelduck Tadorna tadorna	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Short-eared owl Asio flammeus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Slavonian grebe Podiceps auritus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Eurasian teal Anas crecca	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ruddy turnstone Arenaria interpres	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Greater white-fronted goose Anser albifrons albifrons	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Greenland white-fronted goose Anser albifrons flavirostris	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Whooper swan Cygnus cygnus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Eurasian wigeon Anas penelope	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Waterfowl assemblage Waterfowl assemblage	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Seabird assemblage Seabird assemblage	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Birds of estuarine habitats										
Arctic tern Sterna paradisaea	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

EA Class Name	WR Sensitive?	Change in water levels or table	Change in flow or velocity regime	Change in surface flooding	Changed water chemistry	Change in FW flow to estuary	Change in salinity regime	Reduced dilution capacity	Habitat loss	Entrapment
Pied avocet Recurvirostra avosetta	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Barnacle goose Branta leucopsis [Eastern Greenland/Scotland/Ireland]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Bar-tailed godwit Limosa lapponica	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Black-tailed godwit Limosa limosa islandica	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dark-bellied brent goose Branta bernicla bernicla	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Light-bellied brent goose Branta bernicla hrota [Canada/Ireland]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Black (common) scoter Melanitta nigra	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Common tern Sterna hirundo	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Great cormorant Phalacrocorax carbo	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Eurasian curlew Numenius arquata	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dunlin Calidris alpina alpina	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dunlin Calidris alpina schinzii	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
European golden plover Pluvialis apricaria	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Great crested grebe Podiceps cristatus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Grey plover Pluvialis squatarola	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Hen harrier Circus cyaneus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Herring gull Larus argentatus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red knot Calidris canutus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Northern lapwing Vanellus vanellus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Lesser black-backed gull Larus fuscus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Little egret Egretta garzetta	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Little tern Sterna albifrons	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Mediterranean gull Larus melanocephalus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Merlin Falco columbarius	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Eurasian oystercatcher Haematopus ostralegus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Peregrine falcon Falco peregrinus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pink-footed goose Anser brachyrhynchus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Northern pintail Anas acuta	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Purple sandpiper Calidris maritima	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Common redshank Tringa totanus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ringed plover Charadrius hiaticula	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ruff Philomachus pugnax	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Sanderling Calidris alba	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Sandwich tern Sterna sandvicensis	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Greater scaup Aythya marila	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Common shelduck Tadorna tadorna	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Northern shoveler Anas clypeata	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Slavonian grebe Podiceps auritus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Common snipe Gallinago gallinago	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Eurasian teal Anas crecca	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ruddy turnstone Arenaria interpres	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Greater white-fronted goose Anser albifrons albifrons	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Greenland white-fronted goose Anser albifrons flavirostris	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Eurasian wigeon Anas penelope	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

EA Class Name	WR Sensitive?	Change in water levels or table	Change in flow or velocity regime	Change in surface flooding	Changed water chemistry	Change in FW flow to estuary	Change in salinity regime	Reduced dilution capacity	Habitat loss	Entrapment
Waterfowl assemblage Waterfowl assemblage	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Seabird assemblage Seabird assemblage	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Not classified by EA										
Submarine structures made by leaking gases	N									
Atlantic decalcified fixed dunes (Calluno-Ulicetea)	N									
Dunes with Hippopha rhamnoides	N									
Machairs (* in Ireland)	Y									
Coastal dunes with Juniperus spp.	N									
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea	Y									
Sub-Arctic Salix spp. scrub	N									
Alpine and subalpine calcareous grasslands	N									
Species-rich Nardus grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe)	N									
Caves not open to the public	N									
Caledonian forest	N									
Harbour porpoise Phocoena phocoena	N									
Green shield-moss Buxbaumia viridis	Y									
Killarney fern Trichomanes speciosum	Y									
Slender naiad Najas flexilis	Y									
Ramshorn snail Anisus vorticulus	Y									

Appendix E
Feasible options review

Welsh Water WRMP 2019
Habitats Regulations Assessment – Initial Review of Feasible Options

1. Introduction

1.1 The WRMP

All water companies in England and Wales must set out their strategy for managing water resources across their supply area over the next 25 years. This statutory requirement is defined under the Water Act 2003, which also sets out how water companies should publish a Water Resources Management Plan (WRMP) for consultation, setting out how they will balance supply and demand over the 25 year planning period. The WRMP is linked to other water resource planning and policy documents, including the Drought Plan, Water Efficiency Strategy and Leakage Strategy.

The WRMP process identifies potential shortages in the future availability of water and sets out the possible solutions required to maintain the balance between water available and future demand for water. The process initially reviews as many potential solutions as possible (the 'unconstrained list' of options) to identify 'feasible' options for each Water Resource Zone (WRZ) where deficits are predicted. These 'feasible' options are reviewed according to an industry standard methodology to identify 'preferred options' to resolve any supply deficits in relation to financial, environmental and social costing. This preferred list is based on standard assessment methodologies set out in the WRMP, as well as the Strategic Environmental Assessment (SEA) and the Habitats Regulations Assessment. Dŵr Cymru Welsh Water (DCWW) is currently preparing its WRMP for the period 2019 – 2044.

1.2 Habitats Regulations Assessment

Regulation 61 of the *Conservation of Habitats and Species Regulations 2010* (as amended) (the 'Habitats Regulations') states that if a plan or project is "*(a) is likely to have a significant effect on a European site*[1] *or a European offshore marine site*[2] *(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 plan is given effect.

[1] Strictly, 'European sites' are: any Special Area of Conservation (SAC) from the point at which the European Commission and the UK Government agree the site as a 'Site of Community Importance' (SCI); any classified Special Protection Area (SPA); any candidate SAC (cSAC); and (exceptionally) any other site or area that the Commission believes should be considered as an SAC but which has not been identified by the Government. 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') apply; 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. 118) when considering development proposals that may affect them. "European site" is therefore used in this report in its broadest sense, as an umbrella term for all of the above designated sites. Additional information on European site designations is provided in Appendix A.

[2] 'European offshore marine sites' are defined by Regulation 15 of *The Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007* (as amended); these regulations cover waters (and hence sites) over 12 nautical miles from the coast.

The process by which Regulation 61 is met is known as Habitats Regulations Assessment (HRA)[3]. An HRA determines whether there will be any 'likely significant effects' (LSE) on any European site as a result of a plan's implementation (either on its own or 'in combination' with other plans or projects) and, if so, whether these effects will result in any adverse effects on the site's integrity. DCWW has a statutory duty to prepare its WRMP and is therefore the Competent Authority for any HRA.

1.3 This Technical Note

DCWW has commissioned Amec Foster Wheeler (AFW) to undertake the data collection and interpretation required to support an HRA of its WRMP, and to determine whether any aspects of the WRMP (alone or in-combination) could have significant or adverse effects on the integrity of any European sites. As part of this process AFW has undertaken an initial review of the 'feasible options' identified by DCWW; this technical note summarises this review.

The note may be used to support consultations with the statutory authorities although it is not a 'draft HRA', 'screening', or similar assessment of the final plan and is not intended to provide a definitive conclusion on the likely effects of the final WRMP. Rather, it is primarily intended to inform DCWW's selection of preferred options, by identifying:

- those options that would appear to have an unavoidable risk of adverse effects on European sites (and which should therefore be avoided if possible);
- those options where significant or adverse effects would not appear likely, assuming established avoidance and mitigation measures can employed at the scheme level; and
- those options where effects are currently uncertain, which would require additional data or information on operation / construction to support a robust HRA of the WRMP.

2. Approach

2.1 Overview of Plan-Level HRA

Regulation 61 essentially provides a test that the final plan must pass; there is no statutory requirement for HRA to be undertaken on draft plans or similar developmental stages (e.g. the unconstrained or feasible options). However, it is accepted best-practice for the HRA of strategic planning documents to be run as an iterative process alongside plan development, with the emerging proposals or options continually assessed for their possible effects on European sites and modified or abandoned (as necessary) to ensure that the subsequently adopted plan is not likely to result in significant or adverse effects on any European sites, either alone or 'in combination' with other plans. This is undertaken in consultation with NE, NRW and other appropriate consultees. Therefore, the principles of Regulation 61 are typically applied to the emerging components of strategic plans – in this case the feasible options.

The HRA process is a staged assessment to determine whether there will be any 'likely significant effects' (LSE) on any European site as a result of a plan's implementation, either on its own or 'in combination' with other plans or projects (referred to as 'screening'); and, if so, whether these effects will adversely affect the site's integrity (referred to as 'appropriate assessment').

The 'screening' test or 'test of significance' is a low bar: a plan should be considered 'likely' to have an effect if the competent authority (in this case DCWW) is unable (on the basis of objective information) to exclude the possibility that the plan could have significant effects on any European site, either alone or in combination with other plans or projects; an effect will be 'significant' if it could undermine the site's conservation objectives. Screening can be used to 'screen-out' or exclude European sites or plan components from further assessment, if it is possible to determine that significant effects are will not occur

[3] The term 'Appropriate Assessment' has been historically used to describe the process of assessment; however, the process is now more accurately termed 'Habitats Regulations Assessment' (HRA), with the term 'Appropriate Assessment' limited to the specific stage within the process.

(e.g. if sites or interest features are clearly not vulnerable (both exposed and sensitive) to the outcomes of a plan). Screening can take account of any measures included in the WRMP to avoid significant effects.

An 'appropriate assessment' stage provides a more detailed examination of the plan (or its components) where the effects are significant or uncertain[4]. Note that undertaking a more detailed assessment does not necessarily imply a conclusion of 'significant effects' for those sites or aspects that are 'screened in' since in many cases the assessment is completed due to a residual uncertainty which the assessment is intended to resolve. The 'appropriate assessment' stage may therefore conclude that the proposals are likely to have an adverse effect on the integrity of a site (in which case they should be abandoned or modified); or that the effects will be significant but not adverse (i.e. an effect pathway exists, but those effects will not undermine site integrity); or that the effects will, if re-screened, be 'not significant' (taking into account the additional assessment or perhaps additional measures proposed for inclusion in the final plan).

2.2 Review of the Feasible Options

The review of the feasible options is not a 'formal' component of the HRA process as the key assessment stages (screening / appropriate assessment) can only be strictly applied to the proposed final version of the plan (i.e. the preferred options). However, the assessment principles that underpin screening and appropriate assessment are applied to the emerging feasible options to:

- guide the selection of preferred options by DCWW;
- inform the scope of any further assessments likely to be required as the options are refined and developed, including any data likely to be required to support the selection of an option as a preferred option; and
- provide an opportunity for the statutory consultees to review the HRA methods and assumptions, and identify any other potential effects they are aware of that that may need consideration in relation to particular options[5].

Approach

For the HRA, the initial assessment of the feasible options focuses on the 'supply-side' options only, i.e.

- the development of new surface or groundwater sources, or desalination of sea water;
- modification of an existing licence to alter the operational regime;
- 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;
- capital works to the network or assets;
- transferring water to/from adjacent water companies; or
- transferring water or licences from other third parties.

It does not explicitly consider demand- or post-distribution options designed to reduce treated water use (such as metering or provision of water butts) or leakage reduction options as these cannot negatively affect any European sites[6].

[4] i.e. 'likely significant effects', where the possibility of significant effects cannot be excluded.

[5] Depending the consultation proposals for the feasible options stage.

[6] The only realistic mechanism for a negative effect would be through direct encroachment at the local-level (for example a leaking pipe might be located in or near a SAC), but this cannot be meaningfully assessed at the strategic level since location-specific information is not available without specific investigations, which would form part of the package (i.e. the precise location and severity of most leakages is not known ahead of detection).

The feasible options review identifies the location and the anticipated outcomes of each option through construction and operation, based on the option descriptions provided by DCWW. GIS is then used to identify all European sites within a precautionary 20km 'zone of influence', with sites beyond this considered where reasonable impact pathways are present based on the scheme description (for example, receptors downstream of significant new abstractions). The possible effects of each option on European sites and their interest features is then assessed, based on

- the anticipated operation of each option and predicted zone of hydrological influence;
- any predicted construction works required for each option;
- the European site interest features and their sensitivities; and
- the presence of reasonable impact pathways.

Assumptions

The review of the feasible options takes account of established project-level avoidance and mitigation measures that are known to be achievable, available and likely to be effective – for example, normal construction best-practice or project planning. These measures are identified in Appendix B to this technical note and it is assumed that this list will be incorporated as appropriate into the WRMP or its supporting documentation. It is considered (based on professional experience) that most potential construction effects can almost certainly be avoided or mitigated at the project-level using these measures or similar construction best practice[7]. For the operational aspects of supply-side options, potential avoidance measures will be considered where these are apparent, although in most instances the mitigation likely to be required for an option (e.g. compensation releases; 'hands-off' flows) cannot necessarily be determined at this stage, and may not be identifiable without substantial additional investigation or input from DCWW.

The review also assumes that the existing licensing regime is having no significant effects on any European sites, or if this is not the case, that any necessary licence amendments required (e.g. sustainability reductions etc.) have been included in any deficit modelling. The feasible options will therefore only affect European sites through any new resource and production-side options advocated to resolve deficits, and not through the existing permissions regime[8], and it is therefore assumed that options that are 'network solutions' only (i.e. moving spare licensed volumes) will not have operational effects. It is also assumed that there is a reasonable prospect or evidence that the proposed abstraction volumes are available for those 'new water' options.

In combination effects

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. It should also be noted that the WRMP explicitly accounts for predicted water demand changes due to other plans and major projects in its modelling scenarios, which effectively contributes to the 'in combination' assessment.

The review of the feasible options does not include an assessment of the potential 'in combination' effects, either between options or with other plans, projects or programmes. This is due to the large number of options and the level of detail provided on them; any assessment would be speculative and mostly abortive. The potential for in combination effects will be reviewed as the preferred options are selected, with a full 'in combination' assessment undertaken of the preferred options. However, DCWW should be aware of the risks of in combination effects between options and with other plans (e.g. the Drought Plan) when selecting preferred options, particularly where options affect the same catchments or water resources.

[7] Although note that this does not remove the need for project-level HRA.

[8] It is recognised that, occasionally, agreed sustainability reductions have been subsequently shown to be insufficient to address the effects of PWS abstraction on some sites (the most notable example is the River Ehen in Cumbria).

Outputs

The review of the feasible options is summarised in Appendix A. This provides a short description of each option and a narrative assessment of its likely effects, with those European sites within 20km that are most vulnerable (i.e. both exposed and sensitive) to the delivery or operation of the scheme[9] noted in the text. It then provides broad 'recommendations' regards progressing the options as preferred options based on the anticipated construction and operational effects; the criteria for these recommendations are as follows (colour coded for clarity):

Table 2.1 Summary of criteria for considering feasible options as potential

Recommend as preferred option?	Notes
Yes	Option appears unlikely to have any effects on European sites as features are either not exposed or not sensitive to the likely outcomes (i.e. no or no reasonable impact pathways – for example, operational effects for a 'construction only' network solution; 'dry' habitats over (say) 2km from an option; sites in different surface water catchments; upstream sites; etc.(being mindful of mobile species)). In these instances, the recommendation is 'Yes', i.e. no reason not to pursue as preferred option.
Yes	Options where pathways for effects are clearly identifiable (such that HRA would probably be required at the scheme level) but where the potential effects can obviously be avoided or mitigated using established measures that are known to be effective, for example: ▶ construction near a European site (effects avoidable with normal project planning and best-practice); ▶ minor works within European sites (e.g. works to existing assets where effects unlikely to be adverse due to absence of features); ▶ major works near / within European sites that can be completed without adverse effects (e.g. crossings of SAC rivers using existing roads or directional drilling); ▶ operational effects that are avoidable with established operational mitigation (e.g. licence controls, although at this stage potential operational effects will usually lead to an 'uncertain' recommendation to flag the need for additional information). In these instances the generic measures outlined in Appendix B can be relied on if these are included within the WRMP package, although the final plan may need to include specific measures for potential 'high-impact' options (e.g. commitments to non-invasive river crossings or timing works to avoid sensitive periods).
Uncertain	Options where a potential effect is conceivable and cannot be discounted, and the likely effects are therefore uncertain at the feasible options stage. This is typically due to limitations on the information available, either in terms of the operation of the scheme, the mitigation that might be employed, or the data available on the interest features of the sites. These options, if pursued as preferred options, may require ▶ additional investigation to determine their effects, and there may be a risk that the risk of effects cannot be quantified satisfactorily at the strategic level (for example, substantial additional modelling or site-specific investigation may be required). ▶ the identification of specific measures or requirements for scheme delivery for inclusion with the WRMP. This category is therefore intended as a flag to identify those options where there is potentially additional 'cost' associated with their inclusion (either related to the data required to support a robust HRA and hence the option, or the need for specific mitigation commitments) which DCWW should consider when selecting the preferred options.
No	Options where significant effects (i.e. not negligible or inconsequential) on a European site are very likely or certain due to the scale/ nature/location of the option proposals, or the vulnerability and distribution of the interest features within /near the European site. Although a full appropriate assessment is not undertaken at this stage, adverse effects may be more likely (or even certain) if the scheme is taken forward as a preferred option and it is likely that extensive or unproven mitigation will be required following scheme-level investigations. Feasible options in this category are not recommended for consideration as preferred options (although additional information may allow a re-assessment).

3. Next steps

The initial assessments provided for the feasible options are not formal screening assessments or definitive conclusions; further examination of the likely effects of the preferred options will be required to clearly demonstrate 'no likely significant effects' (screening) or 'no adverse effects on integrity' (appropriate assessment), including 'in combination'. The review of the feasible options therefore provides a framework

[9] For clarity, the summary tables do not explicitly identify or assess every European site within 20km; this will be set out in more comprehensive 'screening proformas' that will accompany the final HRA which will be used to transparently document the screening process.

for the selection of the preferred options, identifies areas where further information may be required from DCWW, and allows DCWW to demonstrate a robust iterative approach to the HRA.

The review of the feasible options will be one factor in the preferred options selection process, and it is very possible that DCWW will wish to pursue options that are currently flagged as 'uncertain'. In these instances it will be necessary to determine the information requirements that would allow a robust conclusion of 'no significant effects' or 'no adverse effects' to be drawn, and hence allow the WRMP to pass the Regulation 61 tests. This needs to be undertaken in conjunction with DCWW and its engineers, and may require additional supporting evidence or data from other organisations (e.g. NRW), particularly where the uncertainty relates to operational effects and the availability of new water.

Author	Reviewer
.....	.....
Mike Frost	Alex Melling

Copyright and non-disclosure notice

Third party disclaimer

Management systems

This document has been produced by Amec Foster Wheeler Environment & Infrastructure UK Limited in full compliance with the management systems, which have been certified to ISO 9001, ISO 14001 and OHSAS 18001 by LRQA.

Appendix A

Summary of Feasible Options Review

Habitats Regulations Assessment - Summary of Initial Assessment of Feasible Options

Number	Name	Summary (from proforma)	General Assessment	Recommend option? (Construction)	Recommend option? (Operation)
NEYM003	Connect existing Afon Rhythallt source intake to Cwellyn WTW	This option would re-commission a licensed but currently unused river intake on the Afon Rhythallt at Crawia Weir (near Llanrug where the river changes name to the Afon Seiont). Water abstracted at this point used to be treated at Crug WTW, near Caernarfon but Crug WTW was abandoned during 2007/ 08. Elsewhere, water abstracted from Llyn Cwellyn is treated at Cwellyn WTW but abstraction quantity is significantly constrained by licence conditions and so Cwellyn WTW often has spare capacity. This option would reinstate abstraction from the Afon Rhythallt at Crawia Weir and transfer the water to Cwellyn WTW. This option is a network solution: it would not require any increase in the currently licensed abstraction volumes from the Afon Rhythallt and would operate within the existing licence parameters.	This proposal would be an inter-basin transfer of untreated water, although there will be no storage or discharge of the raw water (therefore no risk of transfer of species etc.). This option would require construction works near this the Afon Gwyrfai a Llyn Cwellyn SAC, but there would be no direct impact either through construction (no new intakes / outfalls etc.) or operation (water from the Afon Rhythallt would be pumped to Cwellyn WTW for treatment). Most potential construction impacts could be managed through normal construction best practice. Construction may need to be timed to minimise potential impacts on migratory fish (salmon). The Y Fenai a Bae Conwy / Menai Strait and Conwy Bay SAC is downstream of the proposed abstraction, although operational effects are not anticipated as the option would not require any increase in the currently licensed abstraction volumes from the Afon Rhythallt and would operate within the existing licence parameters. Specific consideration would be required to ensure no construction impacts on the SAC due to the close proximity of the Scheme. No other sites are likely to be impacted by the scheme.	Construction: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive)	Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)
NEYM017	Buy out the hydropower company and then abstract from the Marchlyn Mawr reservoir and transfer the water to DCWW's Marchlyn Bach reservoir	Transfer from Marchlyn Mawr SRV (hydro electric storage reservoir) to Marchlyn Bach SRV (DCWW source reservoir) . This will provide a contingency supply during dry weather/drought conditions, perhaps a 1 in 20 year requirement. Provide for temporary installation approx. 200m of 250mm main (est) and pump unit to link the Marchlyn Mawr SRV and discharge to gully running to Marchlyn Bach SRV.	Installation of 200m of mains pipes and a pump unit to the west of Marchlyn Mawr Reservoir. The Scheme lies within Snowdonia SAC and so the site and features are potentially vulnerable to direct loss of habitat (etc.) due to new assets (PS / pipe); incidental construction effects (avoidable with best practice); and operational effects (existing gully to be used to transfer water). Having said that, this is a small-scale scheme with most of the construction in existing operational areas around Marchlyn Mawr reservoir, which is semi-natural only and unlikely to support good examples of the principal interest features of the site; furthermore, the scheme would only be used in drought conditions (expected 1 in 20 years), so operational effects would be minimal. Appropriate assessment will be required but effects would not obviously be adverse. The scheme is within the typical expected commuting / foraging range of lesser horseshoe bats associated with Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC but it is extremely unlikely that works in this upland area would have significant effects.	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Yes - effects possible but significant or significant adverse effects avoidable with established operational mitigation (e.g. licence controls)

Habitats Regulations Assessment - Summary of Initial Assessment of Feasible Options

Number	Name	Summary (from proforma)	General Assessment	Recommend option? (Construction)	Recommend option? (Operation)
NEYM022a	New pipeline across the Menai for zonal optimisation	This option looked at the Menai Bridge crossing to assess what options are available for zonal optimisation. The recommendations are to install a new cross connection between the inlet and outlet mains at Penmyndd SR to allow this SR to backfeed across the Menai Bridge to the mainland and upgrade the Cefni to Penmyndd SR pumps. Penmyndd SR will receive a pumped supply from Cefni WTW. Under current operation Penmyndd SR receives approximately 3.8 Ml/day from Pentir SR which receives its supply from both Cwellyn WTW and Mynydd Llandegai WTW and with the solution implemented the flow across the Menai Bridge will reverse with 0.4 Ml/day passing from Anglesey to the mainland which will reduce the required output from Pentir SR by 4.2 Ml/day. This option is a network solution: it would not require any increase in the currently licensed abstraction volumes and would operate within the existing licence parameters.	This option would involve minor asset modifications to allow spare water on Anglesey to be utilised on the mainland. All of the works will be within or near Cefni WTW (pump upgrades) and Penmynedd SR (connections and valving), and are relatively small scale. The existing main across the Britannia Bridge would not require modification for the option to work, although this may be refurbished at some point in the future and this might arguably be undertaken alongside the delivery of this option if required. No European sites will be particularly vulnerable to this option: there will be no operational effects (network solution), and construction is very limited and several kilometres from the nearest sites. All potential construction impacts can managed through normal construction best practice. This conclusion would need to be reviewed if refurbishment of the Brittannia Bridge water main is proposed (Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC may be vulnerable to these works, depending on their scope) but even in this instance it is still expected that all potential construction impacts can managed through normal construction best practice.	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)
NEYM022b	Zonal optimisation to address the lack of bi-directional flow across Menai Bridge	This option addressed the lack of bi-directional flow across the Menai Bridge. The recommendations are to install a new cross connection with non return valve between the inlet and outlet mains at Penmynydd SR, upgrade the Cefni to Penmyndd SR pumps, install a new pumping station on the mainland and install a new 355mm HPPE SDR17 main from the new pumping station to Bryniau SR. This would allow Penmyndd SR to backfeed across the Menai Bridge from Anglesey to the mainland where the flow would then be boosted up to Bryniau SR in Bangor. Under current operation Penmyndd SR receives approximately 3.8 Ml/day from Pentir SR which receives its supply from both Cwellyn WTW and Mynydd Llandegai WTW and with the solution implemented the flow across the Menai Bridge will reverse with 4.3 Ml/day passing from Anglesey to the mainland. This will reduce the required output at Cwellyn WTW and Mynydd Llandegai WTW by a combined 8.1Ml/day. This option is a network solution: it would not require any increase in the currently licensed abstraction volumes and would operate within the existing licence parameters.	This option would involve minor asset modifications to allow spare water on Anglesey to be utilised on the mainland. The works are small scale and located within or near to Cefni WTW. A new cross section is to be installed with a non-return valve at Penmynydd SR and the upgrade of the pumps for Cefni to Penmyndd SR. A new pumping station on the mainland is to be built and connected via a new water main, which is likely to be located within existing roads. There will be no operational effects (network solution) although construction works (pipeline) are likely to be relatively close to Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC. All potential construction impacts can clearly be avoided through normal construction best practice, however.	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)

Habitats Regulations Assessment - Summary of Initial Assessment of Feasible Options

Number	Name	Summary (from proforma)	General Assessment	Recommend option? (Construction)	Recommend option? (Operation)
NEYM023	Cwm Dulyn transfer from Harlech WRZ to NEYM zone	Transfer 1.5Ml/d from Cwm Dulwyn WTW to NEYM. This involves using the remaining capacity of Cwm Dulwyn WTW (total capacity is 3Ml/d) to supply LCAs north of the WTW normally supplied by Cwellyn WTW via Penfordd Helen PS. 5.1km of existing trunk mains would need to be upgraded to reduce head loss whilst maintaining self cleansing velocities. Penfordd Helen PS would no longer feed south the Cwm Dulwyn. This option supplies up to LCA 3D101A01 and its cascading LCAs.	This option is a network solution which uses the remaining capacity of the Cwm Dulwyn WTW licence. Pipeline works of 5.1km are required to upgrade the mains. There are four European Sites within 5km of the likely route although two of these will not be exposed to construction effects (separate catchments / mobile species with limited ranges). The potential exceptions are lesser horseshoe bats and otters associated with Glynllifon SAC and Afon Gwyrfai a Llyn Cwellyn SAC respectively. These species may be vulnerable to construction works affecting supporting habitats outside the designated site boundary (e.g. foraging areas) and so scheme-specific surveys and mitigation measures are likely to be required, although any potential effects will almost certainly be avoidable at the scheme level. No operational effects (network solution).	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)
NEYM024	New main to transfer water from Dolbenmaen WTW to NEYM zone	Transfer 4Ml/d from Dolbenmaen WTW to NEYM. This involves supplying LCAs up to Ysbytty SR normally supplied by Cwm Dulwyn and Cwellyn WTWs. 1.4km of new mains are required to connect Ysbytty SR to the 400mm trunk main downstream of Penfordd Helen PS. This provides the option to supply Ysbytty SR from Dolbenmaen WTW, Cwellyn WTW or both. 14.9km of existing trunk mains would need to be upsized to reduce head loss whilst maintaining self cleansing velocities. A upgraded pump at Dolbenmaen WTW would be required to provide the lift to reach Ysbytty SR and produce a peak flow of 77l/s. This option assumes Cwm Dulwyn WTW is abandoned.	Option requires new mains along a 1.4km cross-country route near the Afon Gwyrfai; and the replacement of 14.9km of existing trunk mains (note, this is mostly located within existing roads but also follows the cross-country section of NEYM023). Works to upgrade the Dolbenmaen WTW are also required. Three European Sites are within 1km of the scheme and have features that may be vulnerable to construction effects (Afon Gwyrfai a Llyn Cwellyn SAC (Salmon, Watercourses with Ranunculus vegetation; otter); Glynllifon SAC (lesser horseshoe bat); Corsydd Eifionydd SAC (Marsh fritillary butterfly). However, effects can be clearly avoidable at the scheme level (e.g. works should be timed to avoid salmon migration and scheme-specific detailed design is required at the planning stage to keep bat flyways intact). All other potential effects can be avoided with normal construction practice (e.g. on downstream sites). No operational effects (network solution).	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)
NEYM025a	Transfer from Bryn Conwy to Bangor (new pipe between existing distribution mains)	This option would involve laying a new main to connect the existing distribution mains from Bryn Conwy to North Eryri Ynys Mon (NEYM). This will allow NEYM to receive a small transfer of Water from Bryn Cowlyd WTW via Oakwood PS, Craigllwyd SR, Llanfairfechan PS and Llanfairfechan SR.	Approximately 1km of new pipeline is to be installed within roads to connect existing mains. This Scheme is low impact and is a 'network solution'. One European Site is located 2km down stream from the Site which makes it vulnerable to possible outcomes of the construction effects but the options is clearly low impact and all construction effects can be avoided through normal construction best practice.	Construction: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive)	Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)
NEYM025b	Transfer from Bryn Conwy to Bangor (new pipe between existing distribution mains with upgrades on smaller diameter mains).	This option would involve laying a new main to connect the existing distribution mains from Bryn Conwy to North Eyri Ynys Mon (NEYM) and upgrading the smaller diameter mains located upstream. This will allow NEYM to receive a small transfer of Water from Cwellyn WTW via Oakwood PS, Craigllwyd SR, Llanfairfechan PS and Llanfairfechan SR.	Approximately 4.5km of new mains pipe is to be installed and another section approximately 0.8km in length is to be upgraded. There are two European Sites 1km downstream from the Scheme and are therefore vulnerable to construction works. Three other European Sites are within close proximity. All anticipated effects on European Sites can be avoided by following construction best practice.	Construction: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive)	Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)

Habitats Regulations Assessment - Summary of Initial Assessment of Feasible Options

Number	Name	Summary (from proforma)	General Assessment	Recommend option? (Construction)	Recommend option? (Operation)
NEYM025c	Transfer from Bryn Conwy to Bangor (new larger diameter dedicated transfer main - retaining the existing distribution mains).	This option would involve laying a new dedicated transfer main connecting the 250mm trunk main downstream of Craigllwyd SR to Bryniau SR within Bangor. This will allow NEYM to receive a transfer of Water from Bryn Cowlyd WTW via Oakwood PS and Craigllwyd SR. It is also proposed to tie the new main into the existing 250mm which supplies Bryniau SR from Mynydd Llandegai WTW as this would allow the new main to supply from West to East and would provide resiliance to the area currently supplied from Craigllwyd SR. In addition to the new main there are also upgrades required to the Oakwood PS and the existing mains around Oakwood PS.	A new trunk main would be required to transfer water from the trunk main at Craigllwyd SR to Bryniau in Bangor. As currently mapped the new trunk main crosses Coedydd Aber SAC at Pen-y-bryn on the northern edge of the SAC. The width of the SAC is approximately 20m across at this point. Diverting the mains pipe beyond the boundary to the north would reduce / avoided the effects significantly. The new trunk main also borders Coedydd Aber SAC in two others along the northern edge of the SAC. It is likely that significant effects can be avoided with appropriate standoff distances and the route should be amended to avoid the SAC. All other potential effects on European Sites can be avoided by following construction best practice.	Construction: Uncertain - significant effects cannot be excluded and may require the identification of bespoke mitigation measures or amendments to scheme design at the plan level	Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)
NEYM026	Marchlyn Bach reservoir - resolve leakage and reinstate reservoir capacity to the original top water level.	The Marchlyn Bach reservoir is currently held ~1.5m below TWL to reduce seepage around the abutments. This scheme would undertake drill and grout operations to improve the hydraulic cut-off beneath and around the dam to enable the reservoir to be returned to its design TWL.	Marchlyn Bach reservoir is within the Eryri/ Snowdonia SAC, and so features within this site may be vulnerable to construction works. However, most if not all of the works will be restricted to existing operational structures / features (embankments, access tracks, etc.) which are very unlikely to support the features of the SAC. The scheme will require appropriate assessement but the effects are likely to be minimal and / or avoidable at the scheme level. All other potential effects can be avoided with established measures.	Construction: Uncertain - significant effects cannot be excluded and may require the identification of bespoke mitigation measures or amendments to scheme design at the plan level	Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)
PEM001	Re-instate Milton source for industrial customers (non potable)	Industrial users are supplied with raw water from Eastern Cleddau. Raw water from existing Milton source can be used to supplement the water from Eastern Cleddau freeing up some of this supply to be used elsewhere. 500m of pipework will be required to connect the milton supply to the existing raw water main. A new borehole will be required at Milton	This option was previously assessed as a preferred option in the 2011 WRMP, and it was concluded that the scheme was unlikely to have any significant adverse effect. The most vulnerable sites are the Pembrokeshire Marine / Sir Benfro Forol SAC and the Pembrokeshire Bat Sites and Bosherston Lakes/ Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston SAC. The closest features of the Pembrokeshire Marine / Sir Benfro Forol SAC are Estuaries; Mudflats and Sandflats; and Atlantic Salt Meadows, which are all present within Radford Pill (the estuary inlet closest to Milton). There is no data available on the current condition of these features within the Radford Pill, although the SSSI data for this area does not suggest that the current abstraction regime is negatively affecting any of the shared (i.e. SAC) interest features. As the abstraction is within the parameters of the existing licenced usage, which is not subject to sustainability reductions, the operational effects are not considered to be significant. With regard to the Pembrokeshire Bat Sites and Bosherston Lakes SAC, the construction work would be required close to known roost sites, although any construction effects can be avoided with normal project planning and best practice measures.	Construction: Uncertain - significant effects cannot be excluded and may require the identification of bespoke mitigation measures or amendments to scheme design at the plan level	Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures

Habitats Regulations Assessment - Summary of Initial Assessment of Feasible Options

Number	Name	Summary (from proforma)	General Assessment	Recommend option? (Construction)	Recommend option? (Operation)
PEM002b	Upgrade zonal infrastructure from Bolton Hill WTW to make use of spare capacity (South Route)	Bolton Hill WTW has an existing maximum capacity of 50 Ml/d. An addional 5 Ml/d of resource can be provided to Bolton Hill from various sources. To realise this additional flow as DO a treatment works extension must be undertaken and various sections of infrastructure will need to be upgraded. The Cleddau Bridge is taken as the constraint on transfer of the additional 5 Ml/d into the southern routes. A model run is required to determine other constraints within the network which may need to be resolved to fully deploy the output.	Scheme-specific detailed design required to avoid effects on greater and lesser horseshoe bats and otter associated with Pembrokeshire Bat Sites and Bosherston Lakes/ Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston SAC and Limestone Coast of South West Wales/ Arfordir Calchfaen de Orllewin Cymru SAC. Scheme-specific detailed design required to avoid significant construction effects to Pembrokeshire Marine/ Sir Benfro Forol SAC due to close proximity causing the Site to be vulnerable.	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)
PEM003	Dam-raising of Llysyfran	This scheme would raise Llys-y-Fran Reservoir by 5 m to increase storage capacity. DO increases unknown (awaiting DO modelling). This option does not currently address additional pumping and treatment at Presili or elsewhere (Llys-y-Fran is a river regulating reservoir and controls release of water into the river for abstraction elsewhere).	Llys-y-Fran reservoir is directly online with the Cleddau Rivers SAC; the river may be directly or indirectly affected by construction works on the dam (e.g. sediment release etc.), although it may be possible to mitigate this with appropriate construction measures. The future operating parameters for the reservoir are uncertain, but it is likely that the current flow regime will be maintained at least and the additional water should allow greater flexibility in operation, including release of compensation flows. The precise effects cannot be determined without scheme-specific modelling and assessment, but may not be adverse. The dam is thought to act as a barrier to some fish species, and modification may provide an opportunity to reduce the effect through the installation of additional measures. However, the scheme will certainly have significant effects on this site, and may affect some species due to alterations in water temperatures associated with water release from a deeper reservoir. Option is incomplete as pumping station information and DO modelling required.	Construction: Uncertain - significant effects cannot be excluded and may require the identification of bespoke mitigation measures or amendments to scheme design at the plan level	Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures
PEM012	Desalination Pembrokeshire WRZ for non-potable supply	This option would require a seawater desalination plant on the coast, with new intake / outfall, with a pipeline to Bolton Hill WTW (~5 km). The plant would only run when demands cannot be met from other resources. Operation will result in the discharge of brine with a significantly different salinity from the seawater, which may have localised effects on some features depending on dilution profiles. The intake / outfall would be located within the Pembrokeshire Marine SAC.	Construction of intake and outfall will directly affect the Pembrokeshire Marine SAC (intake / outfall in Milford Haven) which will result in significant effects on the site. Operation will result in discharge of brine which may have localised effects on some features depending on dilution profiles; fish entrainment is also possible. Effects can only be accurately determined with modelling etc. and detailed design. The Cleddau Rivers SAC is not linked to the site by a direct impact pathway but some mobile interest features may be vulnerable to the effects of the scheme (indirectly via possible effects on the fish species of Pembrokeshire Marine SAC).	Construction: No - significant effects certain and adverse effects likely to be unavoidable	Operation: No - significant effects certain and adverse effects likely to be unavoidable.

Habitats Regulations Assessment - Summary of Initial Assessment of Feasible Options

Number	Name	Summary (from proforma)	General Assessment	Recommend option? (Construction)	Recommend option? (Operation)
PEM014	Abstraction from the Afon Taf	The Afon Taf rises in the western fringe of the Preseli Hills and flows southward into Camarthan Bay. This option involves a new intake at Whitland, a new pipeline to Canaston Bridge and then onward transfer to Bolton Hill WTW via existing infrastructure. A new abstraction licence is required. This option looks at taking 5 Ml/d (CAMS Assessment). The intake and pumping station would be situated on the Taf close Whitland. A13.5 km long transfer pipeline to Canaston Bridge would follow the approximate route of the A40 either in the verge or adjacent farmland.	This option was previously assessed as a preferred option in the 2011 WRMP, and it was concluded that the scheme was unlikely to have any significant adverse effect. The only site that is potentially affected is Pembrokeshire Marine / Sir Benfro Forol SAC. The closest features are Estuaries; Mudflats and Sandflats; and Atlantic Salt Meadows, which are all present within Radford Pill (the estuary inlet closest to Milton). There is no data available on the current condition of these features within the Radford Pill, although the SSSI data for this area does not suggest that the current abstraction regime is negatively affecting any of the shared (i.e. SAC) interest features. It is considered that the effects of the abstraction on these features (and therefore this SAC) is likely to be negligible, particularly as the abstraction would be within the parameters of the existing usage. However, it is may not be possible to conclude no LSE and hence no adverse effect without additional scheme-specific studies.	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Yes - effects possible but significant or significant adverse effects avoidable with established operational mitigation (e.g. licence controls)
PEM016a	SAIP Schemes - strategic transfers from Camarthen (Afon Taf) and Tywi Gower WRZ.	Transfer of spare production capacity from Felindre WTW to Pembrokeshire utilising existing assets. The transfer requirement stated is 4.5Ml/d. Utilise the existing 21" gravity main from Brondini SRV, extend to Capel Dewi WTW, reinforce the existing infra and non-infra assets to transfer to Brandy Hill SRV. The option would require new or uprated pipelines totalling ~ 42km, and associated asset works.	This option is a network solution which uses the spare production capacity of the Felindre WTW licence, so no operational effects would be expected. The option would require new or upgraded pipelines totalling ~ 42km, which cross the Afon Tywi/ River Tywi SAC and the Carmarthen Bay and Estuaries/ Bae Caerfyrddin ac Aberoedd SAC, although it is likely that any effects on these sites can be avoided with normal planning / avoidance / mitigation measures (best-practice, scheduling works outside migration periods, etc.).	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)
PEM016b	East West Transfer Felindre (from Afon Taf and Tywi Gower) to Pembrokeshire - existing assets	Transfer of water from spare production capacity at Felindre WTW to Pembrokeshire utilising a new dedicated main. The transfer requirement stated is 6.0Ml/d.	This option is a network solution which uses the spare production capacity of the Felindre WTW licence, so no operational effects would be expected. The option would require new or uprated pipelines totalling ~ 38km, which cross the Afon Tywi/ River Tywi SAC and Carmarthen Bays and Estuaries / Bae Caerfyrddin ac Aberoedd SAC. No construction effects are anticipated if scheme-specific detailed design is produced to avoid damage to SACs. All other potential effects can be avoided using established measures.	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)

Habitats Regulations Assessment - Summary of Initial Assessment of Feasible Options

Number	Name	Summary (from proforma)	General Assessment	Recommend option? (Construction)	Recommend option? (Operation)
PEM024a	Canaston Pumping Station	Options PEM024a is a relatively minor asset upgrade that would allow finer control of abstraction volumes from the Afon Cleddau, and hence reduce unnecessary over-release of compensation flows from Llys-y-Fran reservoir. The option aims to minimise this over-release of water by configuring the pumps so that the rate of abstraction from the river is close to constant in a given day during periods of resource optimisation, which minimises the difference between the maximum rate of abstraction and the total daily abstraction. This will require a new low-lift pump set with a variable pump rate between 30 Ml/d and 55 Ml/d, and replacement of the fixed speed high-lift pumps with variable-speed pumps. This would then allow water to be conserved within the Llys y Fran reservoir by matching compensation releases to actual abstraction. No changes to the abstraction licence would be required.	The construction works for both options are relatively small-scale, but would be in close proximity to the Afonydd Cleddau/ Cleddau Rivers SAC at Canaston Bridge. The principal environmental risks are therefore likely to be contamination of surface waters by site-derived pollutants; and disturbance of sensitive species (e.g. from site lighting, noise, visual impact, vibration, etc.). Given the scale of the works, these risks can almost certainly be avoided or controlled through the normal project planning process and standard best-practice measures. The operation of the scheme would be within the terms of the existing licence, and is designed to minimise the unnecessary over-release of compensation flows from Llys y Fran. It will result in 'less' water passing down the Afon Cleddau as the compensation releases match the actual abstraction more closely, although licence conditions for compensation flows will be still be met and so (from an HRA perspective) the operational effects of altered compensation releases will be 'not significant' (as the licences have been previously assessed through the Review of Consents and are considered valid for the planning period).	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)
PEM024b	Canaston Pumping Station	Options PEM024b is a relatively minor asset upgrade that would allow finer control of abstraction volumes from the Afon Cleddau, and hence reduce unnecessary over-release of compensation flows from Llys-y-Fran reservoir. The Option aims to minimise this over-release of water by configuring the pumps so that the rate of abstraction from the river is close to constant in a given day during periods of resource optimisation, which minimises the difference between the maximum rate of abstraction and the total daily abstraction. This will require a new low-lift pump set with a variable pump rate between 30 Ml/d and 55 Ml/d, and an increase in the bankside storage volume to attenuate the impact of the high-lift pump abstraction rate, such that the low-lift pumps can pump at a constant rate equivalent to the total abstraction. This would then allow water to be conserved within the Llys y Fran reservoir by matching compensation releases to actual abstraction. No changes to the abstraction licence would be required.	The construction works for both options are relatively small-scale, but would be in close proximity to the Afonydd Cleddau/ Cleddau Rivers SAC at Canaston Bridge. The principal environmental risks are therefore likely to be contamination of surface waters by site-derived pollutants; and disturbance of sensitive species (e.g. from site lighting, noise, visual impact, vibration, etc.). Given the scale of the works, these risks can almost certainly be avoided or controlled through the normal project planning process and standard best-practice measures. The operation of the scheme would be within the terms of the existing licence, and is designed to minimise the unnecessary over-release of compensation flows from Llys y Fran. It will result in 'less' water passing down the Afon Cleddau as the compensation releases match the actual abstraction more closely, although licence conditions for compensation flows will be still be met and so (from an HRA perspective) the operational effects of altered compensation releases will be 'not significant' (as the licences have been previously assessed through the Review of Consents and are considered valid for the planning period).	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)
SEW004	New GW abstraction SE Wales, new WTW	40Ml/d of raw water to be abstracted from Great Spring using existing Network Rail pumps at Sudbrook. Raw water to be delivered to a new WTW sited at the Old Paper Mill. The new WTW will be rated for 40Ml/d and use Nanofiltration combined with a GAC to produce softened water. The potable water will be pumped 4km north to the A48 main where the flow will be split, with a minimum of 16Ml/d going West to Catsash SRV via booster pumps, and 14Ml/d going East to Crosssway Green SRV. The DO is 30Ml/d.	This option was assessed in detail as a preferred option during early iterations of the 2011 WRMP. The assessment concluded that construction impacts could be avoided with best-practice, but there was a degree of uncertainty over the likely effects of the abstraction on the Severn Estuary sites, and the mobile interest features of the River Wye SAC. However, it is apparent that the freshwater input from the Great Spring is negligible in comparison to that from other sources, and the high tidal flux of the estuary is likely to ensure that any effects are local and small-scale only.	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures

Habitats Regulations Assessment - Summary of Initial Assessment of Feasible Options

Number	Name	Summary (from proforma)	General Assessment	Recommend option? (Construction)	Recommend option? (Operation)
SEW005a	Great Spring and upgrade Court Farm (or Sluvad) WTW	Up to 40Ml/d of additional water will be abstracted from the Great Spring and the existing Network Rail pumps will pump it to a new pumping station at DCWW's Sudbrook WTW. This will deliver 40Ml/d of raw water to Court Farm reservoir, via 22km of new 700mm dia raw water main, running south of the M4. From Court Farm reservoir, 15.5Ml/d will be treated at an extension to the WTW. This will be built on DCWW owned land in the field to the west of the WTW. The treatment process will include nanofiltration combined with a GAC to produce 13Ml/d of softened water. Currently, Court Farm output is restricted to 110Ml/d output due to surge issues. A new 65m3 surge vessel (5) will be constructed at Court Farm WTW to allow the WTW to operate at its licensed capacity of 127Ml/d. This should allow an additional 19.5Ml/d to be treated in the existing works, with an additional output of 17Ml/d. This scheme will result in an additional 30Ml/d of DO, which will be distributed using the existing network. A cost has been allowed for upgrading 200mm of rising main under the river Usk, in order to free up the current restriction of 29-30Ml/d maximum east towards Catsash, due to an old concrete main.	Previous assessments of the Great Spring resource have concluded that there is a degree of uncertainty over the likely effects of the abstraction on the Severn Estuary sites, and the mobile interest features of the River Wye SAC. However, it is apparent that the freshwater input from the Great Spring is negligible in comparison to that from other sources, and the high tidal flux of the estuary is likely to ensure that any effects are local and small-scale only. The water main requiring upgrade crosses with the River Usk / Afon Wysg SAC and therefore further information and Site specific detailed design is required to avoid any likely significant effects to the designated site. Lesser and greater horseshoe bats associated with Wye Valley Woodlands/ Coetiroedd Dyffryn Gwy SAC and Wye Valley and Forest of Dean Bat Sites/ Safleoedd Ystlumod Dyffryn Gwy a Fforest y Ddena SAC are also vulnerable to construction works. Detailed information and site specific detailed design are required to determine effects of Scheme and to avoid them.	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures
SEW005b	Great Spring via Sudbrook WTW to Court Farm WTW - 17Mld	20Ml/d of additional water will be abstracted from the Great Spring and the existing Network Rail pumps will pump it to a new pumping station at DCWW's Sudbrook PS. This will deliver 20Ml/d of raw water to Court Farm reservoir, via 22km of new 500mm dia raw water main, running south of the M4. Currently, Court Farm output is restricted to 110Ml/d output due to surge issues. A new 65m3 surge vessel (5) will be constructed at Court Farm WTW to allow the WTW to operate at its licensed capacity of 127Ml/d. This should allow an additional 19.5Ml/d to be treated in the existing works, with an additional output of 17Ml/d. The DO of 17Ml/d will be distributed using the existing network. A cost has been allowed for upgrading 200mm of rising main under the river Usk, in order to free up the current restriction of 29-30Ml/d maximum east towards Catsash, due to an old concrete main.	Previous assessments of the Great Spring resource have concluded that there is a degree of uncertainty over the likely effects of the abstraction on the Severn Estuary sites, and the mobile interest features of the River Wye SAC. However, it is apparent that the freshwater input from the Great Spring is negligible in comparison to that from other sources, and the high tidal flux of the estuary is likely to ensure that any effects are local and small-scale only. The water main requiring upgrade crosses with the River Usk / Afon Wysg SAC and therefore further information and Site specific detailed design is required to avoid any likely significant effects to the designated site. Lesser and greater horseshoe bats associated with Wye Valley Woodlands/ Coetiroedd Dyffryn Gwy SAC and Wye Valley and Forest of Dean Bat Sites/ Safleoedd Ystlumod Dyffryn Gwy a Fforest y Ddena SAC are also vulnerable to construction works. Detailed information and site specific detailed design are required to determine effects of Scheme and to avoid them.	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures

Habitats Regulations Assessment - Summary of Initial Assessment of Feasible Options

Number	Name	Summary (from proforma)	General Assessment	Recommend option? (Construction)	Recommend option? (Operation)
SEW005c	Great Spring Source pumped to Llandegfedd	Up to 40Ml/d of additional water will be abstracted from the Great Spring and the existing Network Rail pumps will pump it to a new pumping station at DCWW's Sudbrook PS. This will deliver up to 40Ml/d of raw water to Court Farm reservoir, via 22km of new 700mm dia raw water main, running south of the M4. From Court Farm reservoir, 38Ml/d will be transferred up to Llandegfedd reservoir, along the existing 42" water main. It will be treated at Sluvad WTW. Any additional water at Court farm will reduce the requirement for other sources to supply Court Farm. This scheme will result in an additional 30Ml/d of DO, which will be distributed using the existing network from Sluvad WTW.	Previous assessments of the Great Spring resource have concluded that there is a degree of uncertainty over the likely effects of the abstraction on the Severn Estuary sites, and the mobile interest features of the River Wye SAC. However, it is apparent that the freshwater input from the Great Spring is negligible in comparison to that from other sources, and the high tidal flux of the estuary is likely to ensure that any effects are local and small-scale only. The water main requiring upgrade crosses with the River Usk / Afon Wysg SAC and therefore further information and Site specific detailed design is required to avoid any likely significant effects to the designated site. Lesser and greater horseshoe bats associated with Wye Valley Woodlands/ Coetiroedd Dyffryn Gwy SAC and Wye Valley and Forest of Dean Bat Sites/ Safleoedd Ystlumod Dyffryn Gwy a Fforest y Ddena SAC are also vulnerable to construction works. Detailed information and site specific detailed design are required to determine effects of Scheme and to avoid them.	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures
SEW007	Dam raising at Talybont	This scheme would raise Talybont Reservoir by 1 m to increase storage capacity. DO increases unknown (awaiting DO modelling). This option does not address Trunk Main upgrades to realise the available treatment capacity at the Talybont WTW. Assumes that Trunk Main upgrades are covered elsewhere in DCWW network upgrades.	Raise the Talybont Reservoir by 1m to increase storage capacity. Talybont reservoir sits at the head of the River Usk which will be very vulnerable to construction effects (although adverse effects can probably be avoided with appropriate design and measures). Works may need to be timed to avoid salmon (associated with the River Usk / Afon Wysg SAC) migration. Lesser horseshoe bats (associated with Usk Bat Sites/ Safleoedd Ystlumod Wysg SAC) need to be considered. Detailed site-specific design is required to ensure no significant effect to the species. It is assumedt that existing operation will be maintained including any compensation releases, and the raising of the dam may increase the resilence of the Usk in this regard.	Construction: Uncertain - significant effects cannot be excluded and may require the identification of bespoke mitigation measures or amendments to scheme design at the plan level	Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures
SEW009	Utilisation of Grwyne as Usk compensating reservoir	Grwyne Reservoir previously supplied water to the Abertillery area, over 40 km to the south. The reservoir has been mothballed since 2004. This option would release 7.8 Ml/d of water into the Usk on a put & take arrangement for subsequent abstraction at Prioress Mill. Raw water would be transfered, around sensitive fishing grounds, to the confluence with the Grwyne Fechan using part of the existing 16" outlet main and a 4.6 km extension. The existing 16" main is currently used as a distribution main and would be replaced with a smaller new supply pipe.	7.8Ml/d is to be released into the Usk and abstracted at Prioress Mill on a put and take basis. The raw water would not be realeased directly from the reservoir (to prevent effects on known spawing areas) but would be transferred via a new main (~16km) along the existing reservoir access road to the confluence of the Grwyne Fawr with the Grwyne Fechan. It is likely that construction effects can be avoided with estblished measures; however, the scheme operation will directly affect the River Usk / Afon Wysg SAC and so appropriate assessment will be required at the strategy and scheme level to confirm that these effects are acceptable. This is likely to require additional modellling / operational information to inform the HRA if included as a preferred option. No other sites are likely to be particularly vulnerable to the scheme.	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures

Habitats Regulations Assessment - Summary of Initial Assessment of Feasible Options

Number	Name	Summary (from proforma)	General Assessment	Recommend option? (Construction)	Recommend option? (Operation)
SEW025	Great Spring plus Wentwood Reservoir water to new WTW at Caerwent	40Ml/d of raw water will be abstracted from the Great Spring. A new pumping station at Sudbrook will deliver the water via a 4km 700mm dia DI main to a new WTW sited at land just to the south of the A48 at Crick. There is also another favourable site available at the MOD site just north of the A48. Wentwood reservoir will be brought back online, and a new 6.5km 300mm dia DI pipeline will deliver up to 7Ml/d of raw water to the new WTW at Crick. The new WTW will be rated for 45Ml/d and use Nanofiltration combined with a GAC to produce softened water with a DO of 34.3Ml/d. This will be pumped into the A48 main where 15Ml/d will be pumped to Crossway Green SRV, and 19.3Ml/d will be pumped to Catsash SRV via booster pumps.	40Ml/d of raw water will be abstracted from the Great Spring. Previous assessments of the Great Spring resource have concluded that there is a degree of uncertainty over the likely effects of the abstraction on the Severn Estuary sites, and the mobile interest features of the River Wye SAC. However, it is apparent that the freshwater input from the Great Spring is negligible in comparison to that from other sources, and the high tidal flux of the estuary is likely to ensure that any effects are local and small-scale only. Greater and lesser horseshoe bats associated with Wye Valley and Forest of Dean Bat Sites/ Safleoedd Ystlumod Dyffryn Gwy a Fforest y Ddena SAC and Wye Valley Woodlands/ Coetiroedd Dyffryn Gwy SAC have the potential to be affected by scheme construction although the new pipelines will largely follow existing roads and effects can be avoided with scheme-specific detailed design. Construction works may need to be timed to avoid breeding and migrating seasons of various bird and fish species associated with Severn Estuary Ramsar / SAC/ SPA.	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures
SEW036	Ynys-y-Fro and Pant-yr-Eos to Court Farm via LG main (bi-directional raw water main)	Supply an additional 9 Ml/d to Court Farm WTW from Ynys-y-Fro and Pant-yr-Eos reservoirs. 4.5 Ml/d gravitates from Pant-yr-Eos to Ynys-y-Fro and from there pump 9 Ml/d to Court Farm, by connecting to the existing LG Main. The main becomes dual purpose, retaining its function as an emergency washwater discharge.	A new raw water main is to be built to connect to the existing raw water main network. 9 Ml/d additional raw water is to be pumped to Court Farm (supplied from Ynys-y-Fro and Pant-yr-Eos reservoirs). A licence increase is required for this option. Ynys-y-Fro and Pant-yr-Eos sit at the head of a small stream that ultimately feeds into the Usk Estuary, although the contribution of this stream to flows in the Usk is inconsequential. Assessment of effects on the Usk is likely to be required but effects are unlikely to be significant. Construction effects can be avoided with normal best practice.	Construction: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive)	Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures
SEW043	Tywi CUS Transfer into SEWCUS	This option looked at transferring water west to east from Felindre WTW into the SEWCUS system utilising some of the 30 Ml/day available at Felindre. The recommendations are to install a new 710mm PE SDR17 (internal 633.6mm) main from Cefn Hirgoed SR to Tongwynlais SR . This will allow Tongwynlais SR to recieve a supply from Felindre WTW via Birchgrove pumps, Birchgrove SR, Margam HL pumps and Cefn Hirgoed SR.	A network solution suggesting the transfer of water from Felindre WTW into the SEWCUS system. A new mains pipe is required from Cefn Hirgoed SR to Tongwynlais SR. Water will be pumped via Birchgrove pumps, Birchgrove SR, Margam HL pumps and Cefn Hirgoed SR. Current route runs very close to the Cardiff Beechwoods SAC, although it's likely that this site can be avoided. Construction effects can be avoided with established measures. No operational effects (transfer of treated water).	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)

Habitats Regulations Assessment - Summary of Initial Assessment of Feasible Options

Number	Name	Summary (from proforma)	General Assessment	Recommend option? (Construction)	Recommend option? (Operation)
SEW044a	Schwyll boreholes to SE via Coastal Route with water treatment	Recommission both the Bridgend WDA and Schwyll borehole systems and transfer flow north to connect up with the western end of the Bosch Main. Bridgend has an abstraction licence of just over 4 Ml/d. Schwyll has historically produced 20 Ml/d. It is licenced for higher abstraction but saline intrusion at high tides limits availability. Bridgend water would be pumped to Schwyll where the combined flow would be treated before transfer north.	This option would be a substantial construction scheme, involving approximately 30km of pipeline (although much of this would be within existing easements). However, all European sites (other than Kenfig SAC and Dunraven Bay SAC) are located over 5km from the pipeline route, and there are no downstream receptors for constructon effects (which can be managed with best practice in any case). Merthyr Mawr Warren, a component of Kenfig SAC, is less than 1km from the Schwyll spring site, and contains a river (Afon Ogmore) that is likely to be affected by the re-instatement of abstraction (although the abstraction is within the terms of the existing licence). The SAC also contains a number of features that may be susceptible to reductions in groundwater levels, although it is likely that these areas will be effectively isolated from the abstraction by the Afon Ogmore. However, the abstraction is within the terms of the existing licence and therefore no significant operational effects would be expected.	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures
SEW044b	WDA & Schwyll Boreholes north to Bosch Main	Recommission both the Bridgend WDA and Schwyll borehole systems and transfer flow north to connect up with the western end of the Bosch Main. Bridgend has an abstraction licence of just over 4 Ml/d. Schwyll has historically produced 20 Ml/d. It is licenced for higher abstraction but saline intrusion at high tides limits availability. Bridgend water would be pumped to Schwyll where the combined flow would be treated before transfer north.	This option would be a substantial construction scheme, involving approximately 30km of pipeline (although much of this would be within existing easements). However, all European sites (other than Kenfig SAC and Dunraven Bay SAC) are located over 5km from the pipeline route, and there are no downstream receptors for constructon effects (which can be managed with best practice in any case). Merthyr Mawr Warren, a component of Kenfig SAC, is less than 1km from the Schwyll spring site, and contains a river (Afon Ogmore) that is likely to be affected by the re-instatement of abstraction (although the abstraction is within the terms of the existing licence). The SAC also contains a number of features that may be susceptible to reductions in groundwater levels, although it is likely that these areas will be effectively isolated from the abstraction by the Afon Ogmore. However, the abstraction is within the terms of the existing licence and therefore no significant operational effects would be expected.	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures
SEW060a	Ponthir effluent transfer scheme to support River Usk flow regulation (below Prioress Mill)	Transfer 30Ml/d (350 l/s) of final effluent from Ponthir WwTW to an outfall at Prioress Mill intake to enable increased abstraction from the River Usk at Prioress Mill. The effluent is currently discharged into the tidal Usk. The DWF from the Ponthir works is around 33Ml/d. This Option requires additional treatment at Ponthir WWTW to enable discharge of effluent into the R.Usk further upstream. A new pumping station & pipeline will be required to transfer the flows. Additional water will be abstracted from Llandegfedd Reservoir and treated at Sluvad WTW. Since this is a 'high season top up' there will be sufficient capacity in Prioress Mill pumping station and rising mains and in Llandegfedd Reservoir.	Construction effects can be avoided through timing works around sensitive seasons for features of the River Usk / Afon Wysg SAC. Scheme-specific detailed design is also required to avoid effects on features associated with the River Usk / Afon Wysg SAC. The bat species associated with Wye Valley and Forest of Dean Bat Sites/ Safleoedd Ystlumod Dyffryn Gwy a Fforest y Ddena SAC are sensitive to interruptions in flight pathways and therefore scheme-specific detailed design would be required to avoid effects. Further information to determine effects on water quality and flow are required to establish if the impact is significant or not on the River Usk / Afon Wysg SAC and the Severn Estuary Ramsar / SPA / SAC	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures

Habitats Regulations Assessment - Summary of Initial Assessment of Feasible Options

Number	Name	Summary (from proforma)	General Assessment	Recommend option? (Construction)	Recommend option? (Operation)
SEW060b	Ponthir Effluent Transfer to River Usk - more stringent WQ	Transfer around 30Ml/d (350 l/s) of final effluent from Ponthir WwTW to an outfall at Prioress Mill intake to compensate for increased abstraction from the R.Usk. The effluent is currently discharged into the tidal Usk. The DWF from the Ponthir works is around 33Ml/d. This Option 'b' requires additional treatment at Ponthir WwTW to achieve discharge 5 BOD / 10 SS / 1 NH3. A new pumping station & pipeline will be required to transfer the flows. Additional water will be abstracted from Llandegfedd Reservoir and treated at Sluvad WTW. Since this is a 'high season top up' there will be sufficient capacity.	Construction effects can be avoided through timing works around sensitive seasons for features of the River Usk / Afon Wysg SAC. Scheme-specific detailed design is also required to avoid effects on features associated with the River Usk / Afon Wysg SAC. The bat species associated with Wye Valley and Forest of Dean Bat Sites/ Safleoedd Ystlumod Dyffryn Gwy a Fforest y Ddena SAC are sensitive to interruptions in flight pathways and therefore scheme-specific detailed design would be required to avoid effects. Further information to determine effects on water quality and flow are required to establish if the impact is significant or not on the River Usk / Afon Wysg SAC and the Severn Estuary Ramsar / SPA / SAC. This option is significantly less likely to have adverse effects on the designated sites than SEW060a, due to the higher levels of water treatment.	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures
SEW062	Use Llywnon WTW washwater to support compensation flows (Currently intermittent discharge)	Process water from both the Cantref and Llwyn-Onn works is intermittently discharged from the Llwyn-Onn washwater plant but cannot count as compensation water due to its intermittent nature. This option would make this discharge constant thereby substituting 2.6 Ml/d of compensation water. Existing redundant sludge tanks can be used to balance flows to give a constant discharge to the river.	This will allow the discharge from the Llwyn-Onn washwater plant to the Afon Taf Fawr to be constant so producing 2.6Ml/d of compensation water. No European sites are vulnerable to this option.	Construction: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive)	Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)
SEW064	Reinstate Wentwood reservoir and transfer to Court Farm WTW via Llanstrisant	Wentwood reservoir will be brought back into service to provide a DO of 4.3Ml/d (6). A new pumping station will be built at Wentwood to pump the raw water 10.9km to Llantrisant pumping station where it will be delivered to Court Farm via the existing raw water main. A 65m3 surge vessel will be installed at Court Farm to increase its capacity from the current 110Ml/d to the consented 127Ml/d, so it can treat the additional 7Ml/d, which is the licensesd daily average abstraction from Wentwood reservoir (6). An additional coagulation and DAF stage will be required, before the water reaches the raw water reservoir in order to deal with the anticipiated algae in the Wentwood water. It is recommended that catchment management measures are implemented in the Wentwood catchment in order to reduce the risk of algal blooms.	The current licence will need to be increased although the effects of this on downstream sites (Severn Estuary Ramsar/ SPA/ SAC) will be negligible as Wentwood does not contribute significantly to freshwater inputs to these sites. Works will be required in close proximity to the River Usk / Afon Wysg SAC but these will be within existing operational sites and established measures can be relied on to ensure no significant effets. Lesser and greater horseshoe bats associated with Wye Valley and Forest of Dean Bat Sites/ Safleoedd Ystlumod Dyffryn Gwy a Fforest y Ddena SAC are potentially vulnerable to construction works. Scheme-specific detailed design is required to ensure the bat flight pathways are not significantly effected by the construction works.	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures
SEW067	Raise overflow at Llandegfedd Reservoir	This scheme would raise Llandegfedd Reservoir overflow by ~200-300 mm to increase storage capacity by attaching a steel plate to the existing tower overflow. No works to the embankment as nominated during the screening assessment. DO increases unknown (awaiting DO modelling).	Scheme requires attaching a steel plate to existing tower overflow to raise Llandegfedd Reservoir overfly by ~200-300mm. The operational effects of this are uncertain - the reservoir currently overflows to the Afon Llwyd which feeds the Usk at Caerleon, and raising the overflow will presumably reduce spill frequency; it will be necessary to understand provisions (etc) for any compensation releases and consequent effects on the River Usk / Afon Wysg SAC that lies 4km downstream of the reservoir and Severn Estuary Ramsar / SAC / SPA. Construction effects will be minimal and avoidable with normal best practice.	Construction: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive)	Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures

Habitats Regulations Assessment - Summary of Initial Assessment of Feasible Options

Number	Name	Summary (from proforma)	General Assessment	Recommend option? (Construction)	Recommend option? (Operation)
TYA001	Afon Dysynni pumped to Afon Fathew for reabstraction and treatment (new WTW), with a pipeline to Abergynolwyn to replace existing works	An abstraction licence exists for the Afon Dysynni. This is not currently being used. The scheme would allow transfer of abstracted water to the Afon Fathew at a point upstream of Pen y Bont WTW and thereby allow an increased abstraction at the WTW. Small yield so the relative cost is likely to be high. No provision for storage at the abstraction so reliant on river flow. This will not be as resilient as some other source types.	The Lleyn Peninsula and the Sarnau SAC is the main downstream receptor of the Afon Dysynni; however, the scheme would use an existing licence (albeit it currently unused) and so operational effects would not be anticipated. Construction effects can be avoided with normal bets-practice. Scheme-specific detailed design and sensitive timings of works for the red-billed cough (associated with Craig yr Aderyn (bird's Rock) SPA).	Construction: Uncertain - significant effects cannot be excluded and may require the identification of bespoke mitigation measures or amendments to scheme design at the	Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)
TYA004	New abstraction from Afon Dysynni at Pont y Garth (to Pen y Bont WTW)	An abstraction licence exists for the Afon Dysinni. This is not currently being used. The scheme would allow Pen y Bont WTW to receive abstracted water from the Afon Dysynni directly via a new raw water transfer main. Due to topography the supply will need to be pumped from source. No provision for storage at the abstraction so reliant on river flow. This will not be as resilient as some other source types. NOTE: This proposal may allow abandonment of the existing abstraction points with associated change in fixed OPEX, however DCWW may choose to maintain the licence.	The Lleyn Peninsula and the Sarnau SAC is the main downstream receptor of the Afon Dysynni; however, the scheme would use an existing licence (albeit it currently unused) and so operational effects would not be anticipated. Construction effects can be avoided with normal best-practice. Scheme-specific detailed design and sensitive timings of works for the red-billed cough (associated with Craig yr Aderyn (bird's Rock) SPA).	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)
TYA009a	Pen-y-Bont WTW Bankside Storage (8Ml)	This option would involve construction of a non-impounding raw water reservoir adjacent to Pen-y-Bont WTW to provide a buffer raw water supply and improve resilience of Pen-y-Bont under dry weather/peak demand conditions when run-of-river abstraction may not supply sufficient inflow to the WTW. The reservoir would be sized at 8 Ml to provide short-term buffer, and would require an increase in licensed abstraction volumes.	The Lleyn Peninsula and the Sarnau SAC is the main downstream receptor of the Afon Fatthew, from which the abstraction would presumably be made; however, the nature of the abstraction (periodic, to provide refill for short-term buffering) is unlikely to affect this site although further information on scheme operation will be required. The features of the coincident downstream sites (e.g. West Wales Marine cSAC; Northern Cardigan Bay pSPA) are not particularly sensitive to the likely effects of the scheme. Construction effects can be avoided with normal best-practice.	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Yes - effects possible but significant or significant adverse effects avoidable with established operational mitigation (e.g. licence controls)
TYA009b	Pen-y-Bont WTW Bankside Storage (35Ml)	This option would involve construction of a non-impounding raw water reservoir adjacent to Pen-y-Bont WTW to provide a buffer raw water supply and improve resilience of Pen-y-Bont under dry weather/peak demand conditions when run-of-river abstraction may not supply sufficient inflow to the WTW. The reservoir would be sized at 35 Ml to provide longer-term dry period buffer, and would require an increase in licensed abstraction volumes.	The Lleyn Peninsula and the Sarnau SAC is the main downstream receptor of the Afon Fatthew, from which the abstraction would presumably be made; however, the nature of the abstraction (periodic, to provide refill for short-term buffering) is unlikely to affect this site although further information on scheme operation will be required. The features of the coincident downstream sites (e.g. West Wales Marine cSAC; Northern Cardigan Bay pSPA) are not particularly sensitive to the likely effects of the scheme. Construction effects can be avoided with normal best-practice.	Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures	Operation: Yes - effects possible but significant or significant adverse effects avoidable with established operational mitigation (e.g. licence controls)

Appendix B

Established / Assumed Avoidance and Mitigation 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 scheme-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 regimes required to ensure no adverse effects occur (e.g. compensation releases - although note that these measures can only be identified through detailed investigation schemes).

Pollution Prevention

The habitats of European sites are most likely to be affected indirectly, through construction-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 current industry best-practices in construction that are likely to be relevant to the proposed schemes:

- Environment Agency Pollution Prevention Guidance Notes[10], including:
  - PPG1: General guide to the prevention of pollution (May 2001);
  - PPG5: Works and maintenance in or near water (October 2007);

[10] 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.

- 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 WRMP 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 (WRMP) 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 NE;
- 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.

Option-Specific Measures

Option specific measures (if required) will be determined as the preferred options are identified. However, it is assumed that the lowest-impact solution will be pursued, particularly regards construction solutions – for example, directional drilling beneath sensitive rivers rather than open cut; etc.

Appendix C

Option-specific summaries

NEYM003

Connect existing Afon Rhythallt source intake to Cwellyn WTW

Option Summary

This option would re-commission a licensed but currently unused river intake on the Afon Rhythallt at Crawia Weir (near Llanrug where the river changes name to the Afon Seiont). Water abstracted at this point used to be treated at Crug WTW, near Caernarfon but Crug WTW was abandoned during 2007/ 08. Elsewhere, water abstracted from Llyn Cwellyn is treated at Cwellyn WTW but abstraction quantity is significantly constrained by licence conditions and so Cwellyn WTW often has spare capacity. This option would reinstate abstraction from the Afon Rhythallt at Crawia Weir and transfer the water to Cwellyn WTW. This option is a network solution: it would not require any increase in the currently licensed abstraction volumes from the Afon Rhythallt and would operate within the existing licence parameters.

General Assessment

This proposal would be an inter-basin transfer of untreated water, although there will be no storage or discharge of the raw water (therefore no risk of transfer of species etc.). This option would require construction works near this the Afon Gwyrfai a Llyn Cwellyn SAC, but there would be no direct impact either through construction (no new intakes / outfalls etc.) or operation (water from the Afon Rhythallt would be pumped to Cwellyn WTW for treatment). Most potential construction impacts could be managed through normal construction best practice. Construction may need to be timed to minimise potential impacts on migratory fish (salmon). The Y Fenai a Bae Conwy / Menai Strait and Conwy Bay SAC is downstream of the proposed abstraction, although operational effects are not anticipated as the option would not require any increase in the currently licensed abstraction volumes from the Afon Rhythallt and would operate within the existing licence parameters. Specific consideration would be required to ensure no construction impacts on the SAC due to the close proximity of the Scheme. No other sites are likely to be impacted by the scheme.

Recommend Option?

Construction: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive)

Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Afon Gwyrfai a Llyn Cwellyn SAC	0	U	N	
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanoju		N	N	Feature not exposed to potential effects of construction due to location upstream from Scheme.
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		U	N	The proposed water main crosses Afon Gwyrfai at two points downstream of Llyn Cwellyn. The watercourse is potentially vulnerable and specific construction measures are required to ensure no significant effects on the SAC.
Atlantic salmon Salmo salar		U	N	Feature potentially vulnerable to construction, bespoke scheme-level mitigation likely to be required but effects avoidable with established measures. Construction works timed to avoid salmon migration would significantly reduce the risk of
Otter Lutra lutra		U	N	Feature potentially vulnerable to construction, but effects avoidable with established measures
Floating water-plantain Luronium natans		N	N	Feature not exposed to potential effects of construction due to location upstream from Scheme.
Eryri/ Snowdonia SAC	4	N	N	
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanoju		N	N	Site not exposed to likely outcomes of option. Scheme downstream from SAC and significant distance away.
Northern Atlantic wet heaths with Erica tetralix		N	N	Site not exposed to likely outcomes of option. Scheme downstream from SAC and significant distance away.
European dry heaths		N	N	Site not exposed to likely outcomes of option. Scheme downstream from SAC and significant distance away.
Alpine and Boreal heaths		N	N	Site not exposed to likely outcomes of option. Scheme downstream from SAC and significant distance away.
Siliceous alpine and boreal grasslands		N	N	Site not exposed to likely outcomes of option. Scheme downstream from SAC and significant distance away.
Alpine and subalpine calcareous grasslands		N	N	Site not exposed to likely outcomes of option. Scheme downstream from SAC and significant distance away.
Species-rich Nardus grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe		N	N	Site not exposed to likely outcomes of option. Scheme downstream from SAC and significant distance away.
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels		N	N	Site not exposed to likely outcomes of option. Scheme downstream from SAC and significant distance away.
Blanket bogs (* if active bog)		N	N	Site not exposed to likely outcomes of option. Scheme downstream from SAC and significant distance away.
Depressions on peat substrates of the Rhynchosporion		N	N	Site not exposed to likely outcomes of option. Scheme downstream from SAC and significant distance away.
Petrifying springs with tufa formation (Cratoneurion)		N	N	Site not exposed to likely outcomes of option. Scheme downstream from SAC and significant distance away.
Alkaline fens		N	N	Site not exposed to likely outcomes of option. Scheme downstream from SAC and significant distance away.
Alpine pioneer formations of the Caricion bicoloris-atrofuscae		N	N	Site not exposed to likely outcomes of option. Scheme downstream from SAC and significant distance away.
Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani)		N	N	Site not exposed to likely outcomes of option. Scheme downstream from SAC and significant distance away.
Calcareous rocky slopes with chasmophytic vegetation		N	N	Site not exposed to likely outcomes of option. Scheme downstream from SAC and significant distance away.
Siliceous rocky slopes with chasmophytic vegetation		N	N	Site not exposed to likely outcomes of option. Scheme downstream from SAC and significant distance away.
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Site not exposed to likely outcomes of option. Scheme downstream from SAC and significant distance away.
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus		N	N	Feature not exposed to likely outcomes of option. Scheme downstream from SAC and significant distance away.
Floating water-plantain Luronium natans		N	N	Feature not exposed to likely outcomes of option. Scheme downstream from SAC and significant distance away.
Glynllifon SAC	4	U	N	
Lesser horseshoe bat Rhinolophus hipposideros		U	N	Feature potentially vulnerable to construction if foraging routes effected. Effects likely avoidable with established
Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC	4/DS	U	N	
Sandbanks which are slightly covered by sea water all the time		U	N	Downstream Site with potential to be effected by construction, but effects avoidable with established measures. Feature not particularly sensitive.
Mudflats and sandflats not covered by seawater at low tide		U	N	Downstream Site with potential to be effected by construction, but effects avoidable with established measures and scheme-specific mitigation
Large shallow inlets and bays		U	N	Downstream Site with potential to be effected by construction, but effects avoidable with established measures.
Reefs		U	N	Downstream Site with potential to be effected by construction, but effects avoidable with established measures.

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Submerged or partially submerged sea caves		N	N	Feature unlikely to be exposed to or vulnerable to likely effects of construction. Feature significant distance away from anticipated effects.
Corsydd Eifionydd SAC	10	N	N	
Transition mires and quaking bogs		N	N	Site not exposed to likely outcomes of option. Site significant distance away, within separate water catchment.
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	Feature not exposed to likely outcomes of option. Site significant distance away, within separate water catchment.
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus		N	N	Feature not exposed to likely outcomes of option. Site significant distance away, within separate water catchment.
Glannau Môn: Cors heli / Anglesey Coast: Saltmarsh SAC	10	N	N	
Estuaries		N	N	Site not exposed to likely outcomes of option. Site significant distance away, within separate water catchment.
Mudflats and sandflats not covered by seawater at low tide		N	N	Site not exposed to likely outcomes of option. Site significant distance away, within separate water catchment.
Salicornia and other annuals colonizing mud and sand		N	N	Feature not exposed to likely outcomes of option. Site significant distance away, within separate water catchment.
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	N	Site not exposed to likely outcomes of option. Site significant distance away, within separate water catchment.
Y Twyni o Abermenai i Aberffraw/ Abermenai to Aberffraw Dunes SAC	10	N	N	
Embryonic shifting dunes		N	N	Site not exposed to likely outcomes of option. Site significant distance away.
Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")		N	N	Site not exposed to likely outcomes of option. Site significant distance away.
Fixed coastal dunes with herbaceous vegetation ("grey dunes")		N	N	Site not exposed to likely outcomes of option. Site significant distance away.
Dunes with Salix repens ssp. argentea (Salicion arenariae)		N	N	Site not exposed to likely outcomes of option. Site significant distance away.
Humid dune slacks		N	N	Site not exposed to likely outcomes of option. Site significant distance away.
Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation		N	N	Site not exposed to likely outcomes of option. Site significant distance away.
Petalwort Petalophyllum ralfsii		N	N	Feature not exposed to likely outcomes of option. Site significant distance away.
Shore dock Rumex rupestris		N	N	Feature not exposed to likely outcomes of option. Site significant distance away.
Anglesey Terns / Morwenoliaid Ynys Môn pSPA	15	N	N	
Sandwich tern Sterna sandvicensis		N	N	Feature not exposed to likely outcomes of option. Site significant distance away.
Roseate tern Sterna dougalli		N	N	Feature not exposed to likely outcomes of option. Site significant distance away.
Common tern Sterna hirundo		N	N	Feature not exposed to likely outcomes of option. Site significant distance away.
Arctic tern Sterna paradisaea		N	N	Feature not exposed to likely outcomes of option. Site significant distance away.
Coedydd Aber SAC	15	N	N	
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Site not exposed to likely outcomes of option. Site significant distance away.
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	Site not exposed to likely outcomes of option. Site significant distance away.
Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC	15	N	N	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	Site not exposed to likely outcomes of option. Site significant distance away.
Northern Atlantic wet heaths with Erica tetralix		N	N	Site not exposed to likely outcomes of option. Site significant distance away.
European dry heaths		N	N	Site not exposed to likely outcomes of option. Site significant distance away.
Tilio-Acerion forests of slopes, screes and ravines		N	N	Site not exposed to likely outcomes of option. Site significant distance away.
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Site not exposed to likely outcomes of option. Site significant distance away.
Bog woodland		N	N	Site not exposed to likely outcomes of option. Site significant distance away.
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	Site not exposed to likely outcomes of option. Site significant distance away.
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Feature feature not exposed to likely outcomes of option due to expected bat foraging range. Site significant distance
Corsydd Môn a Llyn/ Anglesey and Llyn Fens Ramsar	15	N	N	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	N	Site not exposed to likely outcomes of option. Site significant distance away.
3 - supports populations of plant/animal species important for maintaining regional biodiversity Crit. 3 - supports populations c		N	N	Feature not exposed to likely outcomes of option. Site significant distance away.
Corsydd Môn/ Anglesey Fens SAC	15	N	N	
Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.		N	N	Site not exposed to likely outcomes of option. Site significant distance away.
Northern Atlantic wet heaths with Erica tetralix		N	N	Site not exposed to likely outcomes of option. Site significant distance away.
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	Site not exposed to likely outcomes of option. Site significant distance away.
Calcareous fens with Cladium mariscus and species of the Caricion davallianae		N	N	Site not exposed to likely outcomes of option. Site significant distance away.
Alkaline fens		N	N	Site not exposed to likely outcomes of option. Site significant distance away.
Geyer`s whorl snail Vertigo geyeri		N	N	Feature not exposed to likely outcomes of option. Site significant distance away.
Southern damselfly Coenagrion mercuriale		N	N	Feature not exposed to likely outcomes of option. Site significant distance away.
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	Feature not exposed to likely outcomes of option. Site significant distance away.
Glan-traeth SAC	15	N	N	
Great crested newt Triturus cristatus		N	N	Feature not exposed to likely outcomes of option. Site significant distance away.
Llyn Idwal Ramsar	15	N	N	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	N	Site not exposed to likely outcomes of option. Site significant distance away.

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
2 - supports vulnerable, endangered, or critically endangered species or threatened eco. communities Crit. 2 - supports vulner		N	N	Feature not exposed to likely outcomes of option. Site significant distance away.
Traeth Lafan/ Lavan Sands, Conway Bay SPA	15	N	N	
Great crested grebe Podiceps cristatus		N	N	Feature not exposed to likely outcomes of option. Site significant distance away.
Red-breasted merganser Mergus serrator		N	N	Feature not exposed to likely outcomes of option. Site significant distance away.
Eurasian oystercatcher Haematopus ostralegus		N	N	Feature not exposed to likely outcomes of option. Site significant distance away.
Eurasian curlew Numenius arquata		N	N	Feature not exposed to likely outcomes of option. Site significant distance away.
Common redshank Tringa totanus		N	N	Feature not exposed to likely outcomes of option. Site significant distance away.
Liverpool Bay / Bae Lerpwl SPA	20	N	N	
Red-throated diver Gavia stellata		N	N	Feature not exposed to likely outcomes of option. Site significant distance away.
Black (common) scoter Melanitta nigra		N	N	Feature not exposed to likely outcomes of option. Site significant distance away.
Waterfowl assemblage Waterfowl assemblage		N	N	Feature not exposed to likely outcomes of option. Site significant distance away.
Northern Cardigan Bay / Gogledd Bae Ceredigion pSPA	20	N	N	
Red-throated diver Gavia stellata		N	N	Feature not exposed to likely outcomes of option. Site significant distance away.
Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC	20	N	N	
Sandbanks which are slightly covered by sea water all the time		N	N	Site / feature not exposed to likely outcomes of option. Site significant distance away.
Estuaries		N	N	Site / feature not exposed to likely outcomes of option. Site significant distance away.
Mudflats and sandflats not covered by seawater at low tide		N	N	Site / feature not exposed to likely outcomes of option. Site significant distance away.
Coastal lagoons		N	N	Site / feature not exposed to likely outcomes of option. Site significant distance away.
Large shallow inlets and bays		N	N	Site / feature not exposed to likely outcomes of option. Site significant distance away.
Reefs		N	N	Site / feature not exposed to likely outcomes of option. Site significant distance away.
Salicornia and other annuals colonizing mud and sand		N	N	Site / feature not exposed to likely outcomes of option. Site significant distance away.
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	N	Site / feature not exposed to likely outcomes of option. Site significant distance away.
Submerged or partially submerged sea caves		N	N	Site / feature not exposed to or vulnerable to likely outcomes of option. Site significant distance away.
Bottlenose dolphin Tursiops truncatus		N	N	Feature not exposed to likely outcomes of option. Site significant distance away.
Otter Lutra lutra		N	N	Feature not exposed to likely outcomes of option. Site significant distance away.
Grey seal Halichoerus grypus		N	N	Feature not exposed to likely outcomes of option. Site significant distance away.

NEYM017

Buy out the hydropower company and then abstract from the Marchlyn Mawr reservoir and transfer the water to DCWW's Marchlyn Bach reservoir

Option Summary

Transfer from Marchlyn Mawr SRV (hydro electric storage reservoir) to Marchlyn Bach SRV (DCWW source reservoir) . This will provide a contingency supply during dry weather/drought conditions, perhaps a 1 in 20 year requirement. Provide for temporary installation approx. 200m of 250mm main (est) and pump unit to link the Marchlyn Mawr SRV and discharge to gully running to Marchlyn Bach SRV.

General Assessment

Installation of 200m of mains pipes and a pump unit to the west of Marchlyn Mawr Reservoir. The Scheme lies within Snowdonia SAC and so the site and features are potentially vulnerable to direct loss of habitat (etc.) due to new assets (PS / pipe); incidental construction effects (avoidable with best practice); and operational effects (existing gully to be used to transfer water). Having said that, this is a small-scale scheme with most of the construction in existing operational areas around Marchlyn Mawr reservoir, which is semi-natural only and unlikely to support good examples of the principal interest features of the site; furthermore, the scheme would only be used in drought conditions (expected 1 in 20 years), so operational effects would be minimal. Appropriate assessment will be required but effects would not obviously be adverse. The scheme is within the typical expected commuting / foraging range of lesser horseshoe bats associated with Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC but it is extremely unlikely that works in this upland area would have significant effects.

Recommend Option?

Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures

Operation: Yes - effects possible but significant or significant adverse effects avoidable with established operational mitigation (e.g. licence controls)

Sites within 20km and Interest Features	Dist.	Vulnerable? C	O	Notes
Eryri/ Snowdonia SAC	0	U	U	
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanoju		N	N	Feature associated with Llyn Idwal to the east of Marchylun Mawr SRV, which is not linked via an impact pathway
Northern Atlantic wet heaths with Erica tetralix		U	U	Feature may be present within development area; may be affected by construction or operation but mitigation / avoidance probably achievable.
European dry heaths		U	U	Feature may be present within development area; may be affected by construction or operation but mitigation / avoidance probably achievable.
Alpine and Boreal heaths		U	U	Feature may be present within development area; may be affected by construction or operation but mitigation / avoidance probably achievable.
Siliceous alpine and boreal grasslands		U	U	Feature may be present within development area; may be affected by construction or operation but mitigation / avoidance probably achievable.
Alpine and subalpine calcareous grasslands		U	U	Feature may be present within development area; may be affected by construction or operation but mitigation / avoidance probably achievable.
Species-rich Nardus grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe		U	U	Feature may be present within development area; may be affected by construction or operation but mitigation / avoidance probably achievable.
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels		U	U	Feature may be present within development area; may be affected by construction or operation but mitigation / avoidance probably achievable.
Blanket bogs (* if active bog)		U	U	Feature may be present within development area; may be affected by construction or operation but mitigation / avoidance probably achievable.
Depressions on peat substrates of the Rhynchosporion		U	U	Feature may be present within development area; may be affected by construction or operation but mitigation / avoidance probably achievable.
Petrifying springs with tufa formation (Cratoneurion)		U	U	Feature may be present within development area; may be affected by construction or operation but mitigation / avoidance probably achievable.
Alkaline fens		U	U	Feature may be present within development area; may be affected by construction or operation but mitigation / avoidance probably achievable.
Alpine pioneer formations of the Caricion bicoloris-atrofuscae		U	U	Feature may be present within development area; may be affected by construction or operation but mitigation / avoidance probably achievable.
Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani)		U	U	Feature may be present within development area; may be affected by construction or operation but mitigation / avoidance probably achievable.
Calcareous rocky slopes with chasmophytic vegetation		U	U	Feature may be present within development area; may be affected by construction or operation but mitigation / avoidance probably achievable.
Siliceous rocky slopes with chasmophytic vegetation		U	U	Feature may be present within development area; may be affected by construction or operation but mitigation / avoidance probably achievable.
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Feature not present in area of works
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus		U	N	Construction effects avoidable through construction best practice. No operational effects anticipated.
Floating water-plantain Luronium natans		N	N	Feature not present in area of works
Llyn Idwal Ramsar	4	N	N	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	N	There is no impact pathway to the Site
2 - supports vulnerable, endangered, or critically endangered species or threatened eco. communities Crit. 2 - supports vulner		N	N	There is no impact pathway to the Site
Afon Gwyrfai a Llyn Cwellyn SAC	10	N	N	

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanoju		N	N	Geographically separate with waterbodies separating the Scheme from the Site. No impact pathway.
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	Geographically separate with waterbodies separating the Scheme from the Site. No impact pathway.
Atlantic salmon Salmo salar		N	N	Geographically separate with waterbodies separating the Scheme from the Site. No impact pathway.
Otter Lutra lutra		N	N	Geographically separate with waterbodies separating the Scheme from the Site. No impact pathway.
Floating water-plantain Luronium natans		N	N	Geographically separate with waterbodies separating the Scheme from the Site. No impact pathway.
Coedydd Aber SAC	10	N	N	
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Scheme and Site separated geographically and lie within separate water resource zones. No impact pathway
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	Scheme and Site separated geographically and lie within separate water resource zones. No impact pathway
Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC	10	N	N	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	Scheme and Site geographically separate. No imapct pathway
Northern Atlantic wet heaths with Erica tetralix		N	N	Scheme and Site geographically separate. No imapct pathway
European dry heaths		N	N	Scheme and Site geographically separate. No imapct pathway
Tilio-Acerion forests of slopes, screes and ravines		N	N	Scheme and Site geographically separate. No imapct pathway
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Scheme and Site geographically separate. No imapct pathway
Bog woodland		N	N	Scheme and Site geographically separate. No imapct pathway
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	Scheme and Site geographically separate. No imapct pathway
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Within typical foraging range but feature extremely unlikely to make significant use of development area.
Traeth Lafan/ Lavan Sands, Conway Bay SPA	10/DS	N	N	
Great crested grebe Podiceps cristatus		N	N	Feature unlikely to be effected assuming construction best practice. No operational effects anticipated
Red-breasted merganser Mergus serrator		N	N	Feature unlikely to be effected assuming construction best practice. No operational effects anticipated
Eurasian oystercatcher Haematopus ostralegus		N	N	Feature unlikely to be effected assuming construction best practice. No operational effects anticipated
Eurasian curlew Numenius arquata		N	N	Feature unlikely to be effected assuming construction best practice. No operational effects anticipated
Common redshank Tringa totanus		N	N	Feature unlikely to be effected assuming construction best practice. No operational effects anticipated
Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC	10/DS	N	N	
Sandbanks which are slightly covered by sea water all the time		N	N	Site unlikely to be effected assuming construction best practice. No operational effects anticipated
Mudflats and sandflats not covered by seawater at low tide		N	N	Site unlikely to be effected assuming construction best practice. No operational effects anticipated
Large shallow inlets and bays		N	N	Site unlikely to be effected assuming construction best practice. No operational effects anticipated
Reefs		N	N	Site unlikely to be effected assuming construction best practice. No operational effects anticipated
Submerged or partially submerged sea caves		N	N	Feature not vulnerable to likely effects
Glynllifon SAC	15	N	N	
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Scheme beyond features expected foraging / commuting range. No impact pathway
Mwyngloddiau Fforest Gwydir/ Gwydyr Forest Mines SAC	15	N	N	
Calaminarian grasslands of the Violetalia calaminariae		N	N	Scheme and Site located within different Water Resource Zones. No impact pathway.
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Scheme beyond features expected foraging / commuting range. No impact pathway
Anglesey Terns / Morwenoliaid Ynys Môn pSPA	20	N	N	
Sandwich tern Sterna sandvicensis		N	N	Feature and Scheme geographically separate and significant distance apart. No impact pathway
Roseate tern Sterna dougalli		N	N	Feature and Scheme geographically separate and significant distance apart. No impact pathway
Common tern Sterna hirundo		N	N	Feature and Scheme geographically separate and significant distance apart. No impact pathway
Arctic tern Sterna paradisaea		N	N	Feature and Scheme geographically separate and significant distance apart. No impact pathway
Corsydd Eifionydd SAC	20	N	N	
Transition mires and quaking bogs		N	N	Site and Scheme significant distance apart. No impact pathway
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	Feature and Scheme significant distance apart. No impact pathway
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus		N	N	Feature and Scheme significant distance apart. No impact pathway
Corsydd Môn a Llyn/ Anglesey and Llyn Fens Ramsar	20	N	N	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	N	Site and Scheme significant distance apart. No impact pathway
3 - supports populations of plant/animal species important for maintaining regional biodiversity Crit. 3 - supports populations c		N	N	Feature and Scheme significant distance apart. No impact pathway
Corsydd Môn/ Anglesey Fens SAC	20	N	N	
Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.		N	N	Site and Scheme significant distance apart. No impact pathway
Northern Atlantic wet heaths with Erica tetralix		N	N	Site and Scheme significant distance apart. No impact pathway
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	Site and Scheme significant distance apart. No impact pathway
Calcareous fens with Cladium mariscus and species of the Caricion davallianae		N	N	Site and Scheme significant distance apart. No impact pathway
Alkaline fens		N	N	Site and Scheme significant distance apart. No impact pathway
Geyer`s whorl snail Vertigo geyeri		N	N	Feature and Scheme significant distance apart. No impact pathway

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
Southern damselfly Coenagrion mercuriale		N	N	Feature and Scheme significant distance apart. No impact pathway
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	Feature and Scheme significant distance apart. No impact pathway
Glannau Môn: Cors heli / Anglesey Coast: Saltmarsh SAC	20	N	N	
Estuaries		N	N	Site and Scheme significant distance apart with Menai Strait separating them. Likely effects of Scheme unlikely to impact
Mudflats and sandflats not covered by seawater at low tide		N	N	Site and Scheme significant distance apart with Menai Strait separating them. Likely effects of Scheme unlikely to impact
Salicornia and other annuals colonizing mud and sand		N	N	Site and Scheme significant distance apart with Menai Strait separating them. Likely effects of Scheme unlikely to impact
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	N	Site and Scheme significant distance apart with Menai Strait separating them. Likely effects of Scheme unlikely to impact
Glan-traeth SAC	20	N	N	
Great crested newt Triturus cristatus		N	N	Site and Scheme significant distance apart with Menai Strait separating them. Likely effects of Scheme unlikely to impact
Liverpool Bay / Bae Lerpwl SPA	20	N	N	
Red-throated diver Gavia stellata		N	N	Effects of Scheme considered unlikely to impact Feature. Feature not sensitive to likely effects assuming normal measures,
Black (common) scoter Melanitta nigra		N	N	Effects of Scheme considered unlikely to impact Feature. Feature not sensitive to likely effects assuming normal measures,
Waterfowl assemblage Waterfowl assemblage		N	N	Effects of Scheme considered unlikely to impact Feature. Feature not sensitive to likely effects assuming normal measures,
Y Twyni o Abermenai i Aberffraw/ Abermenai to Aberffraw Dunes SAC	20	N	N	
Embryonic shifting dunes		N	N	Site and Scheme significant distance apart. Expected construction and operational effects not considered likely to impact the Site assuming normal measures
Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")		N	N	Site and Scheme significant distance apart. Expected construction and operational effects not considered likely to impact the Site assuming normal measures
Fixed coastal dunes with herbaceous vegetation ("grey dunes")		N	N	Site and Scheme significant distance apart. Expected construction and operational effects not considered likely to impact the Site assuming normal measures
Dunes with Salix repens ssp. argentea (Salicion arenariae)		N	N	Site and Scheme significant distance apart. Expected construction and operational effects not considered likely to impact the Site assuming normal measures
Humid dune slacks		N	N	Site and Scheme significant distance apart. Expected construction and operational effects not considered likely to impact the Site assuming normal measures
Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation		N	N	Site and Scheme significant distance apart. Expected construction and operational effects not considered likely to impact the Site assuming normal measures
Petalwort Petalophyllum ralfsii		N	N	Site and Scheme significant distance apart. Expected construction and operational effects not considered likely to impact the Feature assuming normal measures
Shore dock Rumex rupestris		N	N	Site and Scheme significant distance apart. Expected construction and operational effects not considered likely to impact the Feature assuming normal measures
Ynys Seiriol / Puffin Island SPA	20	N	N	
Great cormorant Phalacrocorax carbo		N	N	Site and Scheme significant distance apart. Expected construction and operational effects not considered likely to impact the Site assuming normal measures

NEYM022a

New pipeline across the Menai for zonal optimisation

Option Summary

This option looked at the Menai Bridge crossing to assess what options are available for zonal optimisation. The recommendations are to install a new cross connection between the inlet and outlet mains at Penmyndd SR to allow this SR to backfeed across the Menai Bridge to the mainland and upgrade the Cefni to Penmyndd SR pumps. Penmyndd SR will receive a pumped supply from Cefni WTW. Under current operation Penmyndd SR receives approximately 3.8 Ml/day from Pentir SR which receives its supply from both Cwellyn WTW and Mynydd Llandegai WTW and with the solution implemented the flow across the Menai Bridge will reverse with 0.4 Ml/day passing from Anglesey to the mainland which will reduce the required output from Pentir SR by 4.2 Ml/day. This option is a network solution: it would not require any increase in the currently licensed abstraction volumes and would operate within the existing licence parameters.

General Assessment

This option would involve minor asset modifications to allow spare water on Anglesey to be utilised on the mainland. All of the works will be within or near Cefni WTW (pump upgrades) and Penmynedd SR (connections and valving), and are relatively small scale. The existing main across the Britannia Bridge would not require modification for the option to work, although this may be refurbished at some point in the future and this might arguably be undertaken alongside the delivery of this option if required. No European sites will be particularly vulnerable to this option: there will be no operational effects (network solution), and construction is very limited and several kilometres from the nearest sites. All potential construction impacts can managed through normal construction best practice. This conclusion would need to be reviewed if refurbishment of the Brittannia Bridge water main is proposed (Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC may be vulnerable to these works, depending on their scope) but even in this instance it is still expected that all potential construction impacts can managed through normal construction best practice.

Recommend Option?

Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures

Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Corsydd Môn a Llyn/ Anglesey and Llyn Fens Ramsar	3	N	N	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	N	Site not exposed to likely outcomes of option as it is upstream from construction works.
3 - supports populations of plant/animal species important for maintaining regional biodiversity Crit. 3 - supports populations o		N	N	Site not exposed to likely outcomes of option as it is upstream from construction works.
Corsydd Môn/ Anglesey Fens SAC	3	N	N	
Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.		N	N	Site not exposed to likely outcomes of option as it is upstream from construction works.
Northern Atlantic wet heaths with Erica tetralix		N	N	Site / feature not exposed to likely outcomes of option (upstream)
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	Site not exposed to likely outcomes of option (upstream)
Calcareous fens with Cladium mariscus and species of the Caricion davallianae		N	N	Site not exposed to likely outcomes of option (upstream)
Alkaline fens		N	N	Site not exposed to likely outcomes of option (upstream)
Geyer`s whorl snail Vertigo geyeri		N	N	Site / feature not exposed to likely outcomes of option (upstream)
Southern damselfly Coenagrion mercuriale		N	N	Feature mobile but unlikely to be exposed to construction effects (habitat preferences / range).
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	Feature mobile but unlikely to be exposed to construction effects (habitat preferences / range).
Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC	4/DS	N	N	
Sandbanks which are slightly covered by sea water all the time		N	N	Feature potentially vulnerable to construction but construction effects certainly avoidable with established measures. No operational effects (network solution).
Mudflats and sandflats not covered by seawater at low tide		N	N	Feature potentially vulnerable to construction but construction effects certainly avoidable with established measures. No operational effects (network solution).
Large shallow inlets and bays		N	N	Feature potentially vulnerable to construction but construction effects certainly avoidable with established measures. No operational effects (network solution).
Reefs		N	N	Feature potentially vulnerable to construction but construction effects certainly avoidable with established measures. No operational effects (network solution).
Submerged or partially submerged sea caves		N	N	Site unlikely to be vulnerable to effects of option.
Anglesey Terns / Morwenoliaid Ynys Môn pSPA	10	N	N	
Sandwich tern Sterna sandvicensis		N	N	Feature not exposed to likely outcomes of option due to significant distance from Scheme
Roseate tern Sterna dougalli		N	N	Feature not exposed to likely outcomes of option due to significant distance from Scheme
Common tern Sterna hirundo		N	N	Feature not exposed to likely outcomes of option due to significant distance from Scheme
Arctic tern Sterna paradisaea		N	N	Feature not exposed to likely outcomes of option due to significant distance from Scheme
Liverpool Bay / Bae Lerpwl SPA	10	N	N	
Red-throated diver Gavia stellata		N	N	Feature not exposed to likely outcomes of option due to significant distance from Scheme
Black (common) scoter Melanitta nigra		N	N	Feature not exposed to likely outcomes of option due to significant distance from Scheme
Waterfowl assemblage Waterfowl assemblage		N	N	Feature not exposed to likely outcomes of option due to significant distance from Scheme
Traeth Lafan/ Lavan Sands, Conway Bay SPA	10	N	N	
Great crested grebe Podiceps cristatus		N	N	Feature not exposed to likely outcomes of option due to significant distance from Scheme
Red-breasted merganser Mergus serrator		N	N	Feature not exposed to likely outcomes of option due to significant distance from Scheme
Eurasian oystercatcher Haematopus ostralegus		N	N	Feature not exposed to likely outcomes of option due to significant distance from Scheme
Eurasian curlew Numenius arquata		N	N	Feature not exposed to likely outcomes of option due to significant distance from Scheme

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
Common redshank Tringa totanus		N	N	Feature not exposed to likely outcomes of option due to significant distance from Scheme
Afon Gwyrfai a Llyn Cwellyn SAC	15	N	N	
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanoju		N	N	Site not exposed to likely outcomes of option due to significant distance from Scheme
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	Site not exposed to likely outcomes of option due to significant distance from Scheme
Atlantic salmon Salmo salar		N	N	Feature not exposed to likely outcomes of option due to significant distance from small-scale works
Otter Lutra lutra		N	N	Feature not exposed to likely outcomes of option due to significant distance from Scheme
Floating water-plantain Luronium natans		N	N	Site not exposed to likely outcomes of option due to significant distance from Scheme
Coedydd Aber SAC	15	N	N	
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Site not exposed to likely outcomes of option due to significant distance from Scheme
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	Site not exposed to likely outcomes of option due to significant distance from Scheme
Eryri/ Snowdonia SAC	15	N	N	
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanoju		N	N	Site not exposed to likely outcomes of option due to significant distance from Scheme
Northern Atlantic wet heaths with Erica tetralix		N	N	Site not exposed to likely outcomes of option due to significant distance from Scheme
European dry heaths		N	N	Site not exposed to likely outcomes of option due to significant distance from Scheme
Alpine and Boreal heaths		N	N	Site not exposed to likely outcomes of option due to significant distance from Scheme
Siliceous alpine and boreal grasslands		N	N	Site not exposed to likely outcomes of option due to significant distance from Scheme
Alpine and subalpine calcareous grasslands		N	N	Site not exposed to likely outcomes of option due to significant distance from Scheme
Species-rich Nardus grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe		N	N	Site not exposed to likely outcomes of option due to significant distance from Scheme
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels		N	N	Site not exposed to likely outcomes of option due to significant distance from Scheme
Blanket bogs (* if active bog)		N	N	Site not exposed to likely outcomes of option due to significant distance from Scheme
Depressions on peat substrates of the Rhynchosporion		N	N	Site not exposed to likely outcomes of option due to significant distance from Scheme
Petrifying springs with tufa formation (Cratoneurion)		N	N	Site not exposed to likely outcomes of option due to significant distance from Scheme
Alkaline fens		N	N	Site not exposed to likely outcomes of option due to significant distance from Scheme
Alpine pioneer formations of the Caricion bicoloris-atrofuscae		N	N	Site not exposed to likely outcomes of option due to significant distance from Scheme
Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani)		N	N	Site not exposed to likely outcomes of option due to significant distance from Scheme
Calcareous rocky slopes with chasmophytic vegetation		N	N	Site not exposed to likely outcomes of option due to significant distance from Scheme
Siliceous rocky slopes with chasmophytic vegetation		N	N	Site not exposed to likely outcomes of option due to significant distance from Scheme
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Site not exposed to likely outcomes of option due to significant distance from Scheme
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus		N	N	Feature not exposed to likely outcomes of option due to significant distance from Scheme
Floating water-plantain Luronium natans		N	N	Feature not exposed to likely outcomes of option due to significant distance from Scheme
Glan-traeth SAC	15	N	N	
Great crested newt Triturus cristatus		N	N	Feature not exposed to likely outcomes of option due to significant distance from Scheme
Ynys Seiriol / Puffin Island SPA	15	N	N	
Great cormorant Phalacrocorax carbo		N	N	Feature not exposed to likely outcomes of option due to significant distance from Scheme
Glannau Môn: Cors heli / Anglesey Coast: Saltmarsh SAC	15/DS	N	N	
Estuaries		N	N	Site not exposed to likely outcomes of option assuming normal measures; due to significant distance from Scheme and works being small-scale
Mudflats and sandflats not covered by seawater at low tide		N	N	Site not exposed to likely outcomes of option assuming normal measures; due to significant distance from Scheme and works being small-scale
Salicornia and other annuals colonizing mud and sand		N	N	Site not exposed to likely outcomes of option assuming normal measures; due to significant distance from Scheme and works being small-scale
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	N	Site not exposed to likely outcomes of option assuming normal measures; due to significant distance from Scheme and works being small-scale
Y Twyni o Abermenai i Aberffraw/ Abermenai to Aberffraw Dunes SAC	15/DS	N	N	
Embryonic shifting dunes		N	N	Site not exposed to likely outcomes of option assuming normal measures; due to significant distance from Scheme and works being small-scale
Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")		N	N	Site not exposed to likely outcomes of option assuming normal measures; due to significant distance from Scheme and works being small-scale
Fixed coastal dunes with herbaceous vegetation ("grey dunes")		N	N	Site not exposed to likely outcomes of option assuming normal measures; due to significant distance from Scheme and works being small-scale
Dunes with Salix repens ssp. argentea (Salicion arenariae)		N	N	Site not exposed to likely outcomes of option assuming normal measures; due to significant distance from Scheme and works being small-scale

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
Humid dune slacks		N	N	Site not exposed to likely outcomes of option assuming normal measures; due to significant distance from Scheme and works being small-scale
Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation		N	N	Site not exposed to likely outcomes of option assuming normal measures; due to significant distance from Scheme and works being small-scale
Petalwort Petalophyllum ralfsii		N	N	Feature not exposed to likely outcomes of option assuming normal measures; due to significant distance from small-scale Scheme
Shore dock Rumex rupestris		N	N	Feature not exposed to likely outcomes of option assuming normal measures; due to significant distance from small-scale Scheme
Glynllifon SAC	20	N	N	
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Site not exposed to likely outcomes of option due to significant distance from Scheme
Llyn Idwal Ramsar	20	N	N	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	N	Site not exposed to likely outcomes of option due to significant distance from Scheme
2 - supports vulnerable, endangered, or critically endangered species or threatened eco. communities Crit. 2 - supports vulner		N	N	Feature not exposed to likely outcomes of option due to significant distance from Scheme
North Anglesey Marine / Gogledd Môn Forol cSAC	20	N	N	
Harbour porpoise Phocoena phocoena		N	N	Feature not exposed to likely outcomes of option due to significant distance from Scheme

NEYM022b

Zonal optimisation to address the lack of bi-directional flow across Menai Bridge

Option Summary

This option addressed the lack of bi-directional flow across the Menai Bridge. The recommendations are to install a new cross connection with non return valve between the inlet and outlet mains at Penmynydd SR, upgrade the Cefni to Penmyndd SR pumps, install a new pumping station on the mainland and install a new 355mm HPPE SDR17 main from the new pumping station to Bryniau SR. This would allow Penmyndd SR to backfeed across the Menai Bridge from Anglesey to the mainland where the flow would then be boosted up to Bryniau SR in Bangor. Under current operation Penmyndd SR receives approximately 3.8 Ml/day from Pentir SR which receives its supply from both Cwellyn WTW and Mynydd Llandegai WTW and with the solution implemented the flow across the Menai Bridge will reverse with 4.3 Ml/day passing from Anglesey to the mainland. This will reduce the required output at Cwellyn WTW and Mynydd Llandegai WTW by a combined 8.1Ml/day. This option is a network solution: it would not require any increase in the currently licensed abstraction volumes and would operate within the existing licence parameters.

General Assessment

This option would involve minor asset modifications to allow spare water on Anglesey to be utilised on the mainland. The works are small scale and located within or near to Cefni WTW. A new cross section is to be installed with a non-return valve at Penmynydd SR and the upgrade of the pumps for Cefni to Penmyndd SR. A new pumping station on the mainland is to be built and connected via a new water main, which is likely to be located within existing roads. There will be no operational effects (network solution) although construction works (pipeline) are likely to be relatively close to Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC. All potential construction impacts can clearly be avoided through normal construction best practice, however.

Recommend Option?

Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures

Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC	I/DS	N	N	
Sandbanks which are slightly covered by sea water all the time		N	N	Feature potentially vulnerable to construction due to close proximity, but effects avoidable with established measures
Mudflats and sandflats not covered by seawater at low tide		N	N	Feature potentially vulnerable to construction due to close proximity, but effects avoidable with established measures
Large shallow inlets and bays		N	N	Feature potentially vulnerable to construction due to close proximity, but effects avoidable with established measures
Reefs		N	N	Feature potentially vulnerable to construction due to close proximity, but effects avoidable with established measures
Submerged or partially submerged sea caves		N	N	Feature not sensitive to likely outcomes of option due to nature of feature
Corsydd Môn a Llyn/ Anglesey and Llyn Fens Ramsar	3	N	N	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	N	Site not likely to be impacted by construction or operational effects due to location upstream from Scheme
3 - supports populations of plant/animal species important for maintaining regional biodiversity Crit. 3 - supports populations c		N	N	Feature not likely to be impacted by construction or operational effects due to location upstream from Scheme
Corsydd Môn/ Anglesey Fens SAC	3	N	N	
Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.		N	N	Site not likely to be impacted by construction or operational effects due to location upstream from Scheme
Northern Atlantic wet heaths with Erica tetralix		N	N	Site not likely to be impacted by construction or operational effects due to location upstream from Scheme
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	Site not likely to be impacted by construction or operational effects due to location upstream from Scheme
Calcareous fens with Cladium mariscus and species of the Caricion davallianae		N	N	Site not likely to be impacted by construction or operational effects due to location upstream from Scheme
Alkaline fens		N	N	Site not likely to be impacted by construction or operational effects due to location upstream from Scheme
Geyer`s whorl snail Vertigo geyeri		N	N	Feature not likely to be impacted by construction or operational effects due to location upstream from Scheme
Southern damselfly Coenagrion mercuriale		N	N	Feature not likely to be impacted by construction or operational effects due to location upstream from Scheme
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	Feature not likely to be impacted by construction or operational effects due to location upstream from Scheme
Traeth Lafan/ Lavan Sands, Conway Bay SPA	3	N	N	
Great crested grebe Podiceps cristatus		N	N	Feature potentially vulnerable to construction due to close proximity, but effects avoidable with established measures
Red-breasted merganser Mergus serrator		N	N	Feature potentially vulnerable to construction due to close proximity, but effects avoidable with established measures
Eurasian oystercatcher Haematopus ostralegus		N	N	Feature potentially vulnerable to construction due to close proximity, but effects avoidable with established measures
Eurasian curlew Numenius arquata		N	N	Feature potentially vulnerable to construction due to close proximity, but effects avoidable with established measures
Common redshank Tringa totanus		N	N	Feature potentially vulnerable to construction due to close proximity, but effects avoidable with established measures
Eryri/ Snowdonia SAC	5	N	N	
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanoju		N	N	Site not likely to be impacted by construction or operational effects due to location upstream.
Northern Atlantic wet heaths with Erica tetralix		N	N	Site not likely to be impacted by construction or operational effects due to location upstream.
European dry heaths		N	N	Site not likely to be impacted by construction or operational effects due to location upstream.
Alpine and Boreal heaths		N	N	Site not likely to be impacted by construction or operational effects due to location upstream.
Siliceous alpine and boreal grasslands		N	N	Site not likely to be impacted by construction or operational effects due to location upstream.
Alpine and subalpine calcareous grasslands		N	N	Site not likely to be impacted by construction or operational effects due to location upstream.
Species-rich Nardus grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe		N	N	Site not likely to be impacted by construction or operational effects due to location upstream.
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels		N	N	Site not likely to be impacted by construction or operational effects due to location upstream.
Blanket bogs (* if active bog)		N	N	Site not likely to be impacted by construction or operational effects due to location upstream.
Depressions on peat substrates of the Rhynchosporion		N	N	Site not likely to be impacted by construction or operational effects due to location upstream.
Petrifying springs with tufa formation (Cratoneurion)		N	N	Site not likely to be impacted by construction or operational effects due to location upstream.
Alkaline fens		N	N	Site not likely to be impacted by construction or operational effects due to location upstream.
Alpine pioneer formations of the Caricion bicoloris-atrofuscae		N	N	Site not likely to be impacted by construction or operational effects due to location upstream.

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani)		N	N	Site not likely to be impacted by construction or operational effects due to location upstream.
Calcareous rocky slopes with chasmophytic vegetation		N	N	Site not likely to be impacted by construction or operational effects due to location upstream.
Siliceous rocky slopes with chasmophytic vegetation		N	N	Site not likely to be impacted by construction or operational effects due to location upstream.
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Site not likely to be impacted by construction or operational effects due to location upstream.
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus		N	N	Feature not likely to be impacted by construction or operational effects due to location upstream.
Floating water-plantain Luronium natans		N	N	Feature not likely to be impacted by construction or operational effects due to location upstream.
Anglesey Terns / Morwenoliaid Ynys Môn pSPA	10	N	N	
Sandwich tern Sterna sandvicensis		N	N	Feature not likely to be impacted by construction or operational effects due significant distance from works
Roseate tern Sterna dougalli		N	N	Feature not likely to be impacted by construction or operational effects due significant distance from works
Common tern Sterna hirundo		N	N	Feature not likely to be impacted by construction or operational effects due significant distance from works
Arctic tern Sterna paradisaea		N	N	Feature not likely to be impacted by construction or operational effects due significant distance from works
Coedydd Aber SAC	10	N	N	
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Site not likely to be impacted by construction or operational effects due significant distance from works
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	Site not likely to be impacted by construction or operational effects due significant distance from works
Liverpool Bay / Bae Lerpwl SPA	10	N	N	
Red-throated diver Gavia stellata		N	N	Feature not likely to be impacted by construction or operational effects due to distance from scheme
Black (common) scoter Melanitta nigra		N	N	Feature not likely to be impacted by construction or operational effects due to distance from scheme
Waterfowl assemblage Waterfowl assemblage		N	N	Feature not likely to be impacted by construction or operational effects due to distance from scheme
Afon Gwyrfai a Llyn Cwellyn SAC	15	N	N	
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanoju		N	N	Site not likely to be impacted by construction or operational effects due to its distance and location upstream from
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	Site not likely to be impacted by construction or operational effects due to its distance and location upstream from
Atlantic salmon Salmo salar		N	N	Feature not likely to be impacted by construction or operational effects due to its distance and location upstream from scheme. There is not an impact pathway linking the Site and Scheme
Otter Lutra lutra		N	N	Feature not likely to be impacted by construction or operational effects due to its distance and location upstream from scheme
Floating water-plantain Luronium natans		N	N	Feature not likely to be impacted by construction or operational effects due to its distance and location upstream from scheme
Glannau Môn: Cors heli / Anglesey Coast: Saltmarsh SAC	15	N	N	
Estuaries		N	N	Site not likely to be impacted by construction or operational effects due to its distance and location separate from
Mudflats and sandflats not covered by seawater at low tide		N	N	Site not likely to be impacted by construction or operational effects due to its distance and location separate from
Salicornia and other annuals colonizing mud and sand		N	N	Feature not likely to be impacted by construction or operational effects due to its distance and location separate from
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	N	Site not likely to be impacted by construction or operational effects due to its distance and location separate from
Glan-traeth SAC	15	N	N	
Great crested newt Triturus cristatus		N	N	Feature not likely to be imapcted by contruction or opertaional effects due to distance and location separate from
Llyn Idwal Ramsar	15	N	N	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	N	Site not likely to be impacted by contruction or operation effects due to location upstream from works.
2 - supports vulnerable, endangered, or critically endangered species or threatened eco. communities Crit. 2 - supports vulner		N	N	Feature not likely to be impacted by contruction or operation effects due to location upstream from works.
Y Twyni o Abermenai i Aberffraw/ Abermenai to Aberffraw Dunes SAC	15	N	N	
Embryonic shifting dunes		N	N	Site not likely to be impacted by contruction or operation effects due to distance from scheme
Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")		N	N	Site not likely to be impacted by contruction or operation effects due to distance from scheme
Fixed coastal dunes with herbaceous vegetation ("grey dunes")		N	N	Site not likely to be impacted by contruction or operation effects due to distance from scheme
Dunes with Salix repens ssp. argentea (Salicion arenariae)		N	N	Site not likely to be impacted by contruction or operation effects due to distance from scheme
Humid dune slacks		N	N	Site not likely to be impacted by contruction or operation effects due to distance from scheme
Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation		N	N	Site not likely to be impacted by contruction or operation effects due to distance from scheme
Petalwort Petalophyllum ralfsii		N	N	Feature not likely to be impacted by contruction or operation effects due to distance from scheme
Shore dock Rumex rupestris		N	N	Feature not likely to be impacted by contruction or operation effects due to distance from scheme
Ynys Seiriol / Puffin Island SPA	15	N	N	
Great cormorant Phalacrocorax carbo		N	N	Feature not likely to be impacted by contruction or operation effects due to distance from scheme
Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC	20	N	N	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	Site not likely to be impacted by contruction or operation effects due to distance from scheme
Northern Atlantic wet heaths with Erica tetralix		N	N	Site not likely to be impacted by contruction or operation effects due to distance from scheme
European dry heaths		N	N	Site not likely to be impacted by contruction or operation effects due to distance from scheme
Tilio-Acerion forests of slopes, screes and ravines		N	N	Site not likely to be impacted by contruction or operation effects due to distance from scheme

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Site not likely to be impacted by contruction or operation effects due to distance from scheme
Bog woodland		N	N	Site not likely to be impacted by contruction or operation effects due to distance from scheme
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	Site not likely to be impacted by contruction or operation effects due to distance from scheme
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Feature not likely to be impacted by construction or operation effects due to distance from scheme. Beyond species expected range
Glynllifon SAC	20	N	N	
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Feature not likely to be impacted by construction or operation effects due to distance from scheme. Beyond species expected range
North Anglesey Marine / Gogledd Môn Forol cSAC	20	N	N	
Harbour porpoise Phocoena phocoena		N	N	Feature not likely to be impacted by construction or operation effects due to distance from scheme.

NEYM023

Cwm Dulyn transfer from Harlech WRZ to NEYM zone

Option Summary

Transfer 1.5Ml/d from Cwm Dulwyn WTW to NEYM. This involves using the remaining capacity of Cwm Dulwyn WTW (total capacity is 3Ml/d) to supply LCAs north of the WTW normally supplied by Cwellyn WTW via Penfordd Helen PS. 5.1km of existing trunk mains would need to be upgraded to reduce head loss whilst maintaining self cleansing velocities. Penfordd Helen PS would no longer feed south the Cwm Dulwyn. This option supplies up to LCA 3D101A01 and its cascading LCAs.

General Assessment

This option is a network solution which uses the remaining capacity of the Cwm Dulwyn WTW licence. Pipeline works of 5.1km are required to upgrade the mains. There are four European Sites within 5km of the likely route although two of these will not be exposed to construction effects (separate catchments / mobile species with limited ranges). The potential exceptions are lesser horseshoe bats and otters associated with Glynllifon SAC and Afon Gwyrfai a Llyn Cwellyn SAC respectively. These species may be vulnerable to construction works affecting supporting habitats outside the designated site boundary (e.g. foraging areas) and so scheme-specific surveys and mitigation measures are likely to be required, although any potential effects will almost certainly be avoidable at the scheme level. No operational effects (network solution).

Recommend Option?

Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures

Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Corsydd Eifionydd SAC	1	N	N	
Transition mires and quaking bogs		N	N	Site not exposed to likely outcomes of option due to lack of connectivity to scheme
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	Feature unlikely to be exposed to likely outcomes of option due to behaviour of species (habitat preferences / range). Any potential effects avoidable at scheme level.
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus		N	N	Feature not exposed to likely outcomes of option due to lack of connectivity to scheme
Glynllifon SAC	1	U	N	
Lesser horseshoe bat Rhinolophus hipposideros		U	N	Feature vulnerable if foraging routes (etc) affected by pipeline construction; risk potentially high due to proximity but effects clearly avoidable through construction best practice and established measures.
Afon Gwyrfai a Llyn Cwellyn SAC	5	N	N	
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanoju		N	N	Site / feature not exposed to likely outcomes of option (separate catchment)
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	Site / feature not exposed to likely outcomes of option (separate catchment)
Atlantic salmon Salmo salar		N	N	Site / feature not exposed to likely outcomes of option (separate catchment)
Otter Lutra lutra		N	N	Feature potentially vulnerable to construction effects but avoidable with normal best-practice.
Floating water-plantain Luronium natans		N	N	Site / feature not exposed to likely outcomes of option (separate catchment)
Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC	5	N	N	
Sandbanks which are slightly covered by sea water all the time		N	N	Site not exposed to likely outcomes of option due to distance and lack of connectivity to scheme
Mudflats and sandflats not covered by seawater at low tide		N	N	Site not exposed to likely outcomes of option due to distance and lack of connectivity to scheme
Large shallow inlets and bays		N	N	Site not exposed to likely outcomes of option due to distance and lack of connectivity to scheme
Reefs		N	N	Site not exposed to likely outcomes of option due to distance and lack of connectivity to scheme
Submerged or partially submerged sea caves		N	N	Site not exposed to likely outcomes of option due to distance and lack of connectivity to scheme
Glannau Môn: Cors heli / Anglesey Coast: Saltmarsh SAC	10	N	N	
Estuaries		N	N	Site not exposed to likely outcomes of option due to distance and connectivity to scheme
Mudflats and sandflats not covered by seawater at low tide		N	N	Site not exposed to likely outcomes of option due to distance and connectivity to scheme
Salicornia and other annuals colonizing mud and sand		N	N	Site not exposed to likely outcomes of option due to distance and connectivity to scheme
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	N	Site not exposed to likely outcomes of option due to distance and connectivity to scheme
Y Twyni o Abermenai i Aberffraw/ Abermenai to Aberffraw Dunes SAC	10	N	N	
Embryonic shifting dunes		N	N	Site not exposed to likely outcomes of option due to distance and connectivity to scheme
Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")		N	N	Site not exposed to likely outcomes of option due to distance and connectivity to scheme
Fixed coastal dunes with herbaceous vegetation ("grey dunes")		N	N	Site not exposed to likely outcomes of option due to distance and connectivity to scheme
Dunes with Salix repens ssp. argentea (Salicion arenariae)		N	N	Site not exposed to likely outcomes of option due to distance and connectivity to scheme
Humid dune slacks		N	N	Site not exposed to likely outcomes of option due to distance and connectivity to scheme
Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation		N	N	Site not exposed to likely outcomes of option due to distance and connectivity to scheme
Petalwort Petalophyllum ralfsii		N	N	Feature not exposed to likely outcomes of option due to distance and connectivity to scheme
Shore dock Rumex rupestris		N	N	Feature not exposed to likely outcomes of option due to distance and connectivity to scheme
Anglesey Terns / Morwenoliaid Ynys Môn pSPA	15	N	N	
Sandwich tern Sterna sandvicensis		N	N	Feature not exposed to likely outcomes of option due to distance and connectivity to scheme
Roseate tern Sterna dougalli		N	N	Feature not exposed to likely outcomes of option due to distance and connectivity to scheme
Common tern Sterna hirundo		N	N	Feature not exposed to likely outcomes of option due to distance and connectivity to scheme
Arctic tern Sterna paradisaea		N	N	Feature not exposed to likely outcomes of option due to distance and connectivity to scheme
Clogwyni Pen Llyn/ Seacliffs of Lleyn SAC	15	N	N	

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Vegetated sea cliffs of the Atlantic and Baltic Coasts		N	N	Site not exposed to likely outcomes of option due to distance and connectivity to scheme
Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC	15	U	N	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	Site not exposed to likely outcomes of option due to distance and connectivity to scheme
Northern Atlantic wet heaths with Erica tetralix		N	N	Site not exposed to likely outcomes of option due to distance and connectivity to scheme
European dry heaths		N	N	Site not exposed to likely outcomes of option due to distance and connectivity to scheme
Tilio-Acerion forests of slopes, screes and ravines		N	N	Site not exposed to likely outcomes of option due to distance and connectivity to scheme
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Site not exposed to likely outcomes of option due to distance and connectivity to scheme
Bog woodland		N	N	Site not exposed to likely outcomes of option due to distance and connectivity to scheme
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	Site not exposed to likely outcomes of option due to distance and connectivity to scheme
Lesser horseshoe bat Rhinolophus hipposideros		U	N	Feature vulnerable to effects of construction as foraging routes potentially impacted. Site and scheme are within the species known range and therefore there is a significant likelihood of scheme effecting species. Effects are avoidable through construction best practice and established measures.
Eryri/ Snowdonia SAC	15	N	N	
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanoju		N	N	Site not exposed to likely outcomes of construction or operation due to the scheme being downstream from the Site. Also the site and scheme are a significant distance apart.
Northern Atlantic wet heaths with Erica tetralix		N	N	Site not exposed to likely outcomes of construction or operation due to the scheme being downstream from the Site. Also the site and scheme are a significant distance apart.
European dry heaths		N	N	Site not exposed to likely outcomes of construction or operation due to the scheme being downstream from the Site. Also the site and scheme are a significant distance apart.
Alpine and Boreal heaths		N	N	Site not exposed to likely outcomes of construction or operation due to the scheme being downstream from the Site. Also the site and scheme are a significant distance apart.
Siliceous alpine and boreal grasslands		N	N	Site not exposed to likely outcomes of construction or operation due to the scheme being downstream from the Site. Also the site and scheme are a significant distance apart.
Alpine and subalpine calcareous grasslands		N	N	Site not exposed to likely outcomes of construction or operation due to the scheme being downstream from the Site. Also the site and scheme are a significant distance apart.
Species-rich Nardus grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe		N	N	Site not exposed to likely outcomes of construction or operation due to the scheme being downstream from the Site. Also the site and scheme are a significant distance apart.
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels		N	N	Site not exposed to likely outcomes of construction or operation due to the scheme being downstream from the Site. Also the site and scheme are a significant distance apart.
Blanket bogs (* if active bog)		N	N	Site not exposed to likely outcomes of construction or operation due to the scheme being downstream from the Site. Also the site and scheme are a significant distance apart.
Depressions on peat substrates of the Rhynchosporion		N	N	Site not exposed to likely outcomes of construction or operation due to the scheme being downstream from the Site. Also the site and scheme are a significant distance apart.
Petrifying springs with tufa formation (Cratoneurion)		N	N	Site not exposed to likely outcomes of construction or operation due to the scheme being downstream from the Site. Also the site and scheme are a significant distance apart.
Alkaline fens		N	N	Site not exposed to likely outcomes of construction or operation due to the scheme being downstream from the Site. Also the site and scheme are a significant distance apart.
Alpine pioneer formations of the Caricion bicoloris-atrofuscae		N	N	Site not exposed to likely outcomes of construction or operation due to the scheme being downstream from the Site. Also the site and scheme are a significant distance apart.
Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani)		N	N	Site not exposed to likely outcomes of construction or operation due to the scheme being downstream from the Site. Also the site and scheme are a significant distance apart.
Calcareous rocky slopes with chasmophytic vegetation		N	N	Site not exposed to likely outcomes of construction or operation due to the scheme being downstream from the Site. Also the site and scheme are a significant distance apart.
Siliceous rocky slopes with chasmophytic vegetation		N	N	Site not exposed to likely outcomes of construction or operation due to the scheme being downstream from the Site. Also the site and scheme are a significant distance apart.
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Site not exposed to likely outcomes of construction or operation due to the scheme being downstream from the Site. Also the site and scheme are a significant distance apart.
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus		N	N	Feature not exposed to likely outcomes of construction or operation due to the scheme being downstream from the Site. Also the site and scheme are a significant distance apart.
Floating water-plantain Luronium natans		N	N	Feature not exposed to likely outcomes of construction or operation due to the scheme being downstream from the Site. Also the site and scheme are a significant distance apart.
Glan-traeth SAC	15	N	N	
Great crested newt Triturus cristatus		N	N	Feature not exposed to likely effects of scheme due to geographical separation and distance apart.

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
Northern Cardigan Bay / Gogledd Bae Ceredigion pSPA	15	N	N	
Red-throated diver Gavia stellata		N	N	Feature not exposed to likely outcomes of option due to distance from scheme. Construction best practice guidelines are sufficient to prevent any negative effects.
Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC	15	N	N	
Sandbanks which are slightly covered by sea water all the time		N	N	Site not exposed to any likely effects of construction or operate due to the distance from the scheme
Estuaries		N	N	Site not exposed to any likely effects of construction or operate due to the distance from the scheme
Mudflats and sandflats not covered by seawater at low tide		N	N	Site not exposed to any likely effects of construction or operate due to the distance from the scheme
Coastal lagoons		N	N	Site not exposed to any likely effects of construction or operate due to the distance from the scheme
Large shallow inlets and bays		N	N	Site not exposed to any likely effects of construction or operate due to the distance from the scheme
Reefs		N	N	Site not exposed to any likely effects of construction or operate due to the distance from the scheme
Salicornia and other annuals colonizing mud and sand		N	N	Site not exposed to any likely effects of construction or operate due to the distance from the scheme
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	N	Site not exposed to any likely effects of construction or operate due to the distance from the scheme
Submerged or partially submerged sea caves		N	N	Site not exposed to any likely effects of construction or operate due to the distance from the scheme
Bottlenose dolphin Tursiops truncatus		N	N	Feature not exposed to likely outcomes of option due to distance from scheme.
Otter Lutra lutra		N	N	Feature not exposed to likely outcomes of option due to distance from scheme.
Grey seal Halichoerus grypus		N	N	Feature not exposed to likely outcomes of option due to distance from scheme.
Corsydd Llyn/ Lleyn Fens SAC	20	N	N	
Calcareous fens with Cladium mariscus and species of the Caricion davallianae		N	N	Site not exposed to any likely effects of construction or operate due to the distance from the scheme
Alkaline fens		N	N	Site not exposed to any likely effects of construction or operate due to the distance from the scheme
Geyer`s whorl snail Vertigo geyeri		N	N	Feature not exposed to likely outcomes of option due to distance from scheme.
Desmoulin`s whorl snail Vertigo moulinsiana		N	N	Feature not exposed to likely outcomes of option due to distance from scheme.
Llyn Idwal Ramsar	20	N	N	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	N	Site not exposed to any likely effects of construction or operate due to the distance from the scheme
2 - supports vulnerable, endangered, or critically endangered species or threatened eco. communities Crit. 2 - supports vulner		N	N	Feature not exposed to likely outcomes of option due to distance from scheme.
Morfa Harlech a Morfa Dyffryn SAC	20	N	N	
Embryonic shifting dunes		N	N	Site not exposed to any likely effects of construction or operate due to the distance from the scheme
Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")		N	N	Site not exposed to any likely effects of construction or operate due to the distance from the scheme
Dunes with Salix repens ssp. argentea (Salicion arenariae)		N	N	Site not exposed to any likely effects of construction or operate due to the distance from the scheme
Humid dune slacks		N	N	Site not exposed to any likely effects of construction or operate due to the distance from the scheme
Petalwort Petalophyllum ralfsii		N	N	Feature not exposed to likely outcomes of option due to distance from scheme.

NEYM024

New main to transfer water from Dolbenmaen WTW to NEYM zone

Option Summary

Transfer 4Ml/d from Dolbenmaen WTW to NEYM. This involves supplying LCAs up to Ysbytty SR normally supplied by Cwm Dulwyn and Cwellyn WTWs. 1.4km of new mains are required to connect Ysbytty SR to the 400mm trunk main downstream of Penfordd Helen PS. This provides the option to supply Ysbytty SR from Dolbenmaen WTW, Cwellyn WTW or both. 14.9km of existing trunk mains would need to be upsized to reduce head loss whilst maintaining self cleansing velocities. A upgraded pump at Dolbenmaen WTW would be required to provide the lift to reach Ysbytty SR and produce a peak flow of 77l/s. This option assumes Cwm Dulwyn WTW is abandoned.

General Assessment

Option requires new mains along a 1.4km cross-country route near the Afon Gwyrfai; and the replacement of 14.9km of existing trunk mains (note, this is mostly located within existing roads but also follows the cross-country section of NEYM023). Works to upgrade the Dolbenmaen WTW are also required. Three European Sites are within 1km of the scheme and have features that may be vulnerable to construction effects (Afon Gwyrfai a Llyn Cwellyn SAC (Salmon, Watercourses with Ranunculus vegetation; otter); Glynllifon SAC (lesser horseshoe bat); Corsydd Eifionydd SAC (Marsh fritillary butterfly). However, effects can be clearly avoidable at the scheme level (e.g. works should be timed to avoid salmon migration and scheme-specific detailed design is required at the planning stage to keep bat flyways intact). All other potential effects can be avoided with normal construction practice (e.g. on downstream sites). No operational effects (network solution).

Recommend Option?

Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures

Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Afon Gwyrfai a Llyn Cwellyn SAC	1	U	N	
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanoju		N	N	Feature located upstream from works and not involved in impact pathway
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	Site potentially vulnerable to construction, but effects avoidable with construction best practice.
Atlantic salmon Salmo salar		U	N	Feature potentially vulnerable to construction, but effects possible to be avoided using established measures (e.g. timing works to avoid salmon migration period)
Otter Lutra lutra		U	N	Feature potentially vulnerable to construction, but effects possible to be avoided using construction best practice.
Floating water-plantain Luronium natans		N	N	Feature located upstream from works and not involved in impact pathway
Corsydd Eifionydd SAC	1	N	N	
Transition mires and quaking bogs		N	N	Site / feature upstream of likely construction area.
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	Feature potentially vulnerable to construction, but effects possible to be avoided using established measures
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus		N	N	Site / feature upstream of likely construction area.
Glynllifon SAC	1	U	N	
Lesser horseshoe bat Rhinolophus hipposideros		U	N	Feature potentially vulnerable to construction if flyways are effected, but effects possible to be avoided using established measures and scheme-specific design
Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC	4	N	N	
Sandbanks which are slightly covered by sea water all the time		N	N	Site potentially vulnerable to construction, but effects avoidable with construction best practice.
Mudflats and sandflats not covered by seawater at low tide		N	N	Site potentially vulnerable to construction, but effects avoidable with construction best practice.
Large shallow inlets and bays		N	N	Site potentially vulnerable to construction, but effects avoidable with construction best practice.
Reefs		N	N	Site potentially vulnerable to construction, but effects avoidable with construction best practice.
Submerged or partially submerged sea caves		N	N	Site potentially vulnerable to construction, but effects avoidable with construction best practice.
Northern Cardigan Bay / Gogledd Bae Ceredigion pSPA	5	N	N	
Red-throated diver Gavia stellata		N	N	Feature unlikely to be exposed to effects
Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC	5	N	N	
Sandbanks which are slightly covered by sea water all the time		N	N	Site potentially vulnerable to construction, but effects avoidable with construction best practice.
Estuaries		N	N	Site potentially vulnerable to construction, but effects avoidable with construction best practice.
Mudflats and sandflats not covered by seawater at low tide		N	N	Site potentially vulnerable to construction, but effects avoidable with construction best practice.
Coastal lagoons		N	N	Site potentially vulnerable to construction, but effects avoidable with construction best practice.
Large shallow inlets and bays		N	N	Site potentially vulnerable to construction, but effects avoidable with construction best practice.
Reefs		N	N	Site potentially vulnerable to construction, but effects avoidable with construction best practice.
Salicornia and other annuals colonizing mud and sand		N	N	Site potentially vulnerable to construction, but effects avoidable with construction best practice.
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	N	Site potentially vulnerable to construction, but effects avoidable with construction best practice.
Submerged or partially submerged sea caves		N	N	Site potentially vulnerable to construction, but effects avoidable with construction best practice.
Bottlenose dolphin Tursiops truncatus		N	N	Site potentially vulnerable to construction, but effects avoidable with construction best practice.
Otter Lutra lutra		N	N	Site potentially vulnerable to construction, but effects avoidable with construction best practice.
Grey seal Halichoerus grypus		N	N	Site potentially vulnerable to construction, but effects avoidable with construction best practice.
Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC	10	U	N	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	Site unlikely to be exposed to expected outcomes of option. Any limited impacts are avoidable using construction best practice.

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Northern Atlantic wet heaths with Erica tetralix		N	N	Site unlikely to be exposed to expected outcomes of option. Any limited impacts are avoidable using construction best practice.
European dry heaths		N	N	Site unlikely to be exposed to expected outcomes of option. Any limited impacts are avoidable using construction best practice.
Tilio-Acerion forests of slopes, screes and ravines		N	N	Site unlikely to be exposed to expected outcomes of option. Any limited impacts are avoidable using construction best practice.
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Site unlikely to be exposed to expected outcomes of option. Any limited impacts are avoidable using construction best practice.
Bog woodland		N	N	Site unlikely to be exposed to expected outcomes of option. Any limited impacts are avoidable using construction best practice.
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	Site unlikely to be exposed to expected outcomes of option. Any limited impacts are avoidable using construction best practice.
Lesser horseshoe bat Rhinolophus hipposideros		U	N	Feature potentially vulnerable to construction if flyways are effected, but effects possible to be avoided using established measures
Eryri/ Snowdonia SAC	10	N	N	
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanoju		N	N	Site not vulnerable to effects of construction or operation due to significant location from scheme and with the Site being located upstream.
Northern Atlantic wet heaths with Erica tetralix		N	N	Site not vulnerable to effects of construction or operation due to significant location from scheme and with the Site being located upstream.
European dry heaths		N	N	Site not vulnerable to effects of construction or operation due to significant location from scheme and with the Site being located upstream.
Alpine and Boreal heaths		N	N	Site not vulnerable to effects of construction or operation due to significant location from scheme and with the Site being located upstream.
Siliceous alpine and boreal grasslands		N	N	Site not vulnerable to effects of construction or operation due to significant location from scheme and with the Site being located upstream.
Alpine and subalpine calcareous grasslands		N	N	Site not vulnerable to effects of construction or operation due to significant location from scheme and with the Site being located upstream.
Species-rich Nardus grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe		N	N	Site not vulnerable to effects of construction or operation due to significant location from scheme and with the Site being located upstream.
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels		N	N	Site not vulnerable to effects of construction or operation due to significant location from scheme and with the Site being located upstream.
Blanket bogs (* if active bog)		N	N	Site not vulnerable to effects of construction or operation due to significant location from scheme and with the Site being located upstream.
Depressions on peat substrates of the Rhynchosporion		N	N	Site not vulnerable to effects of construction or operation due to significant location from scheme and with the Site being located upstream.
Petrifying springs with tufa formation (Cratoneurion)		N	N	Site not vulnerable to effects of construction or operation due to significant location from scheme and with the Site being located upstream.
Alkaline fens		N	N	Site not vulnerable to effects of construction or operation due to significant location from scheme and with the Site being located upstream.
Alpine pioneer formations of the Caricion bicoloris-atrofuscae		N	N	Site not vulnerable to effects of construction or operation due to significant location from scheme and with the Site being located upstream.
Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani)		N	N	Site not vulnerable to effects of construction or operation due to significant location from scheme and with the Site being located upstream.
Calcareous rocky slopes with chasmophytic vegetation		N	N	Site not vulnerable to effects of construction or operation due to significant location from scheme and with the Site being located upstream.
Siliceous rocky slopes with chasmophytic vegetation		N	N	Site not vulnerable to effects of construction or operation due to significant location from scheme and with the Site being located upstream.
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Site not vulnerable to effects of construction or operation due to significant location from scheme and with the Site being located upstream.
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus		N	N	Feature not vulnerable to effects of construction or operation due to significant location from scheme and with the Site being located upstream.
Floating water-plantain Luronium natans		N	N	Feature not vulnerable to effects of construction or operation due to significant location from scheme and with the Site being located upstream.

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Glannau Môn: Cors heli / Anglesey Coast: Saltmarsh SAC	10	N	N	
Estuaries		N	N	No reasonable impact pathways.
Mudflats and sandflats not covered by seawater at low tide		N	N	No reasonable impact pathways.
Salicornia and other annuals colonizing mud and sand		N	N	No reasonable impact pathways.
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	N	No reasonable impact pathways.
Morfa Harlech a Morfa Dyffryn SAC	10	N	N	
Embryonic shifting dunes		N	N	No reasonable impact pathways.
Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")		N	N	No reasonable impact pathways.
Dunes with Salix repens ssp. argentea (Salicion arenariae)		N	N	No reasonable impact pathways.
Humid dune slacks		N	N	No reasonable impact pathways.
Petalwort Petalophyllum ralfsii		N	N	No reasonable impact pathways.
Y Twyni o Abermenai i Aberffraw/ Abermenai to Aberffraw Dunes SAC	10	N	N	
Embryonic shifting dunes		N	N	No reasonable impact pathways.
Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")		N	N	No reasonable impact pathways.
Fixed coastal dunes with herbaceous vegetation ("grey dunes")		N	N	No reasonable impact pathways.
Dunes with Salix repens ssp. argentea (Salicion arenariae)		N	N	No reasonable impact pathways.
Humid dune slacks		N	N	No reasonable impact pathways.
Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation		N	N	No reasonable impact pathways.
Petalwort Petalophyllum ralfsii		N	N	No reasonable impact pathways.
Shore dock Rumex rupestris		N	N	No reasonable impact pathways.
Anglesey Terns / Morwenoliaid Ynys Môn pSPA	15	N	N	
Sandwich tern Sterna sandvicensis		N	N	No reasonable impact pathways.
Roseate tern Sterna dougalli		N	N	No reasonable impact pathways.
Common tern Sterna hirundo		N	N	No reasonable impact pathways.
Arctic tern Sterna paradisaea		N	N	No reasonable impact pathways.
Clogwyni Pen Llyn/ Seacliffs of Lleyn SAC	15	N	N	
Vegetated sea cliffs of the Atlantic and Baltic Coasts		N	N	No reasonable impact pathways.
Glan-traeth SAC	15	N	N	
Great crested newt Triturus cristatus		N	N	No reasonable impact pathways.
Llyn Idwal Ramsar	15	N	N	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	N	No reasonable impact pathways.
2 - supports vulnerable, endangered, or critically endangered species or threatened eco. communities Crit. 2 - supports vulner		N	N	No reasonable impact pathways.
Coedydd Aber SAC	20	N	N	
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Site not vulnerable to effects of construction or operation due to significant location from scheme
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	Feature not vulnerable to effects of construction or operation due to significant location from scheme
Corsydd Llyn/ Lleyn Fens SAC	20	N	N	
Calcareous fens with Cladium mariscus and species of the Caricion davallianae		N	N	No reasonable impact pathways.
Alkaline fens		N	N	No reasonable impact pathways.
Geyer`s whorl snail Vertigo geyeri		N	N	No reasonable impact pathways.
Desmoulin`s whorl snail Vertigo moulinsiana		N	N	No reasonable impact pathways.
Corsydd Môn a Llyn/ Anglesey and Llyn Fens Ramsar	20	N	N	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	N	No reasonable impact pathways.
3 - supports populations of plant/animal species important for maintaining regional biodiversity Crit. 3 - supports populations c		N	N	No reasonable impact pathways.
Corsydd Môn/ Anglesey Fens SAC	20	N	N	
Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.		N	N	No reasonable impact pathways.
Northern Atlantic wet heaths with Erica tetralix		N	N	No reasonable impact pathways.
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	No reasonable impact pathways.
Calcareous fens with Cladium mariscus and species of the Caricion davallianae		N	N	No reasonable impact pathways.
Alkaline fens		N	N	No reasonable impact pathways.
Geyer`s whorl snail Vertigo geyeri		N	N	No reasonable impact pathways.
Southern damselfly Coenagrion mercuriale		N	N	No reasonable impact pathways.
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	No reasonable impact pathways.
Rhinog SAC	20	N	N	

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanoju		N	N	Site not vulnerable to effects of construction or operation due to significant location from scheme
Northern Atlantic wet heaths with Erica tetralix		N	N	Site not vulnerable to effects of construction or operation due to significant location from scheme
European dry heaths		N	N	Site not vulnerable to effects of construction or operation due to significant location from scheme
Alpine and Boreal heaths		N	N	Site not vulnerable to effects of construction or operation due to significant location from scheme
Blanket bogs (* if active bog)		N	N	Site not vulnerable to effects of construction or operation due to significant location from scheme
Depressions on peat substrates of the Rhynchosporion		N	N	Site not vulnerable to effects of construction or operation due to significant location from scheme
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Site not vulnerable to effects of construction or operation due to significant location from scheme
Floating water-plantain Luronium natans		N	N	Feature not vulnerable to effects of construction or operation due to significant location from scheme
Traeth Lafan/ Lavan Sands, Conway Bay SPA	20	N	N	
Great crested grebe Podiceps cristatus		N	N	No reasonable impact pathways.
Red-breasted merganser Mergus serrator		N	N	No reasonable impact pathways.
Eurasian oystercatcher Haematopus ostralegus		N	N	No reasonable impact pathways.
Eurasian curlew Numenius arquata		N	N	No reasonable impact pathways.
Common redshank Tringa totanus		N	N	No reasonable impact pathways.

NEYM025a

Transfer from Bryn Conwy to Bangor (new pipe between existing distribution mains)

Option Summary

This option would involve laying a new main to connect the existing distribution mains from Bryn Conwy to North Eryri Ynys Mon (NEYM). This will allow NEYM to receive a small transfer of Water from Bryn Cowlyd WTW via Oakwood PS, Craiglwyd SR, Llanfairfechan PS and Llanfairfechan SR.

General Assessment

Approximately 1km of new pipeline is to be installed within roads to connect existing mains. This Scheme is low impact and is a 'network solution'. One European Site is located 2km down stream from the Site which makes it vulnerable to possible outcomes of the construction effects but the options is clearly low impact and all construction effects can be avoided through normal construction best practice.

Recommend Option?

Construction: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive)

Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Eryri/ Snowdonia SAC	2	N	N	
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanoju		N	N	Site not exposed to likely outcomes of option as Site is upstream from works.
Northern Atlantic wet heaths with Erica tetralix		N	N	Site not exposed to likely outcomes of option as Site is upstream from works.
European dry heaths		N	N	Site not exposed to likely outcomes of option as Site is upstream from works.
Alpine and Boreal heaths		N	N	Site not exposed to likely outcomes of option as Site is upstream from works.
Siliceous alpine and boreal grasslands		N	N	Site not exposed to likely outcomes of option as Site is upstream from works.
Alpine and subalpine calcareous grasslands		N	N	Site not exposed to likely outcomes of option as Site is upstream from works.
Species-rich Nardus grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe		N	N	Site not exposed to likely outcomes of option as Site is upstream from works.
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels		N	N	Site not exposed to likely outcomes of option as Site is upstream from works.
Blanket bogs (* if active bog)		N	N	Site not exposed to likely outcomes of option as Site is upstream from works.
Depressions on peat substrates of the Rhynchosporion		N	N	Site not exposed to likely outcomes of option as Site is upstream from works.
Petrifying springs with tufa formation (Cratoneurion)		N	N	Site not exposed to likely outcomes of option as Site is upstream from works.
Alkaline fens		N	N	Site not exposed to likely outcomes of option as Site is upstream from works.
Alpine pioneer formations of the Caricion bicoloris-atrofuscae		N	N	Site not exposed to likely outcomes of option as Site is upstream from works.
Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani)		N	N	Site not exposed to likely outcomes of option as Site is upstream from works.
Calcareous rocky slopes with chasmophytic vegetation		N	N	Site not exposed to likely outcomes of option as Site is upstream from works.
Siliceous rocky slopes with chasmophytic vegetation		N	N	Site not exposed to likely outcomes of option as Site is upstream from works.
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Site not exposed to likely outcomes of option as Site is upstream from works.
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus		N	N	Feature not exposed to likely outcomes of option as Site is upstream from works.
Floating water-plantain Luronium natans		N	N	Feature not exposed to likely outcomes of option as Site is upstream from works.
Traeth Lafan/ Lavan Sands, Conway Bay SPA	2/DS	N	N	
Great crested grebe Podiceps cristatus		N	N	Feature potentially vulnerable to construction, but effects easily avoidable with established measures.
Red-breasted merganser Mergus serrator		N	N	Feature potentially vulnerable to construction, but effects easily avoidable with established measures.
Eurasian oystercatcher Haematopus ostralegus		N	N	Feature potentially vulnerable to construction, but effects easily avoidable with established measures.
Eurasian curlew Numenius arquata		N	N	Feature potentially vulnerable to construction, but effects easily avoidable with established measures.
Common redshank Tringa totanus		N	N	Feature potentially vulnerable to construction, but effects easily avoidable with established measures.
Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC	2/DS	N	N	
Sandbanks which are slightly covered by sea water all the time		N	N	Feature potentially vulnerable to construction, but effects easily avoidable with established measures.
Mudflats and sandflats not covered by seawater at low tide		N	N	Feature potentially vulnerable to construction, but effects easily avoidable with established measures.
Large shallow inlets and bays		N	N	Feature potentially vulnerable to construction, but effects easily avoidable with established measures.
Reefs		N	N	Feature potentially vulnerable to construction, but effects easily avoidable with established measures.
Submerged or partially submerged sea caves		N	N	Feature not vulnerable to anticipated effects of Scheme
Coedydd Aber SAC	4	N	N	
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Site not exposed to likely outcomes of option as Site is upstream from works.
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	Site not exposed to likely outcomes of option as Site is upstream from works.
Anglesey Terns / Morwenoliaid Ynys Môn pSPA	10	N	N	
Sandwich tern Sterna sandvicensis		N	N	Feature unlikely to be effected by construction or operation of scheme due to significant distance. Any potential effects would be avoided by using construction best practice
Roseate tern Sterna dougalli		N	N	Feature unlikely to be effected by construction or operation of scheme due to significant distance. Any potential effects would be avoided by using construction best practice
Common tern Sterna hirundo		N	N	Feature unlikely to be effected by construction or operation of scheme due to significant distance. Any potential effects would be avoided by using construction best practice

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Arctic tern Sterna paradisaea		N	N	Feature unlikely to be effected by construction or operation of scheme due to significant distance. Any potential effects would be avoided by using construction best practice
Liverpool Bay / Bae Lerpwl SPA	10	N	N	
Red-throated diver Gavia stellata		N	N	Feature unlikely to be effected by construction or operation of scheme due to significant distance. Any potential effects would be avoided by using construction best practice
Black (common) scoter Melanitta nigra		N	N	Feature unlikely to be effected by construction or operation of scheme due to significant distance. Any potential effects would be avoided by using construction best practice
Waterfowl assemblage Waterfowl assemblage		N	N	Feature unlikely to be effected by construction or operation of scheme due to significant distance. Any potential effects would be avoided by using construction best practice
Corsydd Môn a Llyn/ Anglesey and Llyn Fens Ramsar	15	N	N	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	N	No reasonable impact pathways.
3 - supports populations of plant/animal species important for maintaining regional biodiversity Crit. 3 - supports populations c		N	N	No reasonable impact pathways.
Corsydd Môn/ Anglesey Fens SAC	15	N	N	
Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.		N	N	No reasonable impact pathways.
Northern Atlantic wet heaths with Erica tetralix		N	N	No reasonable impact pathways.
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	No reasonable impact pathways.
Calcareous fens with Cladium mariscus and species of the Caricion davallianae		N	N	No reasonable impact pathways.
Alkaline fens		N	N	No reasonable impact pathways.
Geyer`s whorl snail Vertigo geyeri		N	N	No reasonable impact pathways.
Southern damselfly Coenagrion mercuriale		N	N	No reasonable impact pathways.
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	No reasonable impact pathways.
Llyn Idwal Ramsar	15	N	N	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	N	No reasonable impact pathways.
2 - supports vulnerable, endangered, or critically endangered species or threatened eco. communities Crit. 2 - supports vulner		N	N	No reasonable impact pathways.
Ynys Seiriol / Puffin Island SPA	15	N	N	
Great cormorant Phalacrocorax carbo		N	N	No reasonable impact pathways.
Afon Gwyrfai a Llyn Cwellyn SAC	20	N	N	
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanoju		N	N	No reasonable impact pathways.
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	No reasonable impact pathways.
Atlantic salmon Salmo salar		N	N	No reasonable impact pathways.
Otter Lutra lutra		N	N	No reasonable impact pathways.
Floating water-plantain Luronium natans		N	N	No reasonable impact pathways.
Coedwigoedd Penrhyn Creuddyn/ Creuddyn Peninsula Woods SAC	20	N	N	
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid site		N	N	No reasonable impact pathways.
Tilio-Acerion forests of slopes, screes and ravines		N	N	No reasonable impact pathways.
Taxus baccata woods of the British Isles		N	N	No reasonable impact pathways.
Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC	20	N	N	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	No reasonable impact pathways.
Northern Atlantic wet heaths with Erica tetralix		N	N	No reasonable impact pathways.
European dry heaths		N	N	No reasonable impact pathways.
Tilio-Acerion forests of slopes, screes and ravines		N	N	No reasonable impact pathways.
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	No reasonable impact pathways.
Bog woodland		N	N	No reasonable impact pathways.
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	No reasonable impact pathways.
Lesser horseshoe bat Rhinolophus hipposideros		N	N	No reasonable impact pathways.
Glannau Môn: Cors heli / Anglesey Coast: Saltmarsh SAC	20	N	N	
Estuaries		N	N	No reasonable impact pathways.
Mudflats and sandflats not covered by seawater at low tide		N	N	No reasonable impact pathways.
Salicornia and other annuals colonizing mud and sand		N	N	No reasonable impact pathways.
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	N	No reasonable impact pathways.
Glynllifon SAC	20	N	N	
Lesser horseshoe bat Rhinolophus hipposideros		N	N	No reasonable impact pathways.
Great Orme`s Head/ Pen y Gogarth SAC	20	N	N	

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
Vegetated sea cliffs of the Atlantic and Baltic Coasts		N	N	No reasonable impact pathways.
European dry heaths		N	N	No reasonable impact pathways.
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)		N	N	No reasonable impact pathways.
Mwyngloddiau Fforest Gwydir/ Gwydyr Forest Mines SAC	20	N	N	
Calaminarian grasslands of the Violetalia calaminariae		N	N	No reasonable impact pathways.
Lesser horseshoe bat Rhinolophus hipposideros		N	N	No reasonable impact pathways.
Y Twyni o Abermenai i Aberffraw/ Abermenai to Aberffraw Dunes SAC	20	N	N	
Embryonic shifting dunes		N	N	No reasonable impact pathways.
Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")		N	N	No reasonable impact pathways.
Fixed coastal dunes with herbaceous vegetation ("grey dunes")		N	N	No reasonable impact pathways.
Dunes with Salix repens ssp. argentea (Salicion arenariae)		N	N	No reasonable impact pathways.
Humid dune slacks		N	N	No reasonable impact pathways.
Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation		N	N	No reasonable impact pathways.
Petalwort Petalophyllum ralfsii		N	N	No reasonable impact pathways.
Shore dock Rumex rupestris		N	N	No reasonable impact pathways.

NEYM025b

Transfer from Bryn Conwy to Bangor (new pipe between existing distribution mains with upgrades on smaller diameter mains).

Option Summary

This option would involve laying a new main to connect the existing distribution mains from Bryn Conwy to North Eyri Ynys Mon (NEYM) and upgrading the smaller diameter mains located upstream. This will allow NEYM to receive a small transfer of Water from Cwellyn WTW via Oakwood PS, Craiglwyd SR, Llanfairfechan PS and Llanfairfechan SR.

General Assessment

Approximately 4.5km of new mains pipe is to be installed and another section approximately 0.8km in length is to be upgraded. There are two European Sites 1km downstream from the Scheme and are therefore vulnerable to construction works. Three other European Sites are within close proximity. All anticipated effects on European Sites can be avoided by following construction best practice.

Recommend Option?

Construction: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive)

Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Coedydd Aber SAC	1	N	N	
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Site not exposed to likely outcomes of option due to being upstream from the Scheme
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	Site not exposed to likely outcomes of option due to being upstream from the Scheme
Eryri/ Snowdonia SAC	1	N	N	
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanoju		N	N	Site not exposed to likely outcomes of option due to being upstream from the Scheme
Northern Atlantic wet heaths with Erica tetralix		N	N	Site not exposed to likely outcomes of option due to being upstream from the Scheme
European dry heaths		N	N	Site not exposed to likely outcomes of option due to being upstream from the Scheme
Alpine and Boreal heaths		N	N	Site not exposed to likely outcomes of option due to being upstream from the Scheme
Siliceous alpine and boreal grasslands		N	N	Site not exposed to likely outcomes of option due to being upstream from the Scheme
Alpine and subalpine calcareous grasslands		N	N	Site not exposed to likely outcomes of option due to being upstream from the Scheme
Species-rich Nardus grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe		N	N	Site not exposed to likely outcomes of option due to being upstream from the Scheme
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels		N	N	Site not exposed to likely outcomes of option due to being upstream from the Scheme
Blanket bogs (* if active bog)		N	N	Site not exposed to likely outcomes of option due to being upstream from the Scheme
Depressions on peat substrates of the Rhynchosporion		N	N	Site not exposed to likely outcomes of option due to being upstream from the Scheme
Petrifying springs with tufa formation (Cratoneurion)		N	N	Site not exposed to likely outcomes of option due to being upstream from the Scheme
Alkaline fens		N	N	Site not exposed to likely outcomes of option due to being upstream from the Scheme
Alpine pioneer formations of the Caricion bicoloris-atrofuscae		N	N	Site not exposed to likely outcomes of option due to being upstream from the Scheme
Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani)		N	N	Site not exposed to likely outcomes of option due to being upstream from the Scheme
Calcareous rocky slopes with chasmophytic vegetation		N	N	Site not exposed to likely outcomes of option due to being upstream from the Scheme
Siliceous rocky slopes with chasmophytic vegetation		N	N	Site not exposed to likely outcomes of option due to being upstream from the Scheme
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Site not exposed to likely outcomes of option due to being upstream from the Scheme
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus		N	N	Feature not exposed to likely outcomes of option due to being upstream from the Scheme
Floating water-plantain Luronium natans		N	N	Feature not exposed to likely outcomes of option due to being upstream from the Scheme
Traeth Lafan/ Lavan Sands, Conway Bay SPA	1/DS	N	N	
Great crested grebe Podiceps cristatus		N	N	Feature potentially exposed to construction effects. The effects are avoidable by ensuring construction best practice
Red-breasted merganser Mergus serrator		N	N	Feature potentially exposed to construction effects. The effects are avoidable by ensuring construction best practice
Eurasian oystercatcher Haematopus ostralegus		N	N	Feature potentially exposed to construction effects. The effects are avoidable by ensuring construction best practice
Eurasian curlew Numenius arquata		N	N	Feature potentially exposed to construction effects. The effects are avoidable by ensuring construction best practice
Common redshank Tringa totanus		N	N	Feature potentially exposed to construction effects. The effects are avoidable by ensuring construction best practice
Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC	1/DS	N	N	
Sandbanks which are slightly covered by sea water all the time		N	N	Site potentially exposed to construction effects. The effects are avoidable by ensuring construction best practice
Mudflats and sandflats not covered by seawater at low tide		N	N	Site potentially exposed to construction effects. The effects are avoidable by ensuring construction best practice
Large shallow inlets and bays		N	N	Site potentially exposed to construction effects. The effects are avoidable by ensuring construction best practice
Reefs		N	N	Site potentially exposed to construction effects. The effects are avoidable by ensuring construction best practice
Submerged or partially submerged sea caves		N	N	Site not vulnerable to anticipated effects of works.
Liverpool Bay / Bae Lerpwl SPA	2	N	N	
Red-throated diver Gavia stellata		N	N	Feature potentially exposed to construction effects. The effects are avoidable by ensuring construction best practice
Black (common) scoter Melanitta nigra		N	N	Feature potentially exposed to construction effects. The effects are avoidable by ensuring construction best practice
Waterfowl assemblage Waterfowl assemblage		N	N	Feature potentially exposed to construction effects. The effects are avoidable by ensuring construction best practice
Anglesey Terns / Morwenoliaid Ynys Môn pSPA	10	N	N	
Sandwich tern Sterna sandvicensis		N	N	Feature unlikely to be exponse to effects of construction or operation of the Scheme due to distance away
Roseate tern Sterna dougalli		N	N	Feature unlikely to be exponse to effects of construction or operation of the Scheme due to distance away

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Common tern Sterna hirundo		N	N	Feature unlikely to be exponse to effects of construction or operation of the Scheme due to distance away
Arctic tern Sterna paradisaea		N	N	Feature unlikely to be exponse to effects of construction or operation of the Scheme due to distance away
Ynys Seiriol / Puffin Island SPA	10	N	N	
Great cormorant Phalacrocorax carbo		N	N	Feature unlikely to be exponse to effects of construction or operation of the Scheme due to distance away
Coedwigoedd Penrhyn Creuddyn/ Creuddyn Peninsula Woods SAC	15	N	N	
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid site		N	N	Site not exposed to likely outcomes of option due distance and geographical separation
Tilio-Acerion forests of slopes, screes and ravines		N	N	Site not exposed to likely outcomes of option due distance and geographical separation
Taxus baccata woods of the British Isles		N	N	Site not exposed to likely outcomes of option due distance and geographical separation
Corsydd Môn a Llyn/ Anglesey and Llyn Fens Ramsar	15	N	N	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	N	Site not exposed to likely outcomes of option due distance and geographical separation
3 - supports populations of plant/animal species important for maintaining regional biodiversity Crit. 3 - supports populations c		N	N	Site not exposed to likely outcomes of option due distance and geographical separation
Corsydd Môn/ Anglesey Fens SAC	15	N	N	
Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.		N	N	Site not exposed to likely outcomes of option due distance and geographical separation
Northern Atlantic wet heaths with Erica tetralix		N	N	Site not exposed to likely outcomes of option due distance and geographical separation
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	Site not exposed to likely outcomes of option due distance and geographical separation
Calcareous fens with Cladium mariscus and species of the Caricion davallianae		N	N	Site not exposed to likely outcomes of option due distance and geographical separation
Alkaline fens		N	N	Site not exposed to likely outcomes of option due distance and geographical separation
Geyer`s whorl snail Vertigo geyeri		N	N	Feature not exposed to likely outcomes of option due distance and geographical separation
Southern damselfly Coenagrion mercuriale		N	N	Feature not exposed to likely outcomes of option due distance and geographical separation
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	Feature not exposed to likely outcomes of option due distance and geographical separation
Great Orme`s Head/ Pen y Gogarth SAC	15	N	N	
Vegetated sea cliffs of the Atlantic and Baltic Coasts		N	N	Feature unlikely to be effected by operational or construction effects due to distance from the Scheme
European dry heaths		N	N	Feature unlikely to be effected by operational or construction effects due to distance from the Scheme
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)		N	N	Feature unlikely to be effected by operational or construction effects due to distance from the Scheme
Llyn Idwal Ramsar	15	N	N	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	N	Site unlikely to be effected by operational or construction effects due to distance from the Scheme and loaction fo Site upstream
2 - supports vulnerable, endangered, or critically endangered species or threatened eco. communities Crit. 2 - supports vulner		N	N	Feature unlikely to be effected by operational or construction effects due to distance from the Scheme and loaction fo Site upstream
Mwyngloddiau Fforest Gwydir/ Gwydyr Forest Mines SAC	15	N	N	
Calaminarian grasslands of the Violetalia calaminariae		N	N	Site unlikely to be effected by operational or construction effects due to distance from the Scheme and loaction fo Site upstream
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Feature unlikely to be effected by operational or construction effects due to distance from the Scheme and loaction fo Site upstream
Afon Gwyrfai a Llyn Cwellyn SAC	20	N	N	
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanoju		N	N	Site unlikely to be effected by operational or construction effects due to distance from the Scheme
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	Site unlikely to be effected by operational or construction effects due to distance from the Scheme
Atlantic salmon Salmo salar		N	N	Site unlikely to be effected by operational or construction effects due to distance from the Scheme
Otter Lutra lutra		N	N	Site unlikely to be effected by operational or construction effects due to distance from the Scheme
Floating water-plantain Luronium natans		N	N	Site unlikely to be effected by operational or construction effects due to distance from the Scheme
Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC	20	N	N	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	Site unlikely to be effected by operational or construction effects due to distance from the Scheme
Northern Atlantic wet heaths with Erica tetralix		N	N	Site unlikely to be effected by operational or construction effects due to distance from the Scheme
European dry heaths		N	N	Site unlikely to be effected by operational or construction effects due to distance from the Scheme
Tilio-Acerion forests of slopes, screes and ravines		N	N	Site unlikely to be effected by operational or construction effects due to distance from the Scheme
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Site unlikely to be effected by operational or construction effects due to distance from the Scheme
Bog woodland		N	N	Site unlikely to be effected by operational or construction effects due to distance from the Scheme
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	Site unlikely to be effected by operational or construction effects due to distance from the Scheme
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Site unlikely to be effected by operational or construction effects due to distance from the Scheme
Glannau Môn: Cors heli / Anglesey Coast: Saltmarsh SAC	20	N	N	
Estuaries		N	N	Site unlikely to be effected by operational or construction effects due to distance from the Scheme
Mudflats and sandflats not covered by seawater at low tide		N	N	Site unlikely to be effected by operational or construction effects due to distance from the Scheme
Salicornia and other annuals colonizing mud and sand		N	N	Site unlikely to be effected by operational or construction effects due to distance from the Scheme

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	N	Site unlikely to be effected by operational or construction effects due to distance from the Scheme
Glynllifon SAC	20	N	N	
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Site unlikely to be effected by operational or construction effects due to distance from the Scheme
Y Twyni o Abermenai i Aberffraw/ Abermenai to Aberffraw Dunes SAC	20	N	N	
Embryonic shifting dunes		N	N	Site unlikely to be effected by operational or construction effects due to distance from the Scheme
Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")		N	N	Site unlikely to be effected by operational or construction effects due to distance from the Scheme
Fixed coastal dunes with herbaceous vegetation ("grey dunes")		N	N	Site unlikely to be effected by operational or construction effects due to distance from the Scheme
Dunes with Salix repens ssp. argentea (Salicion arenariae)		N	N	Site unlikely to be effected by operational or construction effects due to distance from the Scheme
Humid dune slacks		N	N	Site unlikely to be effected by operational or construction effects due to distance from the Scheme
Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation		N	N	Site unlikely to be effected by operational or construction effects due to distance from the Scheme
Petalwort Petalophyllum ralfsii		N	N	Site unlikely to be effected by operational or construction effects due to distance from the Scheme
Shore dock Rumex rupestris		N	N	Site unlikely to be effected by operational or construction effects due to distance from the Scheme

NEYM025c

Transfer from Bryn Conwy to Bangor (new larger diameter dedicated transfer main - retaining the existing distribution mains).

Option Summary

This option would involve laying a new dedicated transfer main connecting the 250mm trunk main downstream of Craigllwyd SR to Bryniau SR within Bangor. This will allow NEYM to receive a transfer of Water from Bryn Cowlyd WTW via Oakwood PS and Craigllwyd SR. It is also proposed to tie the new main into the existing 250mm which supplies Bryniau SR from Mynydd Llandegai WTW as this would allow the new main to supply from West to East and would provide resiliance to the area currently supplied from Craigllwyd SR. In addition to the new main there are also upgrades required to the Oakwood PS and the existing mains around Oakwood PS.

General Assessment

A new trunk main would be required to transfer water from the trunk main at Craigllwyd SR to Bryniau in Bangor. As currently mapped the new trunk main crosses Coedydd Aber SAC at Pen-y-bryn on the northern edge of the SAC. The width of the SAC is approximately 20m across at this point. Diverting the mains pipe beyond the boundary to the north would reduce / avoided the effects significantly. The new trunk main also borders Coedydd Aber SAC in two others along the northern edge of the SAC. It is likely that significant effects can be avoided with appropriate standoff distances and the route should be amended to avoid the SAC. All other potential effects on European Sites can be avoided by following construction best practice.

Recommend Option?

Construction: Uncertain - significant effects cannot be excluded and may require the identification of bespoke mitigation measures or amendments to scheme design at the plan level

Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Coedydd Aber SAC	0	Y	N	
Old sessile oak woods with Ilex and Blechnum in the British Isles		Y	N	Site vulnerable to construction works in three locations along the northern edge. Mains pipieline intersects Site in one location and borders in two others. Impacts of water main installation will be tree removal and disturbance. Effects avoidable if mains pipe diverted along A55 edge.
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		Y	N	Site vulnerable to construction works in three locations along the northern edge. Mains pipieline intersects Site in one location and borders in two others. Impacts of water main installation will be tree removal and disturbance. Effects avoidable if mains pipe diverted along A55 edge.
Eryri/ Snowdonia SAC	I	N	N	
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanoju		N	N	Site not exposed to likely outcomes of option due to location upstream from works.
Northern Atlantic wet heaths with Erica tetralix		N	N	Site not exposed to likely outcomes of option due to location upstream from works.
European dry heaths		N	N	Site not exposed to likely outcomes of option due to location upstream from works.
Alpine and Boreal heaths		N	N	Site not exposed to likely outcomes of option due to location upstream from works.
Siliceous alpine and boreal grasslands		N	N	Site not exposed to likely outcomes of option due to location upstream from works.
Alpine and subalpine calcareous grasslands		N	N	Site not exposed to likely outcomes of option due to location upstream from works.
Species-rich Nardus grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe		N	N	Site not exposed to likely outcomes of option due to location upstream from works.
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels		N	N	Site not exposed to likely outcomes of option due to location upstream from works.
Blanket bogs (* if active bog)		N	N	Site not exposed to likely outcomes of option due to location upstream from works.
Depressions on peat substrates of the Rhynchosporion		N	N	Site not exposed to likely outcomes of option due to location upstream from works.
Petrifying springs with tufa formation (Cratoneurion)		N	N	Site not exposed to likely outcomes of option due to location upstream from works.
Alkaline fens		N	N	Site not exposed to likely outcomes of option due to location upstream from works.
Alpine pioneer formations of the Caricion bicoloris-atrofuscae		N	N	Site not exposed to likely outcomes of option due to location upstream from works.
Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani)		N	N	Site not exposed to likely outcomes of option due to location upstream from works.
Calcareous rocky slopes with chasmophytic vegetation		N	N	Site not exposed to likely outcomes of option due to location upstream from works.
Siliceous rocky slopes with chasmophytic vegetation		N	N	Site not exposed to likely outcomes of option due to location upstream from works.
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Site not exposed to likely outcomes of option due to location upstream from works.
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus		N	N	Feature not exposed to likely outcomes of option due to location upstream from works.
Floating water-plantain Luronium natans		N	N	Feature not exposed to likely outcomes of option due to location upstream from works.
Liverpool Bay / Bae Lerpwl SPA	I/DS	N	N	
Red-throated diver Gavia stellata		N	N	Feature potentially vulnerable to both new pipeline construction and the upgrade works. Potential effects can be avoided using construction best practice.
Black (common) scoter Melanitta nigra		N	N	Feature potentially vulnerable to both new pipeline construction and the upgrade works. Potential effects can be avoided using construction best practice.
Waterfowl assemblage Waterfowl assemblage		N	N	Feature potentially vulnerable to both new pipeline construction and the upgrade works. Potential effects can be avoided using construction best practice.
Traeth Lafan/ Lavan Sands, Conway Bay SPA	I/DS	N	N	
Great crested grebe Podiceps cristatus		N	N	Feature potentially vulnerable to both new pipeline construction and the upgrade works. Potential effects can be avoided using construction best practice.
Red-breasted merganser Mergus serrator		N	N	Feature potentially vulnerable to both new pipeline construction and the upgrade works. Potential effects can be avoided using construction best practice.

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Eurasian oystercatcher Haematopus ostralegus		N	N	Feature potentially vulnerable to both new pipeline construction and the upgrade works. Potential effects can be avoided using construction best practice.
Eurasian curlew Numenius arquata		N	N	Feature potentially vulnerable to both new pipeline construction and the upgrade works. Potential effects can be avoided using construction best practice.
Common redshank Tringa totanus		N	N	Feature potentially vulnerable to both new pipeline construction and the upgrade works. Potential effects can be avoided using construction best practice.
Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC	1/DS	N	N	
Sandbanks which are slightly covered by sea water all the time		N	N	Feature potentially vulnerable to both new pipeline construction and the upgrade works. Potential effects can be avoided using construction best practice.
Mudflats and sandflats not covered by seawater at low tide		N	N	Feature potentially vulnerable to both new pipeline construction and the upgrade works. Potential effects can be avoided using construction best practice.
Large shallow inlets and bays		N	N	Feature potentially vulnerable to both new pipeline construction and the upgrade works. Potential effects can be avoided using construction best practice.
Reefs		N	N	Feature potentially vulnerable to both new pipeline construction and the upgrade works. Potential effects can be avoided using construction best practice.
Submerged or partially submerged sea caves		N	N	Feature not sensitive to likely outcomes of option
Coedwigoedd Penrhyn Creuddyn/ Creuddyn Peninsula Woods SAC	4	N	N	
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid site		N	N	Site not exposed to likely outcomes of option due to location upstream from works and geographical separation
Tilio-Acerion forests of slopes, screes and ravines		N	N	Site not exposed to likely outcomes of option due to location upstream from works and geographical separation
Taxus baccata woods of the British Isles		N	N	Site not exposed to likely outcomes of option due to location upstream from works and geographical separation
Anglesey Terns / Morwenoliaid Ynys Môn pSPA	10	N	N	
Sandwich tern Sterna sandvicensis		N	N	No reasonable impact pathways.
Roseate tern Sterna dougalli		N	N	No reasonable impact pathways.
Common tern Sterna hirundo		N	N	No reasonable impact pathways.
Arctic tern Sterna paradisaea		N	N	No reasonable impact pathways.
Corsydd Môn a Llyn/ Anglesey and Llyn Fens Ramsar	10	N	N	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	N	No reasonable impact pathways.
3 - supports populations of plant/animal species important for maintaining regional biodiversity Crit. 3 - supports populations c		N	N	No reasonable impact pathways.
Corsydd Môn/ Anglesey Fens SAC	10	N	N	
Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.		N	N	No reasonable impact pathways.
Northern Atlantic wet heaths with Erica tetralix		N	N	No reasonable impact pathways.
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	No reasonable impact pathways.
Calcareous fens with Cladium mariscus and species of the Caricion davallianae		N	N	No reasonable impact pathways.
Alkaline fens		N	N	No reasonable impact pathways.
Geyer`s whorl snail Vertigo geyeri		N	N	No reasonable impact pathways.
Southern damselfly Coenagrion mercuriale		N	N	No reasonable impact pathways.
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	No reasonable impact pathways.
Great Orme`s Head/ Pen y Gogarth SAC	10	N	N	
Vegetated sea cliffs of the Atlantic and Baltic Coasts		N	N	No reasonable impact pathways.
European dry heaths		N	N	No reasonable impact pathways.
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)		N	N	No reasonable impact pathways.
Ynys Seiriol / Puffin Island SPA	10	N	N	
Great cormorant Phalacrocorax carbo		N	N	No reasonable impact pathways.
Afon Gwyrfai a Llyn Cwellyn SAC	15	N	N	
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanoju		N	N	No reasonable impact pathways.
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	No reasonable impact pathways.
Atlantic salmon Salmo salar		N	N	No reasonable impact pathways.
Otter Lutra lutra		N	N	Unlikely to be affected due to distance
Floating water-plantain Luronium natans		N	N	No reasonable impact pathways.
Llyn Idwal Ramsar	15	N	N	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	N	No reasonable impact pathways.
2 - supports vulnerable, endangered, or critically endangered species or threatened eco. communities Crit. 2 - supports vulner		N	N	No reasonable impact pathways.
Mwyngloddiau Fforest Gwydir/ Gwydyr Forest Mines SAC	15	N	N	

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
Calaminarian grasslands of the Violetalia calaminariae		N	N	No reasonable impact pathways.
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Unlikely to be affected due to distance
Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC	20	N	N	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	No reasonable impact pathways.
Northern Atlantic wet heaths with Erica tetralix		N	N	No reasonable impact pathways.
European dry heaths		N	N	No reasonable impact pathways.
Tilio-Acerion forests of slopes, screes and ravines		N	N	No reasonable impact pathways.
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	No reasonable impact pathways.
Bog woodland		N	N	No reasonable impact pathways.
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	No reasonable impact pathways.
Lesser horseshoe bat Rhinolophus hipposideros		N	N	No reasonable impact pathways.
Glannau Môn: Cors heli / Anglesey Coast: Saltmarsh SAC	20	N	N	
Estuaries		N	N	No reasonable impact pathways.
Mudflats and sandflats not covered by seawater at low tide		N	N	No reasonable impact pathways.
Salicornia and other annuals colonizing mud and sand		N	N	No reasonable impact pathways.
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	N	No reasonable impact pathways.
Glan-traeth SAC	20	N	N	
Great crested newt Triturus cristatus		N	N	No reasonable impact pathways.
Glynllifon SAC	20	N	N	
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Unlikely to be affected due to distance
North Anglesey Marine / Gogledd Môn Forol cSAC	20	N	N	
Harbour porpoise Phocoena phocoena		N	N	No reasonable impact pathways.
Y Twyni o Abermenai i Aberffraw/ Abermenai to Aberffraw Dunes SAC	20	N	N	
Embryonic shifting dunes		N	N	No reasonable impact pathways.
Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")		N	N	No reasonable impact pathways.
Fixed coastal dunes with herbaceous vegetation ("grey dunes")		N	N	No reasonable impact pathways.
Dunes with Salix repens ssp. argentea (Salicion arenariae)		N	N	No reasonable impact pathways.
Humid dune slacks		N	N	No reasonable impact pathways.
Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation		N	N	No reasonable impact pathways.
Petalwort Petalophyllum ralfsii		N	N	No reasonable impact pathways.
Shore dock Rumex rupestris		N	N	No reasonable impact pathways.

NEYM026

Marchlyn Bach reservoir - resolve leakage and reinstate reservoir capacity to the original top water level.

Option Summary

The Marchlyn Bach reservoir is currently held ~1.5m below TWL to reduce seepage around the abutments. This scheme would undertake drill and grout operations to improve the hydraulic cut-off beneath and around the dam to enable the reservoir to be returned to its design TWL.

General Assessment

Marchlyn Bach reservoir is within the Eryri/ Snowdonia SAC, and so features within this site may be vulnerable to construction works. However, most if not all of the works will be restricted to existing operational structures / features (embankments, access tracks, etc.) which are very unlikely to support the features of the SAC. The scheme will require appropriate assessement but the effects are likely to be minimal and / or avoidable at the scheme level. All other potential effects can be avoided with established

Recommend Option?

Construction: Uncertain - significant effects cannot be excluded and may require the identification of bespoke mitigation measures or amendments to scheme design at the plan level

Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Eryri/ Snowdonia SAC	0	Y	N	
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanoju		N	N	Feature not present at this location in site
Northern Atlantic wet heaths with Erica tetralix		Y	N	Feature may be vulnerable if present, but works likely to be limited to existing structures; effects avoidable with established measures.
European dry heaths		Y	N	Feature may be vulnerable if present, but works likely to be limited to existing structures; effects avoidable with established measures.
Alpine and Boreal heaths		Y	N	Feature may be vulnerable if present, but works likely to be limited to existing structures; effects avoidable with established measures.
Siliceous alpine and boreal grasslands		Y	N	Feature may be vulnerable if present, but works likely to be limited to existing structures; effects avoidable with established measures.
Alpine and subalpine calcareous grasslands		Y	N	Feature may be vulnerable if present, but works likely to be limited to existing structures; effects avoidable with established measures.
Species-rich Nardus grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe		Y	N	Feature may be vulnerable if present, but works likely to be limited to existing structures; effects avoidable with established measures.
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels		Y	N	Feature may be vulnerable if present, but works likely to be limited to existing structures; effects avoidable with established measures.
Blanket bogs (* if active bog)		Y	N	Feature may be vulnerable if present, but works likely to be limited to existing structures; effects avoidable with established measures.
Depressions on peat substrates of the Rhynchosporion		Y	N	Feature may be vulnerable if present, but works likely to be limited to existing structures; effects avoidable with established measures.
Petrifying springs with tufa formation (Cratoneurion)		Y	N	Feature may be vulnerable if present, but works likely to be limited to existing structures; effects avoidable with established measures.
Alkaline fens		Y	N	Feature may be vulnerable if present, but works likely to be limited to existing structures; effects avoidable with established measures.
Alpine pioneer formations of the Caricion bicoloris-atrofuscae		Y	N	Feature may be vulnerable if present, but works likely to be limited to existing structures; effects avoidable with established measures.
Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani)		Y	N	Feature may be vulnerable if present, but works likely to be limited to existing structures; effects avoidable with established measures.
Calcareous rocky slopes with chasmophytic vegetation		Y	N	Feature may be vulnerable if present, but works likely to be limited to existing structures; effects avoidable with established measures.
Siliceous rocky slopes with chasmophytic vegetation		Y	N	Feature may be vulnerable if present, but works likely to be limited to existing structures; effects avoidable with established measures.
Old sessile oak woods with Ilex and Blechnum in the British Isles		Y	N	Feature not present at this location in site
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus		Y	N	Feature may be vulnerable if present, but works likely to be limited to existing structures; effects avoidable with established measures.
Floating water-plantain Luronium natans		N	N	Feature not present at this location in site
Llyn Idwal Ramsar	5	N	N	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	N	No reasonable impact pathway (separate catchment)
2 - supports vulnerable, endangered, or critically endangered species or threatened eco. communities Crit. 2 - supports vulner		N	N	No reasonable impact pathway (separate catchment)
Afon Gwyrfai a Llyn Cwellyn SAC	10	N	N	
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanoju		N	N	No reasonable impact pathway (separate catchment)
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	No reasonable impact pathway (separate catchment)

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
Atlantic salmon Salmo salar		N	N	No reasonable impact pathway (separate catchment)
Otter Lutra lutra		N	N	Theoretical risk of construction effects but avoidable with established measures
Floating water-plantain Luronium natans		N	N	No reasonable impact pathway (separate catchment)
Coedydd Aber SAC	10	N	N	
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	No reasonable impact pathway
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	No reasonable impact pathway
Traeth Lafan/ Lavan Sands, Conway Bay SPA	10	N	N	
Great crested grebe Podiceps cristatus		N	N	No reasonable impact pathway
Red-breasted merganser Mergus serrator		N	N	No reasonable impact pathway
Eurasian oystercatcher Haematopus ostralegus		N	N	No reasonable impact pathway
Eurasian curlew Numenius arquata		N	N	No reasonable impact pathway
Common redshank Tringa totanus		N	N	No reasonable impact pathway
Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC	10/DS	N	N	
Sandbanks which are slightly covered by sea water all the time		N	N	Theoretical risk of construction effects but avoidable with established measures
Mudflats and sandflats not covered by seawater at low tide		N	N	Theoretical risk of construction effects but avoidable with established measures
Large shallow inlets and bays		N	N	Theoretical risk of construction effects but avoidable with established measures
Reefs		N	N	Theoretical risk of construction effects but avoidable with established measures
Submerged or partially submerged sea caves		N	N	Theoretical risk of construction effects but avoidable with established measures
Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC	15	N	N	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	No reasonable impact pathway
Northern Atlantic wet heaths with Erica tetralix		N	N	No reasonable impact pathway
European dry heaths		N	N	No reasonable impact pathway
Tilio-Acerion forests of slopes, screes and ravines		N	N	No reasonable impact pathway
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	No reasonable impact pathway
Bog woodland		N	N	No reasonable impact pathway
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	No reasonable impact pathway
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Feature very unlikely to utilise area of works
Glynllifon SAC	15	N	N	
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Feature very unlikely to utilise area of works
Liverpool Bay / Bae Lerpwl SPA	15	N	N	
Red-throated diver Gavia stellata		N	N	No reasonable impact pathway
Black (common) scoter Melanitta nigra		N	N	No reasonable impact pathway
Waterfowl assemblage Waterfowl assemblage		N	N	No reasonable impact pathway
Anglesey Terns / Morwenoliaid Ynys Môn pSPA	20	N	N	
Sandwich tern Sterna sandvicensis		N	N	No reasonable impact pathway
Roseate tern Sterna dougalli		N	N	No reasonable impact pathway
Common tern Sterna hirundo		N	N	No reasonable impact pathway
Arctic tern Sterna paradisaea		N	N	No reasonable impact pathway
Corsydd Eifionydd SAC	20	N	N	
Transition mires and quaking bogs		N	N	No reasonable impact pathway
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	No reasonable impact pathway
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus		N	N	No reasonable impact pathway
Corsydd Môn a Llyn/ Anglesey and Llyn Fens Ramsar	20	N	N	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	N	No reasonable impact pathway
3 - supports populations of plant/animal species important for maintaining regional biodiversity Crit. 3 - supports populations c		N	N	No reasonable impact pathway
Corsydd Môn/ Anglesey Fens SAC	20	N	N	
Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.		N	N	No reasonable impact pathway
Northern Atlantic wet heaths with Erica tetralix		N	N	No reasonable impact pathway
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	No reasonable impact pathway
Calcareous fens with Cladium mariscus and species of the Caricion davallianae		N	N	No reasonable impact pathway
Alkaline fens		N	N	No reasonable impact pathway
Geyer`s whorl snail Vertigo geyeri		N	N	No reasonable impact pathway
Southern damselfly Coenagrion mercuriale		N	N	No reasonable impact pathway

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	No reasonable impact pathway
Glannau Môn: Cors heli / Anglesey Coast: Saltmarsh SAC	20	N	N	
Estuaries		N	N	No reasonable impact pathway
Mudflats and sandflats not covered by seawater at low tide		N	N	No reasonable impact pathway
Salicornia and other annuals colonizing mud and sand		N	N	No reasonable impact pathway
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	N	No reasonable impact pathway
Glan-traeth SAC	20	N	N	
Great crested newt Triturus cristatus		N	N	No reasonable impact pathway
Mwyngloddiau Fforest Gwydir/ Gwydyr Forest Mines SAC	20	N	N	
Calaminarian grasslands of the Violetalia calaminariae		N	N	No reasonable impact pathway
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Feature very unlikely to utilise area of works
Y Twyni o Abermenai i Aberffraw/ Abermenai to Aberffraw Dunes SAC	20	N	N	
Embryonic shifting dunes		N	N	No reasonable impact pathway
Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")		N	N	No reasonable impact pathway
Fixed coastal dunes with herbaceous vegetation ("grey dunes")		N	N	No reasonable impact pathway
Dunes with Salix repens ssp. argentea (Salicion arenariae)		N	N	No reasonable impact pathway
Humid dune slacks		N	N	No reasonable impact pathway
Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation		N	N	No reasonable impact pathway
Petalwort Petalophyllum ralfsii		N	N	No reasonable impact pathway
Shore dock Rumex rupestris		N	N	No reasonable impact pathway
Ynys Seiriol / Puffin Island SPA	20	N	N	
Great cormorant Phalacrocorax carbo		N	N	No reasonable impact pathway

PEM001

Re-instate Milton source for industrial customers (non potable)

Option Summary

Industrial users are supplied with raw water from Eastern Cleddau. Raw water from existing Milton source can be used to supplement the water from Eastern Cleddau freeing up some of this supply to be used elsewhere. 500m of pipework will be required to connect the milton supply to the existing raw water main. A new borehole will be required at Milton

General Assessment

This option was previously assessed as a preferred option in the 2011 WRMP, and it was concluded that the scheme was unlikely to have any significant adverse effect. The most vulnerable sites are the Pembrokeshire Marine / Sir Benfro Forol SAC and the Pembrokeshire Bat Sites and Bosherston Lakes/ Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston SAC. The closest features of the Pembrokeshire Marine / Sir Benfro Forol SAC are Estuaries; Mudflats and Sandflats; and Atlantic Salt Meadows, which are all present within Radford Pill (the estuary inlet closest to Milton). There is no data available on the current condition of these features within the Radford Pill, although the SSSI data for this area does not suggest that the current abstraction regime is negatively affecting any of the shared (i.e. SAC) interest features. As the abstraction is within the parameters of the existing licenced usage, which is not subject to sustainability reductions, the operational effects are not considered to be significant. With regard to the Pembrokeshire Bat Sites and Bosherston Lakes SAC, the construction work would be required close to known roost sites, although any construction effects can be avoided with normal project planning and best practice measures.

Recommend Option?

Construction: Uncertain - significant effects cannot be excluded and may require the identification of bespoke mitigation measures or amendments to scheme design at the plan level

Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Pembrokeshire Bat Sites and Bosherston Lakes/ Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston S	1	N	N	
Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.		N	N	The section of this designated Site which is designated for this feature is a significant distance from the Scheme
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Feature potentially vulnerable to effects if foraging pathways are impacted by construction. Scheme-specific detailed design would be necessary to avoid effects.
Greater horseshoe bat Rhinolophus ferrumequinum		N	N	Feature potentially vulnerable to effects if foraging pathways are impacted by construction. Scheme-specific detailed design would be necessary to avoid effects.
Otter Lutra lutra		N	N	Feature associated with the southern portion of the designated Site but may range across construction area; effects avoidable with standard measures.
Pembrokeshire Marine/ Sir Benfro Forol SAC	1/DS	U	U	
Sandbanks which are slightly covered by sea water all the time		U	U	Site potentially exposed to effects of construction (effects avoidable with standard measures). Borehole abstraction is unlikely to have any direct effects on this Site (existing licence).
Estuaries		U	U	Site potentially exposed to effects of construction (effects avoidable with standard measures). Borehole abstraction is unlikely to have any direct effects on this Site (existing licence).
Mudflats and sandflats not covered by seawater at low tide		U	U	Site potentially exposed to effects of construction (effects avoidable with standard measures). Borehole abstraction is unlikely to have any direct effects on this Site (existing licence).
Coastal lagoons		U	U	Site potentially exposed to effects of construction (effects avoidable with standard measures). Borehole abstraction is unlikely to have any direct effects on this Site (existing licence).
Large shallow inlets and bays		U	U	Site potentially exposed to effects of construction (effects avoidable with standard measures). Borehole abstraction is unlikely to have any direct effects on this Site (existing licence).
Reefs		U	U	Site potentially exposed to effects of construction (effects avoidable with standard measures). Borehole abstraction is unlikely to have any direct effects on this Site (existing licence).
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		U	U	Site potentially exposed to effects of construction (effects avoidable with standard measures). Borehole abstraction is unlikely to have any direct effects on this Site (existing licence).
Submerged or partially submerged sea caves		N	U	Site potentially exposed to effects of construction (effects avoidable with standard measures). Borehole abstraction is unlikely to have any direct effects on this Site (existing licence).
Sea lamprey Petromyzon marinus		U	U	Site potentially exposed to effects of construction (effects avoidable with standard measures). Borehole abstraction is unlikely to have any direct effects on this Site (existing licence).
River lamprey Lampetra fluviatilis		U	U	Site potentially exposed to effects of construction (effects avoidable with standard measures). Borehole abstraction is unlikely to have any direct effects on this Site (existing licence).
Allis shad Alosa alosa		U	U	Site potentially exposed to effects of construction (effects avoidable with standard measures). Borehole abstraction is unlikely to have any direct effects on this Site (existing licence).
Twaite shad Alosa fallax		U	U	Site potentially exposed to effects of construction (effects avoidable with standard measures). Borehole abstraction is unlikely to have any direct effects on this Site (existing licence).
Otter Lutra lutra		U	U	Site potentially exposed to effects of construction (effects avoidable with standard measures). Borehole abstraction is unlikely to have any direct effects on this Site (existing licence).
Grey seal Halichoerus grypus		U	U	Site potentially exposed to effects of construction (effects avoidable with standard measures). Borehole abstraction is unlikely to have any direct effects on this Site (existing licence).
Shore dock Rumex rupestris		U	U	Feature not exposed to scheme.
Castlemartin Coast SPA	3	N	N	

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Red-billed chough Pyrrhocorax pyrrhocorax		N	N	The Site is not liked to the Scheme by an impact pathway and the features of interest are unlikely to be vulnerable to the effects; no significant effects would be anticipated assuming normal measures.
Limestone Coast of South West Wales/ Arfordir Calchfaen de Orllewin Cymru SAC	3	U	N	
Vegetated sea cliffs of the Atlantic and Baltic Coasts		N	N	The Site is not liked to the Scheme by an impact pathway and the features of interest are unlikely to be vulnerable to the effects; no significant effects would be anticipated assuming normal measures.
Fixed coastal dunes with herbaceous vegetation ("grey dunes")		N	N	The Site is not liked to the Scheme by an impact pathway and the features of interest are unlikely to be vulnerable to the effects; no significant effects would be anticipated assuming normal measures.
European dry heaths		N	N	The Site is not liked to the Scheme by an impact pathway and the features of interest are unlikely to be vulnerable to the effects; no significant effects would be anticipated assuming normal measures.
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid site		N	N	The Site is not liked to the Scheme by an impact pathway and the features of interest are unlikely to be vulnerable to the effects; no significant effects would be anticipated assuming normal measures.
Caves not open to the public		N	N	The Site is not liked to the Scheme by an impact pathway and the features of interest are unlikely to be vulnerable to the effects; no significant effects would be anticipated assuming normal measures.
Submerged or partially submerged sea caves		N	N	The Site is not liked to the Scheme by an impact pathway and the features of interest are unlikely to be vulnerable to the effects; no significant effects would be anticipated assuming normal measures.
Greater horseshoe bat Rhinolophus ferrumequinum		U	N	Feature potentially vulnerable is commuting and foraging pathways impacted by the Scheme.
Petalwort Petalophyllum ralfsii		N	N	Feature is not liked to the Scheme by an impact pathway and the features of interest are unlikely to be vulnerable to the effects; no significant effects would be anticipated assuming normal measures.
Early gentian Gentianella anglica		N	N	Feature is not liked to the Scheme by an impact pathway and the features of interest are unlikely to be vulnerable to the effects; no significant effects would be anticipated assuming normal measures.
Bristol Channel Approaches / Dynesfeydd Môr Hafren cSAC	4	N	N	
Harbour porpoise Phocoena phocoena		N	N	Feature not vulnerable to likely effects of Scheme
West Wales Marine / Gorllewin Cymru Forol cSAC	5	N	N	
Harbour porpoise Phocoena phocoena		N	N	Feature not vulnerable to likely effects of Scheme
Carmarthen Bay and Estuaries/ Bae Caerfyrddin ac Aberoedd SAC	10	N	N	
Sandbanks which are slightly covered by sea water all the time		N	N	Site located significant distance from Scheme and therefore not vulnerable to any likely effects.
Estuaries		N	N	Site located significant distance from Scheme and therefore not vulnerable to any likely effects.
Mudflats and sandflats not covered by seawater at low tide		N	N	Site located significant distance from Scheme and therefore not vulnerable to any likely effects.
Large shallow inlets and bays		N	N	Site located significant distance from Scheme and therefore not vulnerable to any likely effects.
Salicornia and other annuals colonizing mud and sand		N	N	Site located significant distance from Scheme and therefore not vulnerable to any likely effects.
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	N	Site located significant distance from Scheme and therefore not vulnerable to any likely effects.
Sea lamprey Petromyzon marinus		N	N	Feature located significant distance from Scheme and therefore not vulnerable to any likely effects.
River lamprey Lampetra fluviatilis		N	N	Feature located significant distance from Scheme and therefore not vulnerable to any likely effects.
Allis shad Alosa alosa		N	N	Feature located significant distance from Scheme and therefore not vulnerable to any likely effects.
Twaite shad Alosa fallax		N	N	Feature located significant distance from Scheme and therefore not vulnerable to any likely effects.
Otter Lutra lutra		N	N	Feature located significant distance from Scheme and therefore not vulnerable to any likely effects.
Skomer, Skokholm and the Seas off Pembrokeshire pSPA	10	N	N	
Manx shearwater Puffinus puffinus		N	N	Feature located significant distance from Scheme and therefore not vulnerable to any likely effects.
European storm-petrel Hydrobates pelagicus		N	N	Feature located significant distance from Scheme and therefore not vulnerable to any likely effects.
Lesser black-backed gull Larus fuscus		N	N	Feature located significant distance from Scheme and therefore not vulnerable to any likely effects.
Atlantic puffin Fratercula arctica		N	N	Feature located significant distance from Scheme and therefore not vulnerable to any likely effects.
Seabird assemblage Seabird assemblage		N	N	Feature located significant distance from Scheme and therefore not vulnerable to any likely effects.
Yerbeston Tops SAC	10	N	N	
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	Site located significant distance from Scheme and therefore not vulnerable to any likely effects.
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	Feature located significant distance from Scheme and therefore not vulnerable to any likely effects.
Afonydd Cleddau/ Cleddau Rivers SAC	15	N	N	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	Feature located significant distance from Scheme and therefore not vulnerable to any likely effects.
Active raised bogs		N	N	Feature located significant distance from Scheme and therefore not vulnerable to any likely effects.
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	Feature located significant distance from Scheme and therefore not vulnerable to any likely effects.
Sea lamprey Petromyzon marinus		N	N	Feature located significant distance from Scheme and therefore not vulnerable to any likely effects.
Brook lamprey Lampetra planeri		N	N	Feature located significant distance from Scheme and therefore not vulnerable to any likely effects.
River lamprey Lampetra fluviatilis		N	N	Feature located significant distance from Scheme and therefore not vulnerable to any likely effects.
Bullhead Cottus gobio		N	N	Feature located significant distance from Scheme and therefore not vulnerable to any likely effects.

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
Otter Lutra lutra		N	N	Feature located significant distance from Scheme and therefore not vulnerable to any likely effects.
Bae Caerfyrddin/ Carmarthen Bay SPA	15	N	N	
Black (common) scoter Melanitta nigra		N	N	Feature located significant distance from Scheme and therefore not vulnerable to any likely effects.
Skokholm and Skomer SPA	15	N	N	
Manx shearwater Puffinus puffinus		N	N	Feature located significant distance from Scheme and therefore not vulnerable to any likely effects.
European storm-petrel Hydrobates pelagicus		N	N	Feature located significant distance from Scheme and therefore not vulnerable to any likely effects.
Lesser black-backed gull Larus fuscus		N	N	Feature located significant distance from Scheme and therefore not vulnerable to any likely effects.
Atlantic puffin Fratercula arctica		N	N	Feature located significant distance from Scheme and therefore not vulnerable to any likely effects.
Short-eared owl Asio flammeus		N	N	Feature located significant distance from Scheme and therefore not vulnerable to any likely effects.
Red-billed chough Pyrrhocorax pyrrhocorax		N	N	Feature located significant distance from Scheme and therefore not vulnerable to any likely effects.
Seabird assemblage Seabird assemblage		N	N	Feature located significant distance from Scheme and therefore not vulnerable to any likely effects.

PEM002b

Upgrade zonal infrastructure from Bolton Hill WTW to make use of spare capacity (South Route)

Option Summary

Bolton Hill WTW has an existing maximum capacity of 50 Ml/d. An addional 5 Ml/d of resource can be provided to Bolton Hill from various sources. To realise this additional flow as DO a treatment works extension must be undertaken and various sections of infrastructure will need to be upgraded. The Cleddau Bridge is taken as the constraint on transfer of the additional 5 Ml/d into the southern routes. A model run is required to determine other constraints within the network which may need to be resolved to fully deploy the output.

General Assessment

Scheme-specific detailed design required to avoid effects on greater and lesser horseshoe bats and otter associated with Pembrokeshire Bat Sites and Bosherston Lakes/ Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston SAC and Limestone Coast of South West Wales/ Arfordir Calchfaen de Orllewin Cymru SAC. Scheme-specific detailed design required to avoid significant construction effects to Pembrokeshire Marine/ Sir Benfro Forol SAC due to close proximity causing the Site to be vulnerable.

Recommend Option?

Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures

Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Pembrokeshire Marine/ Sir Benfro Forol SAC	0	U	N	
Sandbanks which are slightly covered by sea water all the time		U	N	Site vulnerable to construction works as bridge under going works crosses Site. Other works also in close proximity. Scheme-specific detailed design is required to avoid significant effects to SAC. Significant operational effects unlikely.
Estuaries		U	N	Site vulnerable to construction works as bridge under going works crosses Site. Other works also in close proximity. Scheme-specific detailed design is required to avoid significant effects to SAC. Significant operational effects deemed
Mudflats and sandflats not covered by seawater at low tide		U	N	Site vulnerable to construction works as bridge under going works crosses Site. Other works also in close proximity. Scheme-specific detailed design is required to avoid significant effects to SAC. Significant operational effects deemed
Coastal lagoons		U	N	Site vulnerable to construction works as bridge under going works crosses Site. Other works also in close proximity. Scheme-specific detailed design is required to avoid significant effects to SAC. Significant operational effects deemed
Large shallow inlets and bays		U	N	Site vulnerable to construction works as bridge under going works crosses Site. Other works also in close proximity. Scheme-specific detailed design is required to avoid significant effects to SAC. Significant operational effects deemed
Reefs		U	N	Site vulnerable to construction works as bridge under going works crosses Site. Other works also in close proximity. Scheme-specific detailed design is required to avoid significant effects to SAC. Significant operational effects deemed
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		U	N	Site vulnerable to construction works as bridge under going works crosses Site. Other works also in close proximity. Scheme-specific detailed design is required to avoid significant effects to SAC. Significant operational effects deemed
Submerged or partially submerged sea caves		N	N	Feature not vulnerable to construction or operational effects
Sea lamprey Petromyzon marinus		U	N	Scheme-specific detailed design and sensitive timings of works are required to avoid significant effects to feature. No operational effects are anticipated due to network solution.
River lamprey Lampetra fluviatilis		U	N	Scheme-specific detailed design and sensitive timings of works are required to avoid significant effects to feature. No operational effects are anticipated due to network solution.
Allis shad Alosa alosa		U	N	Scheme-specific detailed design and sensitive timings of works are required to avoid significant effects to feature. No operational effects are anticipated due to network solution.
Twaite shad Alosa fallax		U	N	Scheme-specific detailed design and sensitive timings of works are required to avoid significant effects to feature. No operational effects are anticipated due to network solution.
Otter Lutra lutra		U	N	Scheme-specific detailed design and sensitive timings of works are required to avoid significant effects to feature. No operational effects are anticipated due to network solution.
Grey seal Halichoerus grypus		U	N	Scheme-specific detailed design and sensitive timings of works are required to avoid significant effects to feature. No operational effects are anticipated due to network solution.
Shore dock Rumex rupestris		U	N	Scheme-specific detailed design and sensitive timings of works are required to avoid significant effects to feature. No operational effects are anticipated due to network solution.
Afonydd Cleddau/ Cleddau Rivers SAC	10	N	U	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	U	No significant construction effects anticipated due to distance fro Scheme and location of Site upstream. Further information on water sources required to determine operational effects. 'Various sources' mentioned in proforma.
Active raised bogs		N	U	No significant construction effects anticipated due to distance fro Scheme and location of Site upstream. Further information on water sources required to determine operational effects. 'Various sources' mentioned in proforma.
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	U	No significant construction effects anticipated due to distance fro Scheme and location of Site upstream. Further information on water sources required to determine operational effects. 'Various sources' mentioned in proforma.
Sea lamprey Petromyzon marinus		N	U	No significant construction effects anticipated due to distance fro Scheme and location of Site upstream. Further information on water sources required to determine operational effects. 'Various sources' mentioned in proforma.
Brook lamprey Lampetra planeri		N	U	No significant construction effects anticipated due to distance fro Scheme and location of Site upstream. Further information on water sources required to determine operational effects. 'Various sources' mentioned in proforma.

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
River lamprey Lampetra fluviatilis		N	U	No significant construction effects anticipated due to distance fro Scheme and location of Site upstream. Further information on water sources required to determine operational effects. 'Various sources' mentioned in proforma.
Bullhead Cottus gobio		N	U	No significant construction effects anticipated due to distance fro Scheme and location of Site upstream. Further information on water sources required to determine operational effects. 'Various sources' mentioned in proforma.
Otter Lutra lutra		N	U	No significant construction effects anticipated due to distance fro Scheme and location of Site upstream. Further information on water sources required to determine operational effects. 'Various sources' mentioned in proforma.
Bristol Channel Approaches / Dynesfeydd Môr Hafren cSAC	10	N	N	
Harbour porpoise Phocoena phocoena		N	N	Construction effects can be avoided with best practice. Feature not vulnerable to operational effects.
Castlemartin Coast SPA	10	N	N	
Red-billed chough Pyrrhocorax pyrrhocorax		N	N	Construction effects can be avoided with best practice. Feature not vulnerable to operational effects.
Limestone Coast of South West Wales/ Arfordir Calchfaen de Orllewin Cymru SAC	10	U	N	
Vegetated sea cliffs of the Atlantic and Baltic Coasts		N	N	No reasonable impact pathways
Fixed coastal dunes with herbaceous vegetation ("grey dunes")		N	N	No reasonable impact pathways
European dry heaths		N	N	No reasonable impact pathways
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid site		N	N	No reasonable impact pathways
Caves not open to the public		N	N	Feature not vulnerable to construction or operational effects
Submerged or partially submerged sea caves		N	N	Feature not vulnerable to construction or operational effects
Greater horseshoe bat Rhinolophus ferrumequinum		U	N	Scheme-specific detailed design and sensitive timings of works are required to avoid significant effects on bat flight pathways. No operational effects are anticipated due to network solution.
Petalwort Petalophyllum ralfsii		N	N	No reasonable impact pathways
Early gentian Gentianella anglica		N	N	No reasonable impact pathways
Pembrokeshire Bat Sites and Bosherston Lakes/ Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston S	10	U	N	
Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.		N	N	Unlikely to be effected by construction or operational effects due to being upstream from Scheme.
Lesser horseshoe bat Rhinolophus hipposideros		U	N	Scheme-specific detailed design and sensitive timings of works are required to avoid significant effects on bat flight pathways. No operational effects are anticipated due to network solution.
Greater horseshoe bat Rhinolophus ferrumequinum		U	N	Scheme-specific detailed design and sensitive timings of works are required to avoid significant effects on bat flight pathways. No operational effects are anticipated due to network solution.
Otter Lutra lutra		U	N	Scheme-specific detailed design and sensitive timings of works are required to avoid significant effects on feature. No operational effects are anticipated due to network solution.
Skomer, Skokholm and the Seas off Pembrokeshire pSPA	10	N	N	
Manx shearwater Puffinus puffinus		N	N	No reasonable impact pathways
European storm-petrel Hydrobates pelagicus		N	N	No reasonable impact pathways
Lesser black-backed gull Larus fuscus		N	N	No reasonable impact pathways
Atlantic puffin Fratercula arctica		N	N	No reasonable impact pathways
Seabird assemblage Seabird assemblage		N	N	No reasonable impact pathways
Yerbeston Tops SAC	10	N	N	
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	No impact pathway.
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	No impact pathway.
West Wales Marine / Gorllewin Cymru Forol cSAC	15	N	N	
Harbour porpoise Phocoena phocoena		N	N	Construction effects can be avoided with best practice. Feature not vulnerable to operational effects.
Bae Caerfyrddin/ Carmarthen Bay SPA	20	N	N	
Black (common) scoter Melanitta nigra		N	N	Construction effects can be avoided with best practice. Feature not vulnerable to operational effects.
Carmarthen Bay and Estuaries/ Bae Caerfyrddin ac Aberoedd SAC	20	N	N	
Sandbanks which are slightly covered by sea water all the time		N	N	Site and scheme not linked by impact pathway,
Estuaries		N	N	Site and scheme not linked by impact pathway,
Mudflats and sandflats not covered by seawater at low tide		N	N	Site and scheme not linked by impact pathway,
Large shallow inlets and bays		N	N	Site and scheme not linked by impact pathway,
Salicornia and other annuals colonizing mud and sand		N	N	Site and scheme not linked by impact pathway,
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	N	Site and scheme not linked by impact pathway,
Sea lamprey Petromyzon marinus		N	N	Site and scheme not linked by impact pathway,
River lamprey Lampetra fluviatilis		N	N	Site and scheme not linked by impact pathway,
Allis shad Alosa alosa		N	N	Site and scheme not linked by impact pathway,
Twaite shad Alosa fallax		N	N	Site and scheme not linked by impact pathway,

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
Otter Lutra lutra		N	N	Site and scheme not linked by impact pathway,
Skokholm and Skomer SPA	20	N	N	
Manx shearwater Puffinus puffinus		N	N	No reasonable impact pathways
European storm-petrel Hydrobates pelagicus		N	N	No reasonable impact pathways
Lesser black-backed gull Larus fuscus		N	N	No reasonable impact pathways
Atlantic puffin Fratercula arctica		N	N	No reasonable impact pathways
Short-eared owl Asio flammeus		N	N	No reasonable impact pathways
Red-billed chough Pyrrhocorax pyrrhocorax		N	N	No reasonable impact pathways
Seabird assemblage Seabird assemblage		N	N	No reasonable impact pathways

PEM003

Dam-raising of Llysyfran

Option Summary

This scheme would raise Llys-y-Fran Reservoir by 5 m to increase storage capacity. DO increases unknown (awaiting DO modelling). This option does not currently address additional pumping and treatment at Presili or elsewhere (Llys-y-Fran is a river regulating reservoir and controls release of water into the river for abstraction elsewhere).

General Assessment

Llys-y-Fran reservoir is directly online with the Cleddau Rivers SAC; the river may be directly or indirectly affected by construction works on the dam (e.g. sediment release etc.), although it may be possible to mitigate this with appropriate construction measures. The future operating parameters for the reservoir are uncertain, but it is likely that the current flow regime will be maintained at least and the additional water should allow greater flexibility in operation, including release of compensation flows. The precise effects cannot be determined without scheme-specific modelling and assessment, but may not be adverse. The dam is thought to act as a barrier to some fish species, and modification may provide an opportunity to reduce the effect through the installation of additional measures. However, the scheme will certainly have significant effects on this site, and may affect some species due to alterations in water temperatures associated with water release from a deeper reservoir. Option is incomplete as pumping station information and DO modelling required.

Recommend Option?

Construction: Uncertain - significant effects cannot be excluded and may require the identification of bespoke mitigation measures or amendments to scheme design at the plan level

Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Afonydd Cleddau/ Cleddau Rivers SAC	0	Y	Y	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		Y	Y	Llys-y-Fran reservoir is contained within the Cleddau Rivers SAC: the river may be both directly and indirectly afffected by construction works on the dam (e.g. sediment release) and significant water level changes, causing areas to become flooded. Water temperature may also alter changing the habitat and the species that form it.
Active raised bogs		Y	Y	Llys-y-Fran reservoir is contained within the Cleddau Rivers SAC: the river may be both directly and indirectly afffected by construction works on the dam (e.g. sediment release) and significant water level changes, causing areas to become flooded. Water temperature may also alter changing the habitat and the species that form it.
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		Y	Y	Llys-y-Fran reservoir is contained within the Cleddau Rivers SAC: the river may be both directly and indirectly afffected by construction works on the dam (e.g. sediment release) and significant water level changes, causing areas to become
Sea lamprey Petromyzon marinus		Y	Y	Llys-y-Fran reservoir is contained within the Cleddau Rivers SAC: the river may be both directly and indirectly afffected by construction works on the dam (e.g. sediment release) and significant water level changes, causing areas to become flooded. Water temperature changes may impact areas suitable for species
Brook lamprey Lampetra planeri		Y	Y	Llys-y-Fran reservoir is contained within the Cleddau Rivers SAC: the river may be both directly and indirectly afffected by construction works on the dam (e.g. sediment release) and significant water level changes, causing areas to become flooded. Water temperature changes may impact areas suitable for species
River lamprey Lampetra fluviatilis		Y	Y	Llys-y-Fran reservoir is contained within the Cleddau Rivers SAC: the river may be both directly and indirectly afffected by construction works on the dam (e.g. sediment release) and significant water level changes, causing areas to become flooded. Water temperature changes may impact areas suitable for species
Bullhead Cottus gobio		Y	Y	Llys-y-Fran reservoir is contained within the Cleddau Rivers SAC: the river may be both directly and indirectly afffected by construction works on the dam (e.g. sediment release) and significant water level changes, causing areas to become flooded. Water temperature changes may impact areas suitable for species
Otter Lutra lutra		Y	Y	Llys-y-Fran reservoir is contained within the Cleddau Rivers SAC: the river may be both directly and indirectly afffected by construction works on the dam (e.g. sediment release) and significant water level changes, causing areas to become
Preseli SAC	4	N	N	
Northern Atlantic wet heaths with Erica tetralix		N	N	The Site is not linked to the Scheme by an impact pathway. No significant effects would be anticipated assuming normal measures,
European dry heaths		N	N	The Site is not linked to the Scheme by an impact pathway. No significant effects would be anticipated assuming normal measures,
Depressions on peat substrates of the Rhynchosporion		N	N	The Site is not linked to the Scheme by an impact pathway. No significant effects would be anticipated assuming normal measures,
Alkaline fens		N	N	The Site is not linked to the Scheme by an impact pathway. No significant effects would be anticipated assuming normal measures,
Southern damselfly Coenagrion mercuriale		N	N	Feature is not linked to the Scheme by an impact pathway. No significant effects would be anticipated assuming normal measures,
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	Feature is not linked to the Scheme by an impact pathway. No significant effects would be anticipated assuming normal measures,
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus		N	N	Feature is not linked to the Scheme by an impact pathway. No significant effects would be anticipated assuming normal measures,
Gweunydd Blaencleddau SAC	10	N	N	

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Northern Atlantic wet heaths with Erica tetralix		N	N	Site is not vulnerable to expected effects of Scheme due to distance and location within a separate water catchment
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	Site is not vulnerable to expected effects of Scheme due to distance and location within a separate water catchment
Blanket bogs (* if active bog)		N	N	Site is not vulnerable to expected effects of Scheme due to distance and location within a separate water catchment
Transition mires and quaking bogs		N	N	Site is not vulnerable to expected effects of Scheme due to distance and location within a separate water catchment
Alkaline fens		N	N	Site is not vulnerable to expected effects of Scheme due to distance and location within a separate water catchment
Southern damselfly Coenagrion mercuriale		N	N	Feature is not vulnerable to expected effects of Scheme due to distance and location within a separate water catchment
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	Feature is not vulnerable to expected effects of Scheme due to distance and location within a separate water catchment
North Pembrokeshire Woodlands/ Coedydd Gogledd Sir Benfro SAC	10	N	N	
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Site is not considered vulnerable to construction or operational effects due to being located uostream from Scheme
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	Site is not considered vulnerable to construction or operational effects due to being located uostream from Scheme
Barbastelle Barbastella barbastellus		N	N	Site is not considered vulnerable to construction or operational effects due to being located uostream from Scheme
Pembrokeshire Marine/ Sir Benfro Forol SAC	10/DS	N	U	
Sandbanks which are slightly covered by sea water all the time		N	U	Site vulnerable to potential changes in water flows. Precise scheme-specific modelling and assessment required, however effects unlikely to be adverse.
Estuaries		N	U	Site vulnerable to potential changes in water flows. Precise scheme-specific modelling and assessment required, however effects unlikely to be adverse.
Mudflats and sandflats not covered by seawater at low tide		N	U	Site vulnerable to potential changes in water flows. Precise scheme-specific modelling and assessment required, however effects unlikely to be adverse.
Coastal lagoons		N	U	Site vulnerable to potential changes in water flows. Precise scheme-specific modelling and assessment required, however effects unlikely to be adverse.
Large shallow inlets and bays		N	U	Site vulnerable to potential changes in water flows. Precise scheme-specific modelling and assessment required, however effects unlikely to be adverse.
Reefs		N	U	Site vulnerable to potential changes in water flows. Precise scheme-specific modelling and assessment required, however effects unlikely to be adverse.
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	U	Site vulnerable to potential changes in water flows. Precise scheme-specific modelling and assessment required, however effects unlikely to be adverse.
Submerged or partially submerged sea caves		N	U	Site vulnerable to potential changes in water flows. Precise scheme-specific modelling and assessment required, however effects unlikely to be adverse.
Sea lamprey Petromyzon marinus		N	U	Feature vulnerable to potential changes in water flows. Precise scheme-specific modelling and assessment required, however effects unlikely to be adverse.
River lamprey Lampetra fluviatilis		N	U	Feature vulnerable to potential changes in water flows. Precise scheme-specific modelling and assessment required, however effects unlikely to be adverse.
Allis shad Alosa alosa		N	U	Feature vulnerable to potential changes in water flows. Precise scheme-specific modelling and assessment required, however effects unlikely to be adverse.
Twaite shad Alosa fallax		N	U	Feature vulnerable to potential changes in water flows. Precise scheme-specific modelling and assessment required, however effects unlikely to be adverse.
Otter Lutra lutra		N	U	Feature vulnerable to potential changes in water flows. Precise scheme-specific modelling and assessment required, however effects unlikely to be adverse.
Grey seal Halichoerus grypus		N	U	Feature vulnerable to potential changes in water flows. Precise scheme-specific modelling and assessment required, however effects unlikely to be adverse.
Shore dock Rumex rupestris		N	U	Feature vulnerable to potential changes in water flows. Precise scheme-specific modelling and assessment required, however effects unlikely to be adverse.
Pembrokeshire Bat Sites and Bosherston Lakes/ Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston S	15	N	N	
Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.		N	N	Site not vulnerable to likely effects due to signfiicant distance between Site and Scheme
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Feature not vulnerable to likely effects due to signfiicant distance between Site and Scheme
Greater horseshoe bat Rhinolophus ferrumequinum		N	N	Feature not vulnerable to likely effects due to signfiicant distance between Site and Scheme
Otter Lutra lutra		N	N	Feature not vulnerable to likely effects due to signfiicant distance between Site and Scheme
West Wales Marine / Gorllewin Cymru Forol cSAC	15	N	N	
Harbour porpoise Phocoena phocoena		N	N	Feature not vulnerable
Yerbeston Tops SAC	15	N	N	
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	No reasonable impact pathways
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	No reasonable impact pathways
Afon Teifi/ River Teifi SAC	20	N	N	

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanoju		N	N	No reasonable impact pathways
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	No reasonable impact pathways
Sea lamprey Petromyzon marinus		N	N	No reasonable impact pathways
Brook lamprey Lampetra planeri		N	N	No reasonable impact pathways
River lamprey Lampetra fluviatilis		N	N	No reasonable impact pathways
Atlantic salmon Salmo salar		N	N	No reasonable impact pathways
Bullhead Cottus gobio		N	N	No reasonable impact pathways
Otter Lutra lutra		N	N	No reasonable impact pathways
Floating water-plantain Luronium natans		N	N	No reasonable impact pathways
Cardigan Bay/ Bae Ceredigion SAC	20	N	N	
Sandbanks which are slightly covered by sea water all the time		N	N	No reasonable impact pathways
Reefs		N	N	No reasonable impact pathways
Submerged or partially submerged sea caves		N	N	No reasonable impact pathways
Sea lamprey Petromyzon marinus		N	N	No reasonable impact pathways
River lamprey Lampetra fluviatilis		N	N	No reasonable impact pathways
Bottlenose dolphin Tursiops truncatus		N	N	No reasonable impact pathways
Grey seal Halichoerus grypus		N	N	No reasonable impact pathways
Ramsey and St David`s Peninsula Coast SPA	20	N	N	
Red-billed chough Pyrrhocorax pyrrhocorax		N	N	No reasonable impact pathways
St David`s / Ty Ddewi SAC	20	N	N	
Vegetated sea cliffs of the Atlantic and Baltic Coasts		N	N	No reasonable impact pathways
European dry heaths		N	N	No reasonable impact pathways
Floating water-plantain Luronium natans		N	N	No reasonable impact pathways

PEM012

Desalination Pembrokeshire WRZ for non-potable supply

Option Summary

This option would require a seawater desalination plant on the coast, with new intake / outfall, with a pipeline to Bolton Hill WTW (~5 km). The plant would only run when demands cannot be met from other resources. Operation will result in the discharge of brine with a significantly different salinity from the seawater, which may have localised effects on some features depending on dilution profiles. The intake / outfall would be located within the Pembrokeshire Marine SAC.

General Assessment

Construction of intake and outfall will directly affect the Pembrokeshire Marine SAC (intake / outfall in Milford Haven) which will result in significant effects on the site. Operation will result in discharge of brine which may have localised effects on some features depending on dilution profiles; fish entrainment is also possible. Effects can only be accurately determined with modelling etc. and detailed design. The Cleddau Rivers SAC is not linked to the site by a direct impact pathway but some mobile interest features may be vulnerable to the effects of the scheme (indirectly via possible effects on the fish species of Pembrokeshire Marine SAC).

Recommend Option?

Construction: No - significant effects certain and adverse effects likely to be unavoidable

Operation: No - significant effects certain and adverse effects likely to be unavoidable.

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Pembrokeshire Marine/ Sir Benfro Forol SAC	0	Y	Y	
Sandbanks which are slightly covered by sea water all the time		U	U	Limited sensitivity and exposure
Estuaries		Y	Y	Will be directly affected by construction and operation.
Mudflats and sandflats not covered by seawater at low tide		Y	Y	Will be directly affected by construction and operation.
Coastal lagoons		U	U	Limited exposure due to location in site
Large shallow inlets and bays		U	U	Limited sensitivity and exposure
Reefs		Y	Y	Species forming habitat vulnerable salinity changes. Effects can only be accurately determined with modelling. Mitigation possible with specific, detailed design
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		Y	Y	Species forming habitat vulnerable salinity changes. Effects can only be accurately determined with modelling. Mitigation possible with specific, detailed design
Submerged or partially submerged sea caves		N	N	Not sensitive or exposed
Sea lamprey Petromyzon marinus		Y	Y	Discharge of brine will alter salinity of seawater impacting habitat suitability. Entrainment possible. Effects can only be accurately determined with modelling. Mitigation possible with specific, detailed design
River lamprey Lampetra fluviatilis		Y	Y	Discharge of brine will alter salinity of seawater impacting habitat suitability. Entrainment possible. Effects can only be accurately determined with modelling. Mitigation possible with specific, detailed design
Allis shad Alosa alosa		Y	Y	Discharge of brine will alter salinity of seawater impacting habitat suitability. Entrainment possible. Effects can only be accurately determined with modelling. Mitigation possible with specific, detailed design
Twaite shad Alosa fallax		Y	Y	Discharge of brine will alter salinity of seawater impacting habitat suitability. Entrainment possible. Effects can only be accurately determined with modelling. Mitigation possible with specific, detailed design
Otter Lutra lutra		U	U	Possible secondary effects due to impacts on prey species from brine discharge.
Grey seal Halichoerus grypus		U	U	Possible secondary effects due to impacts on prey species from brine discharge.
Shore dock Rumex rupestris		N	N	Not exposed to likely effects.
Castlemartin Coast SPA	3	N	N	
Red-billed chough Pyrrhocorax pyrrhocorax		N	N	Species may use area proposed for works, but unlikely based on aerial photos of habitats.
Limestone Coast of South West Wales/ Arfordir Calchfaen de Orllewin Cymru SAC	3	N	N	
Vegetated sea cliffs of the Atlantic and Baltic Coasts		N	N	No impact pathways
Fixed coastal dunes with herbaceous vegetation ("grey dunes")		N	N	No impact pathways
European dry heaths		N	N	No impact pathways
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid site		N	N	No impact pathways
Caves not open to the public		N	N	No impact pathways
Submerged or partially submerged sea caves		N	N	No impact pathways
Greater horseshoe bat Rhinolophus ferrumequinum		N	N	Potentially vulnerable to construction depending on habitats but avoidable with normal measures.
Petalwort Petalophyllum ralfsii		N	N	No impact pathways
Early gentian Gentianella anglica		N	N	No impact pathways
Pembrokeshire Bat Sites and Bosherston Lakes/ Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston S	4	U	U	
Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.		N	N	No impact pathways
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Potentially vulnerable to construction depending on habitats but avoidable with normal measures.
Greater horseshoe bat Rhinolophus ferrumequinum		N	N	Potentially vulnerable to construction depending on habitats but avoidable with normal measures.
Otter Lutra lutra		U	U	Possible secondary effects due to impacts on prey species from brine discharge.
West Wales Marine / Gorllewin Cymru Forol cSAC	5	U	U	

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Harbour porpoise Phocoena phocoena		U	U	Possible secondary effects due to impacts on prey species from brine discharge but unlikely to result in significant effects due to behavioural preferences.
Skomer, Skokholm and the Seas off Pembrokeshire pSPA	10	Y	Y	
Manx shearwater Puffinus puffinus		Y	Y	Possible secondary effects due to impacts on prey species from brine discharge, but feature not characteristic of inshore waters.
European storm-petrel Hydrobates pelagicus		Y	Y	Possible secondary effects due to impacts on prey species from brine discharge, but feature not characteristic of inshore waters.
Lesser black-backed gull Larus fuscus		Y	Y	Possible secondary effects due to impacts on prey species from brine discharge.
Atlantic puffin Fratercula arctica		Y	Y	Possible secondary effects due to impacts on prey species from brine discharge, but feature not characteristic of inshore waters.
Seabird assemblage Seabird assemblage		Y	Y	Possible secondary effects due to impacts on prey species from brine discharge.
Afonydd Cleddau/ Cleddau Rivers SAC	15	Y	Y	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	No impact pathways
Active raised bogs		N	N	No impact pathways
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	No impact pathways
Sea lamprey Petromyzon marinus		Y	Y	Feature will use Milford Haven so exposed to construction and operation.
Brook lamprey Lampetra planeri		Y	Y	Feature will use Milford Haven so exposed to construction and operation.
River lamprey Lampetra fluviatilis		Y	Y	Feature will use Milford Haven so exposed to construction and operation.
Bullhead Cottus gobio		N	N	No impact pathways
Otter Lutra lutra		N	U	Possible secondary effects due to impacts on prey species from brine discharge.
Bristol Channel Approaches / Dynesfeydd Môr Hafren cSAC	15	U	U	
Harbour porpoise Phocoena phocoena		U	U	Possible secondary effects due to impacts on prey species from brine discharge but unlikely to result in significant effects due to behavioural preferences.
Skokholm and Skomer SPA	15	Y	Y	
Manx shearwater Puffinus puffinus		Y	Y	Possible secondary effects due to impacts on prey species from brine discharge, but feature not characteristic of inshore waters.
European storm-petrel Hydrobates pelagicus		Y	Y	Possible secondary effects due to impacts on prey species from brine discharge, but feature not characteristic of inshore waters.
Lesser black-backed gull Larus fuscus		Y	Y	Possible secondary effects due to impacts on prey species from brine discharge.
Atlantic puffin Fratercula arctica		Y	Y	Possible secondary effects due to impacts on prey species from brine discharge, but feature not characteristic of inshore waters.
Short-eared owl Asio flammeus		N	N	Low exposure to construction; feature not sensitive to operational effects.
Red-billed chough Pyrrhocorax pyrrhocorax		N	N	Low exposure to construction; feature not sensitive to operational effects.
Seabird assemblage Seabird assemblage		Y	Y	Possible secondary effects due to impacts on prey species from brine discharge.
Yerbeston Tops SAC	15	N	N	
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	No impact pathways
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	No impact pathways

PEM014

Abstraction from the Afon Taf

Option Summary

The Afon Taf rises in the western fringe of the Preseli Hills and flows southward into Camarthan Bay. This option involves a new intake at Whitland, a new pipeline to Canaston Bridge and then onward transfer to Bolton Hill WTW via existing infrastructure. A new abstraction licence is required. This option looks at taking 5 Ml/d (CAMS Assessment). The intake and pumping station would be situated on the Taf close Whitland. A13.5 km long transfer pipeline to Canaston Bridge would follow the approximate route of the A40 either in the verge or adjacent farmland.

General Assessment

This option was previously assessed as a preferred option in the 2011 WRMP, and it was concluded that the scheme was unlikely to have any significant adverse effect. The only site that is potentially affected is Pembrokeshire Marine / Sir Benfro Forol SAC. The closest features are Estuaries; Mudflats and Sandflats; and Atlantic Salt Meadows, which are all present within Radford Pill (the estuary inlet closest to Milton). There is no data available on the current condition of these features within the Radford Pill, although the SSSI data for this area does not suggest that the current abstraction regime is negatively affecting any of the shared (i.e. SAC) interest features. It is considered that the effects of the abstraction on these features (and therefore this SAC) is likely to be negligible, particularly as the abstraction would be within the parameters of the existing usage. However, it is may not be possible to conclude no LSE and hence no adverse effect without additional scheme-specific studies.

Recommend Option?

Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures

Operation: Yes - effects possible but significant or significant adverse effects avoidable with established operational mitigation (e.g. licence controls)

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Afonydd Cleddau/ Cleddau Rivers SAC	0	N	N	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	Construction required near SAC but effects avoidable with normal measures; no operational effects
Active raised bogs		N	N	Not exposed
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	Not exposed
Sea lamprey Petromyzon marinus		N	N	Construction required near SAC but effects avoidable with normal measures; no operational effects
Brook lamprey Lampetra planeri		N	N	Construction required near SAC but effects avoidable with normal measures; no operational effects
River lamprey Lampetra fluviatilis		N	N	Construction required near SAC but effects avoidable with normal measures; no operational effects
Bullhead Cottus gobio		N	N	Construction required near SAC but effects avoidable with normal measures; no operational effects
Otter Lutra lutra		N	N	Construction required near SAC but effects avoidable with normal measures; no operational effects
Pembrokeshire Marine/ Sir Benfro Forol SAC	1	N	N	
Sandbanks which are slightly covered by sea water all the time		N	N	Construction required near SAC but effects avoidable with normal measures; no operational effects
Estuaries		N	N	Construction required near SAC but effects avoidable with normal measures; no operational effects
Mudflats and sandflats not covered by seawater at low tide		N	N	Construction required near SAC but effects avoidable with normal measures; no operational effects
Coastal lagoons		N	N	Construction required near SAC but effects avoidable with normal measures; no operational effects
Large shallow inlets and bays		N	N	Construction required near SAC but effects avoidable with normal measures; no operational effects
Reefs		N	N	Construction required near SAC but effects avoidable with normal measures; no operational effects
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	N	Construction required near SAC but effects avoidable with normal measures; no operational effects
Submerged or partially submerged sea caves		N	N	Construction required near SAC but effects avoidable with normal measures; no operational effects
Sea lamprey Petromyzon marinus		N	N	Construction required near SAC but effects avoidable with normal measures; no operational effects
River lamprey Lampetra fluviatilis		N	N	Construction required near SAC but effects avoidable with normal measures; no operational effects
Allis shad Alosa alosa		N	N	Construction required near SAC but effects avoidable with normal measures; no operational effects
Twaite shad Alosa fallax		N	N	Construction required near SAC but effects avoidable with normal measures; no operational effects
Otter Lutra lutra		N	N	Construction required near SAC but effects avoidable with normal measures; no operational effects
Grey seal Halichoerus grypus		N	N	Construction required near SAC but effects avoidable with normal measures; no operational effects
Shore dock Rumex rupestris		N	N	Construction required near SAC but effects avoidable with normal measures; no operational effects
Pembrokeshire Bat Sites and Bosherston Lakes/ Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston S	4	N	N	
Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.		N	N	No impact pathway
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Construction required near SAC but effects avoidable with normal measures; no operational effects
Greater horseshoe bat Rhinolophus ferrumequinum		N	N	Construction required near SAC but effects avoidable with normal measures; no operational effects
Otter Lutra lutra		N	N	Construction required near SAC but effects avoidable with normal measures; no operational effects
Yerbeston Tops SAC	5	N	N	
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	No impact pathway
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	No impact pathway
Bae Caerfyrddin/ Carmarthen Bay SPA	10	N	U	
Black (common) scoter Melanitta nigra		N	U	Site downstream of Taf abstraction; construction effects avoidable with normal measures; operational effects uncertain but distance of abstraction up catchment likely to ensure minimal effects
Bristol Channel Approaches / Dynesfeydd Môr Hafren cSAC	10	N	N	
Harbour porpoise Phocoena phocoena		N	N	Not exposed
Carmarthen Bay and Estuaries/ Bae Caerfyrddin ac Aberoedd SAC	10	N	U	

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Sandbanks which are slightly covered by sea water all the time		N	U	Site downstream of Taf abstraction; construction effects avoidable with normal measures; operational effects uncertain but distance of abstraction up catchment likely to ensure minimal effects
Estuaries		N	U	Site downstream of Taf abstraction; construction effects avoidable with normal measures; operational effects uncertain but distance of abstraction up catchment likely to ensure minimal effects
Mudflats and sandflats not covered by seawater at low tide		N	U	Site downstream of Taf abstraction; construction effects avoidable with normal measures; operational effects uncertain but distance of abstraction up catchment likely to ensure minimal effects
Large shallow inlets and bays		N	U	Site downstream of Taf abstraction; construction effects avoidable with normal measures; operational effects uncertain but distance of abstraction up catchment likely to ensure minimal effects
Salicornia and other annuals colonizing mud and sand		N	U	Site downstream of Taf abstraction; construction effects avoidable with normal measures; operational effects uncertain but distance of abstraction up catchment likely to ensure minimal effects
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	U	Site downstream of Taf abstraction; construction effects avoidable with normal measures; operational effects uncertain but distance of abstraction up catchment likely to ensure minimal effects
Sea lamprey Petromyzon marinus		N	U	Site downstream of Taf abstraction; construction effects avoidable with normal measures; operational effects uncertain but distance of abstraction up catchment likely to ensure minimal effects
River lamprey Lampetra fluviatilis		N	U	Site downstream of Taf abstraction; construction effects avoidable with normal measures; operational effects uncertain but distance of abstraction up catchment likely to ensure minimal effects
Allis shad Alosa alosa		N	U	Site downstream of Taf abstraction; construction effects avoidable with normal measures; operational effects uncertain but distance of abstraction up catchment likely to ensure minimal effects
Twaite shad Alosa fallax		N	U	Site downstream of Taf abstraction; construction effects avoidable with normal measures; operational effects uncertain but distance of abstraction up catchment likely to ensure minimal effects
Otter Lutra lutra		N	U	Site downstream of Taf abstraction; construction effects avoidable with normal measures; operational effects uncertain but distance of abstraction up catchment likely to ensure minimal effects
Carmarthen Bay Dunes/ Twyni Bae Caerfyrddin SAC	10	N	N	
Embryonic shifting dunes		N	N	Site downstream of Taf abstraction but features unlikely to be exposed to significant changes.
Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")		N	N	Site downstream of Taf abstraction but features unlikely to be exposed to significant changes.
Fixed coastal dunes with herbaceous vegetation ("grey dunes")		N	N	Site downstream of Taf abstraction but features unlikely to be exposed to significant changes.
Dunes with Salix repens ssp. argentea (Salicion arenariae)		N	N	Site downstream of Taf abstraction but features unlikely to be exposed to significant changes.
Humid dune slacks		N	N	Site downstream of Taf abstraction but features unlikely to be exposed to significant changes.
Narrow-mouthed whorl snail Vertigo angustior		N	N	Site downstream of Taf abstraction but features unlikely to be exposed to significant changes.
Petalwort Petalophyllum ralfsii		N	N	Site downstream of Taf abstraction but features unlikely to be exposed to significant changes.
Fen orchid Liparis loeselii		N	N	Site downstream of Taf abstraction but features unlikely to be exposed to significant changes.
Gweunydd Blaencleddau SAC	15	N	N	
Northern Atlantic wet heaths with Erica tetralix		N	N	No impact pathways
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	No impact pathways
Blanket bogs (* if active bog)		N	N	No impact pathways
Transition mires and quaking bogs		N	N	No impact pathways
Alkaline fens		N	N	No impact pathways
Southern damselfly Coenagrion mercuriale		N	N	No impact pathways
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	No impact pathways
Preseli SAC	15	N	N	
Northern Atlantic wet heaths with Erica tetralix		N	N	No impact pathways
European dry heaths		N	N	No impact pathways
Depressions on peat substrates of the Rhynchosporion		N	N	No impact pathways
Alkaline fens		N	N	No impact pathways
Southern damselfly Coenagrion mercuriale		N	N	No impact pathways
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	No impact pathways
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus		N	N	No impact pathways
Afon Teifi/ River Teifi SAC	20	N	N	
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanoju		N	N	No impact pathways
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	No impact pathways
Sea lamprey Petromyzon marinus		N	N	No impact pathways
Brook lamprey Lampetra planeri		N	N	No impact pathways
River lamprey Lampetra fluviatilis		N	N	No impact pathways

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
Atlantic salmon Salmo salar		N	N	No impact pathways
Bullhead Cottus gobio		N	N	No impact pathways
Otter Lutra lutra		N	N	No impact pathways
Floating water-plantain Luronium natans		N	N	No impact pathways
Limestone Coast of South West Wales/ Arfordir Calchfaen de Orllewin Cymru SAC	20	N	N	
Vegetated sea cliffs of the Atlantic and Baltic Coasts		N	N	No impact pathways
Fixed coastal dunes with herbaceous vegetation ("grey dunes")		N	N	No impact pathways
European dry heaths		N	N	No impact pathways
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid site		N	N	No impact pathways
Caves not open to the public		N	N	No impact pathways
Submerged or partially submerged sea caves		N	N	No impact pathways
Greater horseshoe bat Rhinolophus ferrumequinum		N	N	No impact pathways
Petalwort Petalophyllum ralfsii		N	N	No impact pathways
Early gentian Gentianella anglica		N	N	No impact pathways
North Pembrokeshire Woodlands/ Coedydd Gogledd Sir Benfro SAC	20	N	N	
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	No impact pathways
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	No impact pathways
Barbastelle Barbastella barbastellus		N	N	Construction may affect areas used by bats from this site, but effects avoidable with normal measures; no operational

PEM016a

SAIP Schemes - strategic transfers from Camarthen (Afon Taf) and Tywi Gower WRZ.

Option Summary

Transfer of spare production capacity from Felindre WTW to Pembrokeshire utilising existing assets. The transfer requirement stated is 4.5Ml/d. Utilise the existing 21" gravity main from Brondini SRV, extend to Capel Dewi WTW, reinforce the existing infra and non-infra assets to transfer to Brandy Hill SRV. The option would require new or uprated pipelines totalling ~ 42km, and associated asset works.

General Assessment

This option is a network solution which uses the spare production capacity of the Felindre WTW licence, so no operational effects would be expected. The option would require new or upgraded pipelines totalling ~ 42km, which cross the Afon Tywi/ River Tywi SAC and the Carmarthen Bay and Estuaries/ Bae Caerfyrddin ac Aberoedd SAC, although it is likely that any effects on these sites can be avoided with normal planning / avoidance / mitigation measures (best-practice, scheduling works outside migration

Recommend Option?

Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures

Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Afon Tywi/ River Tywi SAC	0	Y	N	
Sea lamprey Petromyzon marinus		Y	N	Potentially vulnerable to construction effects but avoidable with established measures
Brook lamprey Lampetra planeri		Y	N	Potentially vulnerable to construction effects but avoidable with established measures
River lamprey Lampetra fluviatilis		Y	N	Potentially vulnerable to construction effects but avoidable with established measures
Allis shad Alosa alosa		Y	N	Potentially vulnerable to construction effects but avoidable with established measures
Twaite shad Alosa fallax		Y	N	Potentially vulnerable to construction effects but avoidable with established measures
Bullhead Cottus gobio		Y	N	Potentially vulnerable to construction effects but avoidable with established measures
Otter Lutra lutra		Y	N	Potentially vulnerable to construction effects but avoidable with established measures
Carmarthen Bay and Estuaries/ Bae Caerfyrddin ac Aberoedd SAC	0	U	N	
Sandbanks which are slightly covered by sea water all the time		U	N	Potentially vulnerable to construction effects but avoidable with established measures
Estuaries		U	N	Potentially vulnerable to construction effects but avoidable with established measures
Mudflats and sandflats not covered by seawater at low tide		U	N	Potentially vulnerable to construction effects but avoidable with established measures
Large shallow inlets and bays		U	N	Potentially vulnerable to construction effects but avoidable with established measures
Salicornia and other annuals colonizing mud and sand		U	N	Potentially vulnerable to construction effects but avoidable with established measures
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		U	N	Potentially vulnerable to construction effects but avoidable with established measures
Sea lamprey Petromyzon marinus		U	N	Potentially vulnerable to construction effects but avoidable with established measures
River lamprey Lampetra fluviatilis		U	N	Potentially vulnerable to construction effects but avoidable with established measures
Allis shad Alosa alosa		U	N	Potentially vulnerable to construction effects but avoidable with established measures
Twaite shad Alosa fallax		U	N	Potentially vulnerable to construction effects but avoidable with established measures
Otter Lutra lutra		U	N	Potentially vulnerable to construction effects but avoidable with established measures
Bristol Channel Approaches / Dynesfeydd Môr Hafren cSAC	10	N	N	
Harbour porpoise Phocoena phocoena		N	N	No impact pathways
Carmarthen Bay Dunes/ Twyni Bae Caerfyrddin SAC	10	N	N	
Embryonic shifting dunes		N	N	Theoretical construction effects avoidable with best practice.
Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")		N	N	Theoretical construction effects avoidable with best practice.
Fixed coastal dunes with herbaceous vegetation ("grey dunes")		N	N	Theoretical construction effects avoidable with best practice.
Dunes with Salix repens ssp. argentea (Salicion arenariae)		N	N	Theoretical construction effects avoidable with best practice.
Humid dune slacks		N	N	Theoretical construction effects avoidable with best practice.
Narrow-mouthed whorl snail Vertigo angustior		N	N	Theoretical construction effects avoidable with best practice.
Petalwort Petalophyllum ralfsii		N	N	Theoretical construction effects avoidable with best practice.
Fen orchid Liparis loeselii		N	N	Theoretical construction effects avoidable with best practice.
Cernydd Carmel SAC	10	N	N	
Turloughs		N	N	No impact pathways
Northern Atlantic wet heaths with Erica tetralix		N	N	No impact pathways
European dry heaths		N	N	No impact pathways
Active raised bogs		N	N	No impact pathways
Tilio-Acerion forests of slopes, screes and ravines		N	N	No impact pathways
Bae Caerfyrddin/ Carmarthen Bay SPA	10/DS	N	N	
Black (common) scoter Melanitta nigra		N	N	Theoretical construction effects avoidable with best practice.
Afon Teifi/ River Teifi SAC	15	N	N	
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanoju		N	N	No impact pathways
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	No impact pathways

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
Sea lamprey Petromyzon marinus		N	N	No impact pathways
Brook lamprey Lampetra planeri		N	N	No impact pathways
River lamprey Lampetra fluviatilis		N	N	No impact pathways
Atlantic salmon Salmo salar		N	N	No impact pathways
Bullhead Cottus gobio		N	N	No impact pathways
Otter Lutra lutra		N	N	Theoretical construction effects avoidable with best practice.
Floating water-plantain Luronium natans		N	N	No impact pathways
Afonydd Cleddau/ Cleddau Rivers SAC	15	N	N	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	No impact pathways
Active raised bogs		N	N	No impact pathways
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	No impact pathways
Sea lamprey Petromyzon marinus		N	N	No impact pathways
Brook lamprey Lampetra planeri		N	N	No impact pathways
River lamprey Lampetra fluviatilis		N	N	No impact pathways
Bullhead Cottus gobio		N	N	No impact pathways
Otter Lutra lutra		N	N	No impact pathways
Caeau Mynydd Mawr SAC	15	N	N	
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	No impact pathways
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	No impact pathways
Pembrokeshire Bat Sites and Bosherston Lakes/ Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston S	15	N	N	
Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.		N	N	No impact pathways
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Theoretical construction effects avoidable with best practice.
Greater horseshoe bat Rhinolophus ferrumequinum		N	N	Theoretical construction effects avoidable with best practice.
Otter Lutra lutra		N	N	Theoretical construction effects avoidable with best practice.
Burry Inlet Ramsar	20	N	N	
5 - regularly supports 20,000 or more waterbirds Crit. 5 - regularly supports 20,000 or more waterbirds		N	N	No impact pathways
6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds Crit. 6 - regularly supports		N	N	No impact pathways
Burry Inlet SPA	20	N	N	
Common shelduck Tadorna tadorna		N	N	No impact pathways
Eurasian wigeon Anas penelope		N	N	No impact pathways
Eurasian teal Anas crecca		N	N	No impact pathways
Northern pintail Anas acuta		N	N	No impact pathways
Northern shoveler Anas clypeata		N	N	No impact pathways
Eurasian oystercatcher Haematopus ostralegus		N	N	No impact pathways
Grey plover Pluvialis squatarola		N	N	No impact pathways
Red knot Calidris canutus		N	N	No impact pathways
Eurasian curlew Numenius arquata		N	N	No impact pathways
Common redshank Tringa totanus		N	N	No impact pathways
Ruddy turnstone Arenaria interpres		N	N	No impact pathways
Dunlin Calidris alpina alpina		N	N	No impact pathways
Waterfowl assemblage Waterfowl assemblage		N	N	No impact pathways
Gweunydd Blaencleddau SAC	20	N	N	
Northern Atlantic wet heaths with Erica tetralix		N	N	No impact pathways
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	No impact pathways
Blanket bogs (* if active bog)		N	N	No impact pathways
Transition mires and quaking bogs		N	N	No impact pathways
Alkaline fens		N	N	No impact pathways
Southern damselfly Coenagrion mercuriale		N	N	No impact pathways
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	No impact pathways
Limestone Coast of South West Wales/ Arfordir Calchfaen de Orllewin Cymru SAC	20	N	N	
Vegetated sea cliffs of the Atlantic and Baltic Coasts		N	N	No impact pathways
Fixed coastal dunes with herbaceous vegetation ("grey dunes")		N	N	No impact pathways
European dry heaths		N	N	No impact pathways

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid site		N	N	No impact pathways
Caves not open to the public		N	N	No impact pathways
Submerged or partially submerged sea caves		N	N	No impact pathways
Greater horseshoe bat Rhinolophus ferrumequinum		N	N	No impact pathways
Petalwort Petalophyllum ralfsii		N	N	No impact pathways
Early gentian Gentianella anglica		N	N	No impact pathways
Pembrokeshire Marine/ Sir Benfro Forol SAC	20	N	N	
Sandbanks which are slightly covered by sea water all the time		N	N	No impact pathways
Estuaries		N	N	No impact pathways
Mudflats and sandflats not covered by seawater at low tide		N	N	No impact pathways
Coastal lagoons		N	N	No impact pathways
Large shallow inlets and bays		N	N	No impact pathways
Reefs		N	N	No impact pathways
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	N	No impact pathways
Submerged or partially submerged sea caves		N	N	No impact pathways
Sea lamprey Petromyzon marinus		N	N	No impact pathways
River lamprey Lampetra fluviatilis		N	N	No impact pathways
Allis shad Alosa alosa		N	N	No impact pathways
Twaite shad Alosa fallax		N	N	No impact pathways
Otter Lutra lutra		N	N	No impact pathways
Grey seal Halichoerus grypus		N	N	No impact pathways
Shore dock Rumex rupestris		N	N	No impact pathways
Preseli SAC	20	N	N	
Northern Atlantic wet heaths with Erica tetralix		N	N	No impact pathways
European dry heaths		N	N	No impact pathways
Depressions on peat substrates of the Rhynchosporion		N	N	No impact pathways
Alkaline fens		N	N	No impact pathways
Southern damselfly Coenagrion mercuriale		N	N	No impact pathways
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	No impact pathways
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus		N	N	No impact pathways
Yerbeston Tops SAC	20	N	N	
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	No impact pathways
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	No impact pathways

PEM016b

East West Transfer Felindre (from Afon Taf and Tywi Gower) to Pembrokeshire - existing assets

Option Summary

Transfer of water from spare production capacity at Felindre WTW to Pembrokeshire utilising a new dedicated main. The transfer requirement stated is 6.0Ml/d.

General Assessment

This option is a network solution which uses the spare production capacity of the Felindre WTW licence, so no operational effects would be expected. The option would require new or uprated pipelines totalling ~ 38km, which cross the Afon Tywi/ River Tywi SAC and Carmarthen Bays and Estuaries / Bae Caerfyrddin ac Aberoedd SAC. No construction effects are anticipated if scheme-specific detailed design is produced to avoid damage to SACs. All other potential effects can be avoided using established measures.

Recommend Option?

Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures

Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Afon Tywi/ River Tywi SAC	0	N	N	
Sea lamprey Petromyzon marinus		N	N	Feature potentially vulnerable to construction but effects avoidable. Works to be schdeuled outside of migration and breeding season of feature. Scheme-specific detailed design is required to avoid significant effects.
Brook lamprey Lampetra planeri		N	N	Feature potentially vulnerable to construction but effects avoidable. Works to be schdeuled outside of migration and breeding season of feature. Scheme-specific detailed design is required to avoid significant effects.
River lamprey Lampetra fluviatilis		N	N	Feature potentially vulnerable to construction but effects avoidable. Works to be schdeuled outside of migration and breeding season of feature. Scheme-specific detailed design is required to avoid significant effects.
Allis shad Alosa alosa		N	N	Feature potentially vulnerable to construction but effects avoidable. Works to be schdeuled outside of migration and breeding season of feature. Scheme-specific detailed design is required to avoid significant effects.
Twaite shad Alosa fallax		N	N	Feature potentially vulnerable to construction but effects avoidable. Works to be schdeuled outside of migration and breeding season of feature. Scheme-specific detailed design is required to avoid significant effects.
Bullhead Cottus gobio		N	N	Feature potentially vulnerable to construction but effects avoidable. Works to be schdeuled outside of migration and breeding season of feature. Scheme-specific detailed design is required to avoid significant effects.
Otter Lutra lutra		N	N	Feature potentially vulnerable to construction but effects avoidable. Works to be schdeuled outside of migration and breeding season of feature. Scheme-specific detailed design is required to avoid significant effects.
Carmarthen Bay and Estuaries/ Bae Caerfyrddin ac Aberoedd SAC	0	N	N	
Sandbanks which are slightly covered by sea water all the time		N	N	Feature not vulnerable to effects of scheme assuming established measures
Estuaries		N	N	Feature not vulnerable to effects of scheme assuming established measures
Mudflats and sandflats not covered by seawater at low tide		N	N	Feature not vulnerable to effects of scheme assuming established measures
Large shallow inlets and bays		N	N	Feature not vulnerable to effects of scheme assuming established measures
Salicornia and other annuals colonizing mud and sand		N	N	Feature not vulnerable to effects of scheme assuming established measures
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	N	Feature not vulnerable to effects of scheme assuming established measures
Sea lamprey Petromyzon marinus		N	N	Feature potentially vulnerable to construction but effects avoidable. Works to be schdeuled outside of migration and breeding season of feature. Scheme-specific detailed design is required to avoid significant effects.
River lamprey Lampetra fluviatilis		N	N	Feature potentially vulnerable to construction but effects avoidable. Works to be schdeuled outside of migration and breeding season of feature. Scheme-specific detailed design is required to avoid significant effects.
Allis shad Alosa alosa		N	N	Feature potentially vulnerable to construction but effects avoidable. Works to be schdeuled outside of migration and breeding season of feature. Scheme-specific detailed design is required to avoid significant effects.
Twaite shad Alosa fallax		N	N	Feature potentially vulnerable to construction but effects avoidable. Works to be schdeuled outside of migration and breeding season of feature. Scheme-specific detailed design is required to avoid significant effects.
Otter Lutra lutra		N	N	Feature potentially vulnerable to construction but effects avoidable. Works to be schdeuled outside of migration and breeding season of feature. Scheme-specific detailed design is required to avoid significant effects.
Caeau Mynydd Mawr SAC	10	N	N	
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	No impact pathway (distance)
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	No impact pathway (distance)
Bae Caerfyrddin/ Carmarthen Bay SPA	10/DS	N	N	
Black (common) scoter Melanitta nigra		N	N	Feature not vulnerable to effects of scheme assuming established measures
Bristol Channel Approaches / Dynesfeydd Môr Hafren cSAC	10/DS	N	N	
Harbour porpoise Phocoena phocoena		N	N	Feature not vulnerable to effects of scheme assuming established measures
Burry Inlet Ramsar	10/DS	N	N	
5 - regularly supports 20,000 or more waterbirds Crit. 5 - regularly supports 20,000 or more waterbirds		N	N	Feature not vulnerable to effects of scheme assuming established measures
6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds Crit. 6 - regularly supports		N	N	Feature not vulnerable to effects of scheme assuming established measures
Burry Inlet SPA	10/DS	N	N	

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
Common shelduck Tadorna tadorna		N	N	Feature not vulnerable to effects of scheme assuming established measures
Eurasian wigeon Anas penelope		N	N	Feature not vulnerable to effects of scheme assuming established measures
Eurasian teal Anas crecca		N	N	Feature not vulnerable to effects of scheme assuming established measures
Northern pintail Anas acuta		N	N	Feature not vulnerable to effects of scheme assuming established measures
Northern shoveler Anas clypeata		N	N	Feature not vulnerable to effects of scheme assuming established measures
Eurasian oystercatcher Haematopus ostralegus		N	N	Feature not vulnerable to effects of scheme assuming established measures
Grey plover Pluvialis squatarola		N	N	Feature not vulnerable to effects of scheme assuming established measures
Red knot Calidris canutus		N	N	Feature not vulnerable to effects of scheme assuming established measures
Eurasian curlew Numenius arquata		N	N	Feature not vulnerable to effects of scheme assuming established measures
Common redshank Tringa totanus		N	N	Feature not vulnerable to effects of scheme assuming established measures
Ruddy turnstone Arenaria interpres		N	N	Feature not vulnerable to effects of scheme assuming established measures
Dunlin Calidris alpina alpina		N	N	Feature not vulnerable to effects of scheme assuming established measures
Waterfowl assemblage Waterfowl assemblage		N	N	Feature not vulnerable to effects of scheme assuming established measures
Carmarthen Bay Dunes/ Twyni Bae Caerfyrddin SAC	10/DS	N	N	
Embryonic shifting dunes		N	N	Feature not vulnerable to effects of scheme assuming established measures
Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")		N	N	Feature not vulnerable to effects of scheme assuming established measures
Fixed coastal dunes with herbaceous vegetation ("grey dunes")		N	N	Feature not vulnerable to effects of scheme assuming established measures
Dunes with Salix repens ssp. argentea (Salicion arenariae)		N	N	Feature not vulnerable to effects of scheme assuming established measures
Humid dune slacks		N	N	Feature not vulnerable to effects of scheme assuming established measures
Narrow-mouthed whorl snail Vertigo angustior		N	N	Feature not vulnerable to effects of scheme assuming established measures
Petalwort Petalophyllum ralfsii		N	N	Feature not vulnerable to effects of scheme assuming established measures
Fen orchid Liparis loeselii		N	N	Feature not vulnerable to effects of scheme assuming established measures
Afonydd Cleddau/ Cleddau Rivers SAC	15	N	N	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	No impact pathway (distance)
Active raised bogs		N	N	No impact pathway (distance)
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	No impact pathway (distance)
Sea lamprey Petromyzon marinus		N	N	No impact pathway (distance)
Brook lamprey Lampetra planeri		N	N	No impact pathway (distance)
River lamprey Lampetra fluviatilis		N	N	No impact pathway (distance)
Bullhead Cottus gobio		N	N	No impact pathway (distance)
Otter Lutra lutra		N	N	No impact pathway (distance)
Cernydd Carmel SAC	15	N	N	
Turloughs		N	N	No impact pathway (distance)
Northern Atlantic wet heaths with Erica tetralix		N	N	No impact pathway (distance)
European dry heaths		N	N	No impact pathway (distance)
Active raised bogs		N	N	No impact pathway (distance)
Tilio-Acerion forests of slopes, screes and ravines		N	N	No impact pathway (distance)
Gower Commons/ Tiroedd Comin Gwyr SAC	15	N	N	
Northern Atlantic wet heaths with Erica tetralix		N	N	No impact pathway (distance)
European dry heaths		N	N	No impact pathway (distance)
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	No impact pathway (distance)
Southern damselfly Coenagrion mercuriale		N	N	No impact pathway (distance)
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	No impact pathway (distance)
Pembrokeshire Marine/ Sir Benfro Forol SAC	15	N	N	
Sandbanks which are slightly covered by sea water all the time		N	N	Feature not vulnerable to effects of scheme assuming established measures
Estuaries		N	N	Feature not vulnerable to effects of scheme assuming established measures
Mudflats and sandflats not covered by seawater at low tide		N	N	Feature not vulnerable to effects of scheme assuming established measures
Coastal lagoons		N	N	Feature not vulnerable to effects of scheme assuming established measures
Large shallow inlets and bays		N	N	Feature not vulnerable to effects of scheme assuming established measures
Reefs		N	N	Feature not vulnerable to effects of scheme assuming established measures
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	N	Feature not vulnerable to effects of scheme assuming established measures
Submerged or partially submerged sea caves		N	N	Feature not vulnerable to effects of scheme assuming established measures
Sea lamprey Petromyzon marinus		N	N	Feature not vulnerable to effects of scheme assuming established measures

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
River lamprey Lampetra fluviatilis		N	N	Feature not vulnerable to effects of scheme assuming established measures
Allis shad Alosa alosa		N	N	Feature not vulnerable to effects of scheme assuming established measures
Twaite shad Alosa fallax		N	N	Feature not vulnerable to effects of scheme assuming established measures
Otter Lutra lutra		N	N	Feature not vulnerable to effects of scheme assuming established measures
Grey seal Halichoerus grypus		N	N	Feature not vulnerable to effects of scheme assuming established measures
Shore dock Rumex rupestris		N	N	Feature not vulnerable to effects of scheme assuming established measures
Afon Teifi/ River Teifi SAC	20	N	N	
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanoju		N	N	No impact pathway (distance)
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	No impact pathway (distance)
Sea lamprey Petromyzon marinus		N	N	No impact pathway (distance)
Brook lamprey Lampetra planeri		N	N	No impact pathway (distance)
River lamprey Lampetra fluviatilis		N	N	No impact pathway (distance)
Atlantic salmon Salmo salar		N	N	No impact pathway (distance)
Bullhead Cottus gobio		N	N	No impact pathway (distance)
Otter Lutra lutra		N	N	No impact pathway (distance)
Floating water-plantain Luronium natans		N	N	No impact pathway (distance)
Gower Ash Woods/ Coedydd Ynn Gwyr SAC	20	N	N	
Tilio-Acerion forests of slopes, screes and ravines		N	N	No impact pathway (distance)
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	No impact pathway (distance)
Gweunydd Blaencleddau SAC	20	N	N	
Northern Atlantic wet heaths with Erica tetralix		N	N	No impact pathway (distance)
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	No impact pathway (distance)
Blanket bogs (* if active bog)		N	N	No impact pathway (distance)
Transition mires and quaking bogs		N	N	No impact pathway (distance)
Alkaline fens		N	N	No impact pathway (distance)
Southern damselfly Coenagrion mercuriale		N	N	No impact pathway (distance)
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	No impact pathway (distance)
Pembrokeshire Bat Sites and Bosherston Lakes/ Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston S	20	N	N	
Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.		N	N	No impact pathway (distance)
Lesser horseshoe bat Rhinolophus hipposideros		N	N	No impact pathway (distance)
Greater horseshoe bat Rhinolophus ferrumequinum		N	N	No impact pathway (distance)
Otter Lutra lutra		N	N	No impact pathway (distance)
Preseli SAC	20	N	N	
Northern Atlantic wet heaths with Erica tetralix		N	N	No impact pathway (distance)
European dry heaths		N	N	No impact pathway (distance)
Depressions on peat substrates of the Rhynchosporion		N	N	No impact pathway (distance)
Alkaline fens		N	N	No impact pathway (distance)
Southern damselfly Coenagrion mercuriale		N	N	No impact pathway (distance)
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	No impact pathway (distance)
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus		N	N	No impact pathway (distance)
Yerbeston Tops SAC	20	N	N	
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	No impact pathway (distance)
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	No impact pathway (distance)
Limestone Coast of South West Wales/ Arfordir Calchfaen de Orllewin Cymru SAC	20/DS	N	N	
Vegetated sea cliffs of the Atlantic and Baltic Coasts		N	N	Site not vulnerable to effects assuming established measures
Fixed coastal dunes with herbaceous vegetation ("grey dunes")		N	N	Site not vulnerable to effects assuming established measures
European dry heaths		N	N	Site not vulnerable to effects assuming established measures
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid site		N	N	Site not vulnerable to effects assuming established measures
Caves not open to the public		N	N	Site not vulnerable to effects assuming established measures
Submerged or partially submerged sea caves		N	N	Site not vulnerable to effects assuming established measures
Greater horseshoe bat Rhinolophus ferrumequinum		N	N	Site not vulnerable to effects assuming established measures
Petalwort Petalophyllum ralfsii		N	N	Site not vulnerable to effects assuming established measures
Early gentian Gentianella anglica		N	N	Site not vulnerable to effects assuming established measures

PEM024a

Canaston Pumping Station

Option Summary

Options PEM024a is a relatively minor asset upgrade that would allow finer control of abstraction volumes from the Afon Cleddau, and hence reduce unnecessary over-release of compensation flows from Llys-y-Fran reservoir. The option aims to minimise this over-release of water by configuring the pumps so that the rate of abstraction from the river is close to constant in a given day during periods of resource optimisation, which minimises the difference between the maximum rate of abstraction and the total daily abstraction. This will require a new low-lift pump set with a variable pump rate between 30 Ml/d and 55 Ml/d, and replacement of the fixed speed high-lift pumps with variable-speed pumps. This would then allow water to be conserved within the Llys y Fran reservoir by matching compensation releases to actual abstraction. No changes to the abstraction licence would be required.

General Assessment

The construction works for both options are relatively small-scale, but would be in close proximity to the Afonydd Cleddau/ Cleddau Rivers SAC at Canaston Bridge. The principal environmental risks are therefore likely to be contamination of surface waters by site-derived pollutants; and disturbance of sensitive species (e.g. from site lighting, noise, visual impact, vibration, etc.). Given the scale of the works, these risks can almost certainly be avoided or controlled through the normal project planning process and standard best-practice measures. The operation of the scheme would be within the terms of the existing licence, and is designed to minimise the unnecessary over-release of compensation flows from Llys y Fran. It will result in 'less' water passing down the Afon Cleddau as the compensation releases match the actual abstraction more closely, although licence conditions for compensation flows will be still be met and so (from an HRA perspective) the operational effects of altered compensation releases will be 'not significant' (as the licences have been previously assessed through the Review of Consents and are considered valid for the planning period).

Recommend Option?

Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures

Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Afonydd Cleddau/ Cleddau Rivers SAC	0/DS	Y	N	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		Y	N	Limited exposure to construction effects
Active raised bogs		N	N	Feature not exposed (location)
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	Feature not exposed (location)
Sea lamprey Petromyzon marinus		Y	N	Limited exposure to construction effects
Brook lamprey Lampetra planeri		Y	N	Limited exposure to construction effects
River lamprey Lampetra fluviatilis		Y	N	Limited exposure to construction effects
Bullhead Cottus gobio		Y	N	Limited exposure to construction effects
Otter Lutra lutra		Y	N	Limited exposure to construction effects
Pembrokeshire Marine/ Sir Benfro Forol SAC	1/DS	Y	N	
Sandbanks which are slightly covered by sea water all the time		N	N	Feature not exposed (location) / sensitive
Estuaries		Y	N	Limited exposure to construction effects
Mudflats and sandflats not covered by seawater at low tide		Y	N	Limited exposure to construction effects
Coastal lagoons		N	N	Feature not exposed (location)
Large shallow inlets and bays		Y	N	Limited exposure to construction effects
Reefs		N	N	Feature not exposed (location)
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		Y	N	Limited exposure to construction effects
Submerged or partially submerged sea caves		N	N	Feature not exposed (location) / sensitive
Sea lamprey Petromyzon marinus		Y	N	Limited exposure to construction effects
River lamprey Lampetra fluviatilis		Y	N	Limited exposure to construction effects
Allis shad Alosa alosa		Y	N	Limited exposure to construction effects
Twaite shad Alosa fallax		Y	N	Limited exposure to construction effects
Otter Lutra lutra		Y	N	Limited exposure to construction effects
Grey seal Halichoerus grypus		N	N	Feature not sensitive
Shore dock Rumex rupestris		N	N	Feature not exposed (location) / sensitive
Pembrokeshire Bat Sites and Bosherston Lakes/ Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston S	4	Y	N	
Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.		N	N	Feature not exposed (location)
Lesser horseshoe bat Rhinolophus hipposideros		Y	N	Limited exposure to construction effects
Greater horseshoe bat Rhinolophus ferrumequinum		Y	N	Limited exposure to construction effects
Otter Lutra lutra		Y	N	Limited exposure to construction effects
Yerbeston Tops SAC	5	N	N	
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	Feature not exposed (location)
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	Feature not exposed (location)
Bae Caerfyrddin/ Carmarthen Bay SPA	15	N	N	
Black (common) scoter Melanitta nigra		N	N	Feature not exposed (location)

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Carmarthen Bay and Estuaries/ Bae Caerfyrddin ac Aberoedd SAC	15	N	N	
Sandbanks which are slightly covered by sea water all the time		N	N	Feature not exposed (location)
Estuaries		N	N	Feature not exposed (location)
Mudflats and sandflats not covered by seawater at low tide		N	N	Feature not exposed (location)
Large shallow inlets and bays		N	N	Feature not exposed (location)
Salicornia and other annuals colonizing mud and sand		N	N	Feature not exposed (location)
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	N	Feature not exposed (location)
Sea lamprey Petromyzon marinus		N	N	Feature not exposed (location)
River lamprey Lampetra fluviatilis		N	N	Feature not exposed (location)
Allis shad Alosa alosa		N	N	Feature not exposed (location)
Twaite shad Alosa fallax		N	N	Feature not exposed (location)
Otter Lutra lutra		N	N	Feature not exposed (location)
Bristol Channel Approaches / Dynesfeydd Môr Hafren cSAC	15/DS	N	N	
Harbour porpoise Phocoena phocoena		N	N	Feature not exposed (location)
Carmarthen Bay Dunes/ Twyni Bae Caerfyrddin SAC	20	N	N	
Embryonic shifting dunes		N	N	Feature not exposed (location)
Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")		N	N	Feature not exposed (location)
Fixed coastal dunes with herbaceous vegetation ("grey dunes")		N	N	Feature not exposed (location)
Dunes with Salix repens ssp. argentea (Salicion arenariae)		N	N	Feature not exposed (location)
Humid dune slacks		N	N	Feature not exposed (location)
Narrow-mouthed whorl snail Vertigo angustior		N	N	Feature not exposed (location)
Petalwort Petalophyllum ralfsii		N	N	Feature not exposed (location)
Fen orchid Liparis loeselii		N	N	Feature not exposed (location)
Gweunydd Blaencleddau SAC	20	N	N	
Northern Atlantic wet heaths with Erica tetralix		N	N	Feature not exposed (location)
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	Feature not exposed (location)
Blanket bogs (* if active bog)		N	N	Feature not exposed (location)
Transition mires and quaking bogs		N	N	Feature not exposed (location)
Alkaline fens		N	N	Feature not exposed (location)
Southern damselfly Coenagrion mercuriale		N	N	Feature not exposed (location)
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	Feature not exposed (location)
Limestone Coast of South West Wales/ Arfordir Calchfaen de Orllewin Cymru SAC	20	Y	N	
Vegetated sea cliffs of the Atlantic and Baltic Coasts		N	N	Feature not exposed (location)
Fixed coastal dunes with herbaceous vegetation ("grey dunes")		N	N	Feature not exposed (location)
European dry heaths		N	N	Feature not exposed (location)
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid site		N	N	Feature not exposed (location)
Caves not open to the public		N	N	Feature not exposed (location)
Submerged or partially submerged sea caves		N	N	Feature not exposed (location)
Greater horseshoe bat Rhinolophus ferrumequinum		Y	N	Limited exposure to construction effects
Petalwort Petalophyllum ralfsii		N	N	Feature not exposed (location)
Early gentian Gentianella anglica		N	N	Feature not exposed (location)
North Pembrokeshire Woodlands/ Coedydd Gogledd Sir Benfro SAC	20	Y	N	
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Feature not exposed (location)
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	Feature not exposed (location)
Barbastelle Barbastella barbastellus		Y	N	Limited exposure to construction effects
Preseli SAC	20	N	N	
Northern Atlantic wet heaths with Erica tetralix		N	N	Feature not exposed (location)
European dry heaths		N	N	Feature not exposed (location)
Depressions on peat substrates of the Rhynchosporion		N	N	Feature not exposed (location)
Alkaline fens		N	N	Feature not exposed (location)
Southern damselfly Coenagrion mercuriale		N	N	Feature not exposed (location)
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	Feature not exposed (location)
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus		N	N	Feature not exposed (location)

PEM024b

Canaston Pumping Station

Option Summary

Options PEM024b is a relatively minor asset upgrade that would allow finer control of abstraction volumes from the Afon Cleddau, and hence reduce unnecessary over-release of compensation flows from Llys-y-Fran reservoir. The Option aims to minimise this over-release of water by configuring the pumps so that the rate of abstraction from the river is close to constant in a given day during periods of resource optimisation, which minimises the difference between the maximum rate of abstraction and the total daily abstraction. This will require a new low-lift pump set with a variable pump rate between 30 Ml/d and 55 Ml/d, and an increase in the bankside storage volume to attenuate the impact of the high-lift pump abstraction rate, such that the low-lift pumps can pump at a constant rate equivalent to the total abstraction. This would then allow water to be conserved within the Llys y Fran reservoir by matching compensation releases to actual abstraction. No changes to the abstraction licence would be required.

General Assessment

The construction works for both options are relatively small-scale, but would be in close proximity to the Afonydd Cleddau/ Cleddau Rivers SAC at Canaston Bridge. The principal environmental risks are therefore likely to be contamination of surface waters by site-derived pollutants; and disturbance of sensitive species (e.g. from site lighting, noise, visual impact, vibration, etc.). Given the scale of the works, these risks can almost certainly be avoided or controlled through the normal project planning process and standard best-practice measures. The operation of the scheme would be within the terms of the existing licence, and is designed to minimise the unnecessary over-release of compensation flows from Llys y Fran. It will result in 'less' water passing down the Afon Cleddau as the compensation releases match the actual abstraction more closely, although licence conditions for compensation flows will be still be met and so (from an HRA perspective) the operational effects of altered compensation releases will be 'not significant' (as the licences have been previously assessed through the Review of Consents and are considered valid for the planning period).

Recommend Option?

Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures

Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Afonydd Cleddau/ Cleddau Rivers SAC	0/DS	Y	N	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		Y	N	Limited exposure to construction effects
Active raised bogs		N	N	Feature not exposed (location)
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	Feature not exposed (location)
Sea lamprey Petromyzon marinus		Y	N	Limited exposure to construction effects
Brook lamprey Lampetra planeri		Y	N	Limited exposure to construction effects
River lamprey Lampetra fluviatilis		Y	N	Limited exposure to construction effects
Bullhead Cottus gobio		Y	N	Limited exposure to construction effects
Otter Lutra lutra		Y	N	Limited exposure to construction effects
Pembrokeshire Marine/ Sir Benfro Forol SAC	1/DS	Y	N	
Sandbanks which are slightly covered by sea water all the time		N	N	Feature not exposed (location) / sensitive
Estuaries		Y	N	Limited exposure to construction effects
Mudflats and sandflats not covered by seawater at low tide		Y	N	Limited exposure to construction effects
Coastal lagoons		N	N	Feature not exposed (location)
Large shallow inlets and bays		Y	N	Limited exposure to construction effects
Reefs		N	N	Feature not exposed (location)
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		Y	N	Limited exposure to construction effects
Submerged or partially submerged sea caves		N	N	Feature not exposed (location) / sensitive
Sea lamprey Petromyzon marinus		Y	N	Limited exposure to construction effects
River lamprey Lampetra fluviatilis		Y	N	Limited exposure to construction effects
Allis shad Alosa alosa		Y	N	Limited exposure to construction effects
Twaite shad Alosa fallax		Y	N	Limited exposure to construction effects
Otter Lutra lutra		Y	N	Limited exposure to construction effects
Grey seal Halichoerus grypus		N	N	Feature not sensitive
Shore dock Rumex rupestris		N	N	Feature not exposed (location) / sensitive
Pembrokeshire Bat Sites and Bosherston Lakes/ Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston S	4	Y	N	
Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.		N	N	Feature not exposed (location)
Lesser horseshoe bat Rhinolophus hipposideros		Y	N	Limited exposure to construction effects
Greater horseshoe bat Rhinolophus ferrumequinum		Y	N	Limited exposure to construction effects
Otter Lutra lutra		Y	N	Limited exposure to construction effects
Yerbeston Tops SAC	5	N	N	
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	Feature not exposed (location)
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	Feature not exposed (location)
Bae Caerfyrddin/ Carmarthen Bay SPA	15	N	N	
Black (common) scoter Melanitta nigra		N	N	Feature not exposed (location)

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Carmarthen Bay and Estuaries/ Bae Caerfyrddin ac Aberoedd SAC	15	N	N	
Sandbanks which are slightly covered by sea water all the time		N	N	Feature not exposed (location)
Estuaries		N	N	Feature not exposed (location)
Mudflats and sandflats not covered by seawater at low tide		N	N	Feature not exposed (location)
Large shallow inlets and bays		N	N	Feature not exposed (location)
Salicornia and other annuals colonizing mud and sand		N	N	Feature not exposed (location)
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	N	Feature not exposed (location)
Sea lamprey Petromyzon marinus		N	N	Feature not exposed (location)
River lamprey Lampetra fluviatilis		N	N	Feature not exposed (location)
Allis shad Alosa alosa		N	N	Feature not exposed (location)
Twaite shad Alosa fallax		N	N	Feature not exposed (location)
Otter Lutra lutra		N	N	Feature not exposed (location)
Bristol Channel Approaches / Dynesfeydd Môr Hafren cSAC	15/DS	N	N	
Harbour porpoise Phocoena phocoena		N	N	Feature not exposed (location)
Carmarthen Bay Dunes/ Twyni Bae Caerfyrddin SAC	20	N	N	
Embryonic shifting dunes		N	N	Feature not exposed (location)
Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")		N	N	Feature not exposed (location)
Fixed coastal dunes with herbaceous vegetation ("grey dunes")		N	N	Feature not exposed (location)
Dunes with Salix repens ssp. argentea (Salicion arenariae)		N	N	Feature not exposed (location)
Humid dune slacks		N	N	Feature not exposed (location)
Narrow-mouthed whorl snail Vertigo angustior		N	N	Feature not exposed (location)
Petalwort Petalophyllum ralfsii		N	N	Feature not exposed (location)
Fen orchid Liparis loeselii		N	N	Feature not exposed (location)
Gweunydd Blaencleddau SAC	20	N	N	
Northern Atlantic wet heaths with Erica tetralix		N	N	Feature not exposed (location)
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	Feature not exposed (location)
Blanket bogs (* if active bog)		N	N	Feature not exposed (location)
Transition mires and quaking bogs		N	N	Feature not exposed (location)
Alkaline fens		N	N	Feature not exposed (location)
Southern damselfly Coenagrion mercuriale		N	N	Feature not exposed (location)
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	Feature not exposed (location)
Limestone Coast of South West Wales/ Arfordir Calchfaen de Orllewin Cymru SAC	20	Y	N	
Vegetated sea cliffs of the Atlantic and Baltic Coasts		N	N	Feature not exposed (location)
Fixed coastal dunes with herbaceous vegetation ("grey dunes")		N	N	Feature not exposed (location)
European dry heaths		N	N	Feature not exposed (location)
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid site		N	N	Feature not exposed (location)
Caves not open to the public		N	N	Feature not exposed (location)
Submerged or partially submerged sea caves		N	N	Feature not exposed (location)
Greater horseshoe bat Rhinolophus ferrumequinum		Y	N	Limited exposure to construction effects
Petalwort Petalophyllum ralfsii		N	N	Feature not exposed (location)
Early gentian Gentianella anglica		N	N	Feature not exposed (location)
North Pembrokeshire Woodlands/ Coedydd Gogledd Sir Benfro SAC	20	Y	N	
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Feature not exposed (location)
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	Feature not exposed (location)
Barbastelle Barbastella barbastellus		Y	N	Limited exposure to construction effects
Preseli SAC	20	N	N	
Northern Atlantic wet heaths with Erica tetralix		N	N	Feature not exposed (location)
European dry heaths		N	N	Feature not exposed (location)
Depressions on peat substrates of the Rhynchosporion		N	N	Feature not exposed (location)
Alkaline fens		N	N	Feature not exposed (location)
Southern damselfly Coenagrion mercuriale		N	N	Feature not exposed (location)
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	Feature not exposed (location)
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus		N	N	Feature not exposed (location)

SEW004

New GW abstraction SE Wales, new WTW

Option Summary

40Ml/d of raw water to be abstracted from Great Spring using existing Network Rail pumps at Sudbrook. Raw water to be delivered to a new WTW sited at the Old Paper Mill. The new WTW will be rated for 40Ml/d and use Nanofiltration combined with a GAC to produce softened water. The potable water will be pumped 4km north to the A48 main where the flow will be split, with a minimum of 16Ml/d going West to Catsash SRV via booster pumps, and 14Ml/d going East to Crosssway Green SRV. The DO is

General Assessment

This option was assessed in detail as a preferred option during early iterations of the 2011 WRMP. The assessment concluded that construction impacts could be avoided with best-practice, but there was a degree of uncertainty over the likely effects of the abstraction on the Severn Estuary sites, and the mobile interest features of the River Wye SAC. However, it is apparent that the freshwater input from the Great Spring is negligible in comparison to that from other sources, and the high tidal flux of the estuary is likely to ensure that any effects are local and small-scale only.

Recommend Option?

Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures

Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Severn Estuary Ramsar	I/DS	N	U	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
3 - supports populations of plant/animal species important for maintaining regional biodiversity Crit. 3 - supports popul		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
4 - supports plant/animal species at a critical stage in their life cycles, or provides refuge Crit. 4 - supports plant/animal		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
5 - regularly supports 20,000 or more waterbirds Crit. 5 - regularly supports 20,000 or more waterbirds		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds Crit. 6 - regularly su		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
8 - important source of food for fishes, spawning ground, nursery and/or migration path Crit. 8 - important source of food for		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Severn Estuary SPA	I/DS	N	U	
Tundra swan Cygnus columbianus bewickii		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Common shelduck Tadorna tadorna		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Gadwall Anas strepera		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Common redshank Tringa totanus		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Greater white-fronted goose Anser albifrons albifrons		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Dunlin Calidris alpina alpina		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Waterfowl assemblage Waterfowl assemblage		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Severn Estuary/ Môr Hafren SAC	I/DS	N	U	
Sandbanks which are slightly covered by sea water all the time		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Estuaries		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Mudflats and sandflats not covered by seawater at low tide		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Reefs		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Sea lamprey Petromyzon marinus		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
River lamprey Lampetra fluviatilis		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Twaite shad Alosa fallax		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
River Wye/ Afon Gwy SAC	10	N	U	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	No impact pathways
Transition mires and quaking bogs		N	N	No impact pathways
White-clawed (or Atlantic stream) crayfish Austropotamobius pallipes		N	N	No impact pathways
Sea lamprey Petromyzon marinus		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Brook lamprey Lampetra planeri		N	N	No impact pathways
River lamprey Lampetra fluviatilis		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Allis shad Alosa alosa		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Twaite shad Alosa fallax		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Atlantic salmon Salmo salar		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Bullhead Cottus gobio		N	N	No impact pathways
Otter Lutra lutra		N	N	No impact pathways
Wye Valley Woodlands/ Coetiroedd Dyffryn Gwy SAC	10	N	N	
Asperulo-Fagetum beech forests		N	N	No impact pathways
Tilio-Acerion forests of slopes, screes and ravines		N	N	No impact pathways
Taxus baccata woods of the British Isles		N	N	No impact pathways
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Construction effects avoidable with established measures.
Avon Gorge Woodlands SAC	15	N	N	
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid site		N	N	No impact pathways
Tilio-Acerion forests of slopes, screes and ravines		N	N	No impact pathways
River Usk/ Afon Wysg SAC	20	N	U	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	No impact pathways
Sea lamprey Petromyzon marinus		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Brook lamprey Lampetra planeri		N	N	No impact pathways
River lamprey Lampetra fluviatilis		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Allis shad Alosa alosa		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Twaite shad Alosa fallax		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Atlantic salmon Salmo salar		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Bullhead Cottus gobio		N	N	No impact pathways
Otter Lutra lutra		N	N	No impact pathways
Wye Valley and Forest of Dean Bat Sites/ Safleoedd Ystlumod Dyffryn Gwy a Fforest y Ddena SAC	20	N	N	
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Construction effects avoidable with established measures.
Greater horseshoe bat Rhinolophus ferrumequinum		N	N	Construction effects avoidable with established measures.

SEW005a

Great Spring and upgrade Court Farm (or Sluvad) WTW

Option Summary

Up to 40Ml/d of additional water will be abstracted from the Great Spring and the existing Network Rail pumps will pump it to a new pumping station at DCWW's Sudbrook WTW. This will deliver 40Ml/d of raw water to Court Farm reservoir, via 22km of new 700mm dia raw water main, running south of the M4. From Court Farm reservoir, 15.5Ml/d will be treated at an extension to the WTW. This will be built on DCWW owned land in the field to the west of the WTW. The treatment process will include nanofiltration combined with a GAC to produce 13Ml/d of softened water. Currently, Court Farm output is restricted to 110Ml/d output due to surge issues. A new 65m3 surge vessel (5) will be constructed at Court Farm WTW to allow the WTW to operate at its licensed capacity of 127Ml/d. This should allow an additional 19.5Ml/d to be treated in the existing works, with an additional output of 17Ml/d. This scheme will result in an additional 30Ml/d of DO, which will be distributed using the existing network. A cost has been allowed for upgrading 200mm of rising main under the river Usk, in order to free up the current restriction of 29-30Ml/d maximum east towards Catsash, due to an old concrete main.

General Assessment

Previous assessments of the Great Spring resource have concluded that there is a degree of uncertainty over the likely effects of the abstraction on the Severn Estuary sites, and the mobile interest features of the River Wye SAC. However, it is apparent that the freshwater input from the Great Spring is negligible in comparison to that from other sources, and the high tidal flux of the estuary is likely to ensure that any effects are local and small-scale only. The water main requiring upgrade crosses with the River Usk / Afon Wysg SAC and therefore further information and Site specific detailed design is required to avoid any likely significant effects to the designated site. Lesser and greater horseshoe bats associated with Wye Valley Woodlands/ Coetiroedd Dyffryn Gwy SAC and Wye Valley and Forest of Dean Bat Sites/ Safleoedd Ystlumod Dyffryn Gwy a Fforest y Ddena SAC are also vulnerable to construction works. Detailed information and site specific detailed design are required to determine effects of Scheme and to avoid

Recommend Option?

Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures

Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
River Usk/ Afon Wysg SAC	0	N	U	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Sea lamprey Petromyzon marinus		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Brook lamprey Lampetra planeri		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
River lamprey Lampetra fluviatilis		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Allis shad Alosa alosa		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Twaite shad Alosa fallax		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Atlantic salmon Salmo salar		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Bullhead Cottus gobio		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Otter Lutra lutra		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Severn Estuary Ramsar	I/DS	N	U	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
3 - supports populations of plant/animal species important for maintaining regional biodiversity Crit. 3 - supports popul		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
4 - supports plant/animal species at a critical stage in their life cycles, or provides refuge Crit. 4 - supports plant/animal		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
5 - regularly supports 20,000 or more waterbirds Crit. 5 - regularly supports 20,000 or more waterbirds		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds Crit. 6 - regularly su		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
8 - important source of food for fishes, spawning ground, nursery and/or migration path Crit. 8 - important source of food for		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Severn Estuary SPA	I/DS	N	U	
Tundra swan Cygnus columbianus bewickii		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Common shelduck Tadorna tadorna		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Gadwall Anas strepera		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Common redshank Tringa totanus		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Greater white-fronted goose Anser albifrons albifrons		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Dunlin Calidris alpina alpina		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Waterfowl assemblage Waterfowl assemblage		N	N	No impact pathways
Severn Estuary/ Môr Hafren SAC	1/DS	N	U	
Sandbanks which are slightly covered by sea water all the time		N	N	No impact pathways
Estuaries		N	N	No impact pathways
Mudflats and sandflats not covered by seawater at low tide		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Reefs		N	N	No impact pathways
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Sea lamprey Petromyzon marinus		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
River lamprey Lampetra fluviatilis		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Twaite shad Alosa fallax		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
River Wye/ Afon Gwy SAC	10	N	U	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	No impact pathways
Transition mires and quaking bogs		N	N	No impact pathways
White-clawed (or Atlantic stream) crayfish Austropotamobius pallipes		N	N	No impact pathways
Sea lamprey Petromyzon marinus		N	N	No impact pathways
Brook lamprey Lampetra planeri		N	N	No impact pathways
River lamprey Lampetra fluviatilis		N	N	No impact pathways
Allis shad Alosa alosa		N	N	No impact pathways
Twaite shad Alosa fallax		N	N	No impact pathways
Atlantic salmon Salmo salar		N	N	No impact pathways
Bullhead Cottus gobio		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Otter Lutra lutra		N	N	No impact pathways
Wye Valley Woodlands/ Coetiroedd Dyffryn Gwy SAC	10	N	U	
Asperulo-Fagetum beech forests		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Tilio-Acerion forests of slopes, screes and ravines		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Taxus baccata woods of the British Isles		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Lesser horseshoe bat Rhinolophus hipposideros		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Avon Gorge Woodlands SAC	15	N	N	
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid site		N	N	No impact pathways
Tilio-Acerion forests of slopes, screes and ravines		N	N	No impact pathways
Aberbargoed Grasslands SAC	20	N	N	
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	Construction effects avoidable with established measures.
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	Construction effects avoidable with established measures.
Usk Bat Sites/ Safleoedd Ystlumod Wysg SAC	20	N	N	
European dry heaths		N	N	No impact pathways
Degraded raised bogs still capable of natural regeneration		N	N	No impact pathways
Blanket bogs (* if active bog)		N	N	No impact pathways
Calcareous rocky slopes with chasmophytic vegetation		N	N	No impact pathways
Caves not open to the public		N	N	No impact pathways
Tilio-Acerion forests of slopes, screes and ravines		N	N	No impact pathways
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Construction effects avoidable with established measures.
Wye Valley and Forest of Dean Bat Sites/ Safleoedd Ystlumod Dyffryn Gwy a Fforest y Ddena SAC	20	N	N	
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Construction effects avoidable with established measures.
Greater horseshoe bat Rhinolophus ferrumequinum		N	N	Construction effects avoidable with established measures.

SEW005b

Great Spring via Sudbrook WTW to Court Farm WTW - 17Mld

Option Summary

20Ml/d of additional water will be abstracted from the Great Spring and the existing Network Rail pumps will pump it to a new pumping station at DCWW's Sudbrook WTW. This will deliver 20Ml/d of raw water to Court Farm reservoir, via 22km of new 500mm dia raw water main, running south of the M4. Currently, Court Farm output is restricted to 110Ml/d output due to surge issues. A new 65m3 surge vessel (5) will be constructed at Court Farm WTW to allow the WTW to operate at its licensed capacity of 127Ml/d. This should allow an additional 19.5Ml/d to be treated in the existing works, with an additional output of 17Ml/d. The DO of 17Ml/d will be distributed using the existing network. A cost has been allowed for upgrading 200mm of rising main under the river Usk, in order to free up the current restriction of 29-30Ml/d maximum east towards Catsash, due to an old concrete main.

General Assessment

Previous assessments of the Great Spring resource have concluded that there is a degree of uncertainty over the likely effects of the abstraction on the Severn Estuary sites, and the mobile interest features of the River Wye SAC. However, it is apparent that the freshwater input from the Great Spring is negligible in comparison to that from other sources, and the high tidal flux of the estuary is likely to ensure that any effects are local and small-scale only. The water main requiring upgrade crosses with the River Usk / Afon Wysg SAC and therefore further information and Site specific detailed design is required to avoid any likely significant effects to the designated site. Lesser and greater horseshoe bats associated with Wye Valley Woodlands/ Coetiroedd Dyffryn Gwy SAC and Wye Valley and Forest of Dean Bat Sites/ Safleoedd Ystlumod Dyffryn Gwy a Fforest y Ddena SAC are also vulnerable to construction works. Detailed information and site specific detailed design are required to determine effects of Scheme and to avoid

Recommend Option?

Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures

Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
River Usk/ Afon Wysg SAC	0	N	U	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Sea lamprey Petromyzon marinus		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Brook lamprey Lampetra planeri		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
River lamprey Lampetra fluviatilis		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Allis shad Alosa alosa		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Twaite shad Alosa fallax		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Atlantic salmon Salmo salar		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Bullhead Cottus gobio		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Otter Lutra lutra		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Severn Estuary Ramsar	I/DS	N	U	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
3 - supports populations of plant/animal species important for maintaining regional biodiversity Crit. 3 - supports popul		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
4 - supports plant/animal species at a critical stage in their life cycles, or provides refuge Crit. 4 - supports plant/animal		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
5 - regularly supports 20,000 or more waterbirds Crit. 5 - regularly supports 20,000 or more waterbirds		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds Crit. 6 - regularly su		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
8 - important source of food for fishes, spawning ground, nursery and/or migration path Crit. 8 - important source of food for		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Severn Estuary SPA	I/DS	N	U	
Tundra swan Cygnus columbianus bewickii		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Common shelduck Tadorna tadorna		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Gadwall Anas strepera		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Common redshank Tringa totanus		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Greater white-fronted goose Anser albifrons albifrons		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Dunlin Calidris alpina alpina		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Waterfowl assemblage Waterfowl assemblage		N	N	No impact pathways
Severn Estuary/ Môr Hafren SAC	1/DS	N	U	
Sandbanks which are slightly covered by sea water all the time		N	N	No impact pathways
Estuaries		N	N	No impact pathways
Mudflats and sandflats not covered by seawater at low tide		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Reefs		N	N	No impact pathways
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Sea lamprey Petromyzon marinus		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
River lamprey Lampetra fluviatilis		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Twaite shad Alosa fallax		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
River Wye/ Afon Gwy SAC	10	N	U	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	No impact pathways
Transition mires and quaking bogs		N	N	No impact pathways
White-clawed (or Atlantic stream) crayfish Austropotamobius pallipes		N	N	No impact pathways
Sea lamprey Petromyzon marinus		N	N	No impact pathways
Brook lamprey Lampetra planeri		N	N	No impact pathways
River lamprey Lampetra fluviatilis		N	N	No impact pathways
Allis shad Alosa alosa		N	N	No impact pathways
Twaite shad Alosa fallax		N	N	No impact pathways
Atlantic salmon Salmo salar		N	N	No impact pathways
Bullhead Cottus gobio		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Otter Lutra lutra		N	N	No impact pathways
Wye Valley Woodlands/ Coetiroedd Dyffryn Gwy SAC	10	N	U	
Asperulo-Fagetum beech forests		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Tilio-Acerion forests of slopes, screes and ravines		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Taxus baccata woods of the British Isles		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Lesser horseshoe bat Rhinolophus hipposideros		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Avon Gorge Woodlands SAC	15	N	N	
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid site		N	N	No impact pathways
Tilio-Acerion forests of slopes, screes and ravines		N	N	No impact pathways
Aberbargoed Grasslands SAC	20	N	N	
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	Construction effects avoidable with established measures.
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	Construction effects avoidable with established measures.
Usk Bat Sites/ Safleoedd Ystlumod Wysg SAC	20	N	N	
European dry heaths		N	N	No impact pathways
Degraded raised bogs still capable of natural regeneration		N	N	No impact pathways
Blanket bogs (* if active bog)		N	N	No impact pathways
Calcareous rocky slopes with chasmophytic vegetation		N	N	No impact pathways
Caves not open to the public		N	N	No impact pathways
Tilio-Acerion forests of slopes, screes and ravines		N	N	No impact pathways
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Construction effects avoidable with established measures.
Wye Valley and Forest of Dean Bat Sites/ Safleoedd Ystlumod Dyffryn Gwy a Fforest y Ddena SAC	20	N	N	
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Construction effects avoidable with established measures.
Greater horseshoe bat Rhinolophus ferrumequinum		N	N	Construction effects avoidable with established measures.

SEW005c

Great Spring Source pumped to Llandegfedd

Option Summary

Up to 40Ml/d of additional water will be abstracted from the Great Spring and the existing Network Rail pumps will pump it to a new pumping station at DCWW's Sudbrook WTW. This will deliver up to 40Ml/d of raw water to Court Farm reservoir, via 22km of new 700mm dia raw water main, running south of the M4. From Court Farm reservoir, 38Ml/d will be transferred up to Llandegfedd reservoir, along the existing 42" water main. It will be treated at Llandegfedd. Any additional water at Court farm will reduce the requirement for other sources to supply Court Farm. This scheme will result in an additional 30Ml/d of DO, which will be distributed using the existing network from Llandegfedd.

General Assessment

Previous assessments of the Great Spring resource have concluded that there is a degree of uncertainty over the likely effects of the abstraction on the Severn Estuary sites, and the mobile interest features of the River Wye SAC. However, it is apparent that the freshwater input from the Great Spring is negligible in comparison to that from other sources, and the high tidal flux of the estuary is likely to ensure that any effects are local and small-scale only. The water main requiring upgrade crosses with the River Usk / Afon Wysg SAC and therefore further information and Site specific detailed design is required to avoid any likely significant effects to the designated site. Lesser and greater horseshoe bats associated with Wye Valley Woodlands/ Coetiroedd Dyffryn Gwy SAC and Wye Valley and Forest of Dean Bat Sites/ Safleoedd Ystlumod Dyffryn Gwy a Fforest y Ddena SAC are also vulnerable to construction works. Detailed information and site specific detailed design are required to determine effects of Scheme and to avoid

Recommend Option?

Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures

Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
River Usk/ Afon Wysg SAC	0	N	U	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Sea lamprey Petromyzon marinus		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Brook lamprey Lampetra planeri		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
River lamprey Lampetra fluviatilis		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Allis shad Alosa alosa		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Twaite shad Alosa fallax		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Atlantic salmon Salmo salar		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Bullhead Cottus gobio		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Otter Lutra lutra		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Severn Estuary Ramsar	I/DS	N	U	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
3 - supports populations of plant/animal species important for maintaining regional biodiversity Crit. 3 - supports popul		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
4 - supports plant/animal species at a critical stage in their life cycles, or provides refuge Crit. 4 - supports plant/animal		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
5 - regularly supports 20,000 or more waterbirds Crit. 5 - regularly supports 20,000 or more waterbirds		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds Crit. 6 - regularly su		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
8 - important source of food for fishes, spawning ground, nursery and/or migration path Crit. 8 - important source of food for		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Severn Estuary SPA	I/DS	N	U	
Tundra swan Cygnus columbianus bewickii		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Common shelduck Tadorna tadorna		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Gadwall Anas strepera		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Common redshank Tringa totanus		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Greater white-fronted goose Anser albifrons albifrons		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Dunlin Calidris alpina alpina		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Waterfowl assemblage Waterfowl assemblage		N	N	No impact pathways
Severn Estuary/ Môr Hafren SAC	1/DS	N	U	
Sandbanks which are slightly covered by sea water all the time		N	N	No impact pathways
Estuaries		N	N	No impact pathways
Mudflats and sandflats not covered by seawater at low tide		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Reefs		N	N	No impact pathways
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Sea lamprey Petromyzon marinus		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
River lamprey Lampetra fluviatilis		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Twaite shad Alosa fallax		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
River Wye/ Afon Gwy SAC	10	N	U	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	No impact pathways
Transition mires and quaking bogs		N	N	No impact pathways
White-clawed (or Atlantic stream) crayfish Austropotamobius pallipes		N	N	No impact pathways
Sea lamprey Petromyzon marinus		N	N	No impact pathways
Brook lamprey Lampetra planeri		N	N	No impact pathways
River lamprey Lampetra fluviatilis		N	N	No impact pathways
Allis shad Alosa alosa		N	N	No impact pathways
Twaite shad Alosa fallax		N	N	No impact pathways
Atlantic salmon Salmo salar		N	N	No impact pathways
Bullhead Cottus gobio		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Otter Lutra lutra		N	N	No impact pathways
Wye Valley Woodlands/ Coetiroedd Dyffryn Gwy SAC	10	N	U	
Asperulo-Fagetum beech forests		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Tilio-Acerion forests of slopes, screes and ravines		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Taxus baccata woods of the British Isles		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Lesser horseshoe bat Rhinolophus hipposideros		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Avon Gorge Woodlands SAC	15	N	N	
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid site		N	N	No impact pathways
Tilio-Acerion forests of slopes, screes and ravines		N	N	No impact pathways
Aberbargoed Grasslands SAC	20	N	N	
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	Construction effects avoidable with established measures.
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	Construction effects avoidable with established measures.
Usk Bat Sites/ Safleoedd Ystlumod Wysg SAC	20	N	N	
European dry heaths		N	N	No impact pathways
Degraded raised bogs still capable of natural regeneration		N	N	No impact pathways
Blanket bogs (* if active bog)		N	N	No impact pathways
Calcareous rocky slopes with chasmophytic vegetation		N	N	No impact pathways
Caves not open to the public		N	N	No impact pathways
Tilio-Acerion forests of slopes, screes and ravines		N	N	No impact pathways
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Construction effects avoidable with established measures.
Wye Valley and Forest of Dean Bat Sites/ Safleoedd Ystlumod Dyffryn Gwy a Fforest y Ddena SAC	20	N	N	
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Construction effects avoidable with established measures.
Greater horseshoe bat Rhinolophus ferrumequinum		N	N	Construction effects avoidable with established measures.

SEW007

Dam raising at Talybont

Option Summary

This scheme would raise Talybont Reservoir by 1 m to increase storage capacity. DO increases unknown (awaiting DO modelling). This option does not address Trunk Main upgrades to realise the available treatment capacity at the Talybont WTW. Assumes that Trunk Main upgrades are covered elsewhere in DCWW network upgrades.

General Assessment

Raise the Talybont Reservoir by 1m to increase storage capacity. Talybont reservoir sits at the head of the River Usk which will be very vulnerable to construction effects (although adverse effects can probably be avoided with appropriate design and measures). Works may need to be timed to avoid salmon (associated with the River Usk / Afon Wysg SAC) migration. Lesser horseshoe bats (associated with Usk Bat Sites/ Safleoedd Ystlumod Wysg SAC) need to be considered. Detailed site-specific design is required to ensure no significant effect to the species. It is assumedt that existing operation will be maintained including any compensation releases, and the raising of the dam may increase the resilence of the Usk in this regard.

Recommend Option?

Construction: Uncertain - significant effects cannot be excluded and may require the identification of bespoke mitigation measures or amendments to scheme design at the plan level

Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
River Usk/ Afon Wysg SAC	1/DS	U	N	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		U	N	Likely scale of construction means site is very vulnerable, but adverse effects can probably be avoided through scheme
Sea lamprey Petromyzon marinus		U	N	Likely scale of construction means site is very vulnerable, but adverse effects can probably be avoided through scheme
Brook lamprey Lampetra planeri		U	N	Likely scale of construction means site is very vulnerable, but adverse effects can probably be avoided through scheme
River lamprey Lampetra fluviatilis		U	N	Likely scale of construction means site is very vulnerable, but adverse effects can probably be avoided through scheme
Allis shad Alosa alosa		U	N	Likely scale of construction means site is very vulnerable, but adverse effects can probably be avoided through scheme
Twaite shad Alosa fallax		U	N	Likely scale of construction means site is very vulnerable, but adverse effects can probably be avoided through scheme
Atlantic salmon Salmo salar		U	N	Likely scale of construction means site is very vulnerable, but adverse effects can probably be avoided through scheme
Bullhead Cottus gobio		U	N	Likely scale of construction means site is very vulnerable, but adverse effects can probably be avoided through scheme
Otter Lutra lutra		U	N	Likely scale of construction means site is very vulnerable, but adverse effects can probably be avoided through scheme
Usk Bat Sites/ Safleoedd Ystlumod Wysg SAC	3	U	N	
European dry heaths		N	N	Feature not exposed to the effects of construction / operation due to the lack of an impact pathway. The Sites fragments are separated from the Scheme by the River Usk and Afon Crawnon.
Degraded raised bogs still capable of natural regeneration		N	N	Feature not exposed to the effects of construction / operation due to the lack of an impact pathway. The Sites fragments are separated from the Scheme by the River Usk and Afon Crawnon.
Blanket bogs (* if active bog)		N	N	Feature not exposed to the effects of construction / operation due to the lack of an impact pathway. The Sites fragments are separated from the Scheme by the River Usk and Afon Crawnon.
Calcareous rocky slopes with chasmophytic vegetation		N	N	Feature not exposed to the effects of construction / operation due to the lack of an impact pathway. The Sites fragments are separated from the Scheme by the River Usk and Afon Crawnon.
Caves not open to the public		N	N	Feature not exposed to the effects of construction / operation due to the lack of an impact pathway. The Sites fragments are separated from the Scheme by the River Usk and Afon Crawnon.
Tilio-Acerion forests of slopes, screes and ravines		N	N	Feature not exposed to the effects of construction / operation due to the lack of an impact pathway. The Sites fragments are separated from the Scheme by the River Usk and Afon Crawnon.
Lesser horseshoe bat Rhinolophus hipposideros		U	N	Feature potentially vulnerable to effects of construction as bat foraging / commuting flight pathways may be impacts. Scheme specific mitigation and detailed design are required to avoid significant effects.
Brecon Beacons/ Bannau Brycheiniog SAC	10	N	N	
European dry heaths		N	N	Site not exposed to likely effects of Scheme due to significant distance apart.
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels		N	N	Site not exposed to likely effects of Scheme due to significant distance apart.
Calcareous rocky slopes with chasmophytic vegetation		N	N	Site not exposed to likely effects of Scheme due to significant distance apart.
Siliceous rocky slopes with chasmophytic vegetation		N	N	Site not exposed to likely effects of Scheme due to significant distance apart.
Cwm Cadlan SAC	15	N	N	
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	Site not exposed to likely effects of Scheme due to significant distance apart.
Alkaline fens		N	N	Site not exposed to likely effects of Scheme due to significant distance apart.
Cwm Clydach Woodlands / Coedydd Cwm Clydach SAC	15	N	N	
Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or		N	N	Site not exposed to likely effects of Scheme due to significant distance apart.
Asperulo-Fagetum beech forests		N	N	Site not exposed to likely effects of Scheme due to significant distance apart.
Drostre Bank SAC	15	N	N	
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	Site not exposed to likely effects of Scheme due to significant distance apart.
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	Site not exposed to likely effects of Scheme due to significant distance apart.
River Wye/ Afon Gwy SAC	15	N	N	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	Site not exposed to likely effects of Scheme due to significant distance apart and lack of impact pathway

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
Transition mires and quaking bogs		N	N	Site not exposed to likely effects of Scheme due to significant distance apart and lack of impact pathway
White-clawed (or Atlantic stream) crayfish Austropotamobius pallipes		N	N	Feature not exposed to likely effects of Scheme due to significant distance apart and lack of impact pathway
Sea lamprey Petromyzon marinus		N	N	Feature not exposed to likely effects of Scheme due to significant distance apart and lack of impact pathway
Brook lamprey Lampetra planeri		N	N	Feature not exposed to likely effects of Scheme due to significant distance apart and lack of impact pathway
River lamprey Lampetra fluviatilis		N	N	Feature not exposed to likely effects of Scheme due to significant distance apart and lack of impact pathway
Allis shad Alosa alosa		N	N	Feature not exposed to likely effects of Scheme due to significant distance apart and lack of impact pathway
Twaite shad Alosa fallax		N	N	Feature not exposed to likely effects of Scheme due to significant distance apart and lack of impact pathway
Atlantic salmon Salmo salar		N	N	Feature not exposed to likely effects of Scheme due to significant distance apart and lack of impact pathway
Bullhead Cottus gobio		N	N	Feature not exposed to likely effects of Scheme due to significant distance apart and lack of impact pathway
Otter Lutra lutra		N	N	Feature not exposed to likely effects of Scheme due to significant distance apart and lack of impact pathway
Aberbargoed Grasslands SAC	20	N	N	
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	Site not exposed to likely effects of Scheme due to significant distance apart and lack of impact pathway
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	Feature not exposed to likely effects of Scheme due to significant distance apart and lack of impact pathway
Blaen Cynon SAC	20	N	N	
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	Feature not exposed to likely effects of Scheme due to significant distance apart and lack of impact pathway
Coed y Cerrig SAC	20	N	N	
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	Site not exposed to likely effects of Scheme due to significant distance apart and lack of impact pathway
Coedydd Nedd a Mellte SAC	20	N	N	
Tilio-Acerion forests of slopes, screes and ravines		N	N	Site not exposed to likely effects of Scheme due to significant distance apart and lack of impact pathway
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Site not exposed to likely effects of Scheme due to significant distance apart and lack of impact pathway
Sugar Loaf Woodlands SAC	20	N	N	
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Site not exposed to likely effects of Scheme due to significant distance apart and lack of impact pathway
Severn Estuary Ramsar	DS	N	N	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	N	Site unlikely to be impacted by Scheme due to significant distance and measures required for the Usk will safeguard.
3 - supports populations of plant/animal species important for maintaining regional biodiversity Crit. 3 - supports popul		N	N	Site unlikely to be impacted by Scheme due to significant distance and measures required for the Usk will safeguard.
4 - supports plant/animal species at a critical stage in their life cycles, or provides refuge Crit. 4 - supports plant/animal		N	N	Site unlikely to be impacted by Scheme due to significant distance and measures required for the Usk will safeguard.
5 - regularly supports 20,000 or more waterbirds Crit. 5 - regularly supports 20,000 or more waterbirds		N	N	Site unlikely to be impacted by Scheme due to significant distance and measures required for the Usk will safeguard.
6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds Crit. 6 - regularly su		N	N	Site unlikely to be impacted by Scheme due to significant distance and measures required for the Usk will safeguard.
8 - important source of food for fishes, spawning ground, nursery and/or migration path Crit. 8 - important source of food for		N	N	Site unlikely to be impacted by Scheme due to significant distance and measures required for the Usk will safeguard.
Severn Estuary SPA	DS	N	N	
Tundra swan Cygnus columbianus bewickii		N	N	Site unlikely to be impacted by Scheme due to significant distance and measures required for the Usk will safeguard.
Common shelduck Tadorna tadorna		N	N	Site unlikely to be impacted by Scheme due to significant distance and measures required for the Usk will safeguard.
Gadwall Anas strepera		N	N	Site unlikely to be impacted by Scheme due to significant distance and measures required for the Usk will safeguard.
Common redshank Tringa totanus		N	N	Site unlikely to be impacted by Scheme due to significant distance and measures required for the Usk will safeguard.
Greater white-fronted goose Anser albifrons albifrons		N	N	Site unlikely to be impacted by Scheme due to significant distance and measures required for the Usk will safeguard.
Dunlin Calidris alpina alpina		N	N	Site unlikely to be impacted by Scheme due to significant distance and measures required for the Usk will safeguard.
Waterfowl assemblage Waterfowl assemblage		N	N	Site unlikely to be impacted by Scheme due to significant distance and measures required for the Usk will safeguard.
Severn Estuary/ Môr Hafren SAC	DS	N	N	
Sandbanks which are slightly covered by sea water all the time		N	N	Site unlikely to be impacted by Scheme due to significant distance and measures required for the Usk will safeguard.
Estuaries		N	N	Site unlikely to be impacted by Scheme due to significant distance and measures required for the Usk will safeguard.
Mudflats and sandflats not covered by seawater at low tide		N	N	Site unlikely to be impacted by Scheme due to significant distance and measures required for the Usk will safeguard.
Reefs		N	N	Site unlikely to be impacted by Scheme due to significant distance and measures required for the Usk will safeguard.
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	N	Site unlikely to be impacted by Scheme due to significant distance and measures required for the Usk will safeguard.
Sea lamprey Petromyzon marinus		N	N	Site unlikely to be impacted by Scheme due to significant distance and measures required for the Usk will safeguard.
River lamprey Lampetra fluviatilis		N	N	Site unlikely to be impacted by Scheme due to significant distance and measures required for the Usk will safeguard.
Twaite shad Alosa fallax		N	N	Site unlikely to be impacted by Scheme due to significant distance and measures required for the Usk will safeguard.

SEW009

Utilisation of Grwyne as Usk compensating reservoir

Option Summary

Grwyne Reservoir previously supplied water to the Abertillery area, over 40 km to the south. The reservoir has been mothballed since 2004. This option would release 7.8 Ml/d of water into the Usk on a put & take arrangement for subsequent abstraction at Prioress Mill. Raw water would be transfered, around sensitive fishing grounds, to the confluence with the Grwyne Fechan using part of the existing 16" outlet main and a 4.6 km extension. The existing 16" main is currently used as a distribution main and would be replaced with a smaller new supply pipe.

General Assessment

7.8Ml/d is to be released into the Usk and abstracted at Prioress Mill on a put and take basis. The raw water would not be realeased directly from the reservoir (to prevent effects on known spawing areas) but would be transferred via a new main (~16km) along the existing reservoir access road to the confluence of the Grwyne Fawr with the Grwyne Fechan. It is likely that construction effects can be avoided with estblished measures; however, the scheme operation will directly affect the River Usk / Afon Wysg SAC and so appropriate assessment will be required at the strategy and scheme level to confirm that these effects are acceptable. This is likely to require additional modellling / operational information to inform the HRA if included as a preferred option. No other sites are likely to be particularly vulnerable to the scheme.

Recommend Option?

Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures

Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
River Usk/ Afon Wysg SAC	0	U	Y	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		U	Y	Construction works will require scheme-specific detailed design to prevent likely significant effects of construction. Further detail on water quality flow rates and water levels in the River Usk are required to determine the potential
Sea lamprey Petromyzon marinus		U	Y	Construction works will require scheme-specific detailed design to prevent likely significant effects of construction. Further detail on water quality flow rates and water levels in the River Usk are required to determine the potential
Brook lamprey Lampetra planeri		U	Y	Construction works will require scheme-specific detailed design to prevent likely significant effects of construction. Further detail on water quality flow rates and water levels in the River Usk are required to determine the potential
River lamprey Lampetra fluviatilis		U	Y	Construction works will require scheme-specific detailed design to prevent likely significant effects of construction. Further detail on water quality flow rates and water levels in the River Usk are required to determine the potential
Allis shad Alosa alosa		U	Y	Construction works will require scheme-specific detailed design to prevent likely significant effects of construction. Further detail on water quality flow rates and water levels in the River Usk are required to determine the potential
Twaite shad Alosa fallax		U	Y	Construction works will require scheme-specific detailed design to prevent likely significant effects of construction. Further detail on water quality flow rates and water levels in the River Usk are required to determine the potential
Atlantic salmon Salmo salar		U	Y	Construction works will require scheme-specific detailed design to prevent likely significant effects of construction. Further detail on water quality flow rates and water levels in the River Usk are required to determine the potential
Bullhead Cottus gobio		U	Y	Construction works will require scheme-specific detailed design to prevent likely significant effects of construction. Further detail on water quality flow rates and water levels in the River Usk are required to determine the potential
Otter Lutra lutra		U	Y	Construction works will require scheme-specific detailed design to prevent likely significant effects of construction. Further detail on water quality flow rates and water levels in the River Usk are required to determine the potential
Coed y Cerrig SAC	1	N	N	
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	Site upstream from Scheme and is unlikely to experience any significant effects assuming normal measures.
Sugar Loaf Woodlands SAC	2	N	N	
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Site upstream from Scheme and is unlikely to experience any significant effects assuming normal measures.
Usk Bat Sites/ Safleoedd Ystlumod Wysg SAC	2	N	N	
European dry heaths		N	N	Site upstream from Scheme and is unlikely to experience any significant effects assuming normal measures.
Degraded raised bogs still capable of natural regeneration		N	N	Site upstream from Scheme and is unlikely to experience any significant effects assuming normal measures.
Blanket bogs (* if active bog)		N	N	Site upstream from Scheme and is unlikely to experience any significant effects assuming normal measures.
Calcareous rocky slopes with chasmophytic vegetation		N	N	Site upstream from Scheme and is unlikely to experience any significant effects assuming normal measures.
Caves not open to the public		N	N	Feature not vulnerable to likely effects of Scheme due to nature of feature.
Tilio-Acerion forests of slopes, screes and ravines		N	N	Site upstream from Scheme and is unlikely to experience any significant effects assuming normal measures.
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Potentially vulnerable to construction, but pipe located in roads and so effects avoidable with standard measures. No operational effects anticipated.
Cwm Clydach Woodlands / Coedydd Cwm Clydach SAC	10	N	N	
Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or		N	N	Site significant distance from Scheme and therefore not vulnerable to likely effects.
Asperulo-Fagetum beech forests		N	N	Site significant distance from Scheme and therefore not vulnerable to likely effects.
River Wye/ Afon Gwy SAC	10	N	N	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	Site significant distance from Scheme and not within impact pathway
Transition mires and quaking bogs		N	N	Site significant distance from Scheme and not within impact pathway
White-clawed (or Atlantic stream) crayfish Austropotamobius pallipes		N	N	Feature significant distance from Scheme and not within impact pathway

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Sea lamprey Petromyzon marinus		N	N	Feature significant distance from Scheme and not within impact pathway
Brook lamprey Lampetra planeri		N	N	Feature significant distance from Scheme and not within impact pathway
River lamprey Lampetra fluviatilis		N	N	Feature significant distance from Scheme and not within impact pathway
Allis shad Alosa alosa		N	N	Feature significant distance from Scheme and not within impact pathway
Twaite shad Alosa fallax		N	N	Feature significant distance from Scheme and not within impact pathway
Atlantic salmon Salmo salar		N	N	Feature significant distance from Scheme and not within impact pathway
Bullhead Cottus gobio		N	N	Feature significant distance from Scheme and not within impact pathway
Otter Lutra lutra		N	N	Feature significant distance from Scheme and not within impact pathway
Drostre Bank SAC	15	N	N	
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	Feature significant distance from Scheme and not within impact pathway
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	Feature significant distance from Scheme and not within impact pathway
Llangorse Lake/ Llyn Syfaddan SAC	15	N	N	
Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation		N	N	Site significant distance from Scheme and not within impact pathway
Rhos Goch SAC	20	N	N	
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	Site significant distance from Scheme and unlikely to be exposed to significant effects
Active raised bogs		N	N	Site significant distance from Scheme and unlikely to be exposed to significant effects
Transition mires and quaking bogs		N	N	Site significant distance from Scheme and unlikely to be exposed to significant effects
Bog woodland		N	N	Site significant distance from Scheme and unlikely to be exposed to significant effects
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	Site significant distance from Scheme and unlikely to be exposed to significant effects
Severn Estuary Ramsar	DS	N	N	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	N	No significant effect assuming normal measures. Operation of scheme should have no effect (put and take).
3 - supports populations of plant/animal species important for maintaining regional biodiversity Crit. 3 - supports popul		N	N	No significant effect assuming normal measures. Operation of scheme should have no effect (put and take).
4 - supports plant/animal species at a critical stage in their life cycles, or provides refuge Crit. 4 - supports plant/animal		N	N	No significant effect assuming normal measures. Operation of scheme should have no effect (put and take).
5 - regularly supports 20,000 or more waterbirds Crit. 5 - regularly supports 20,000 or more waterbirds		N	N	No significant effect assuming normal measures. Operation of scheme should have no effect (put and take).
6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds Crit. 6 - regularly su		N	N	No significant effect assuming normal measures. Operation of scheme should have no effect (put and take).
8 - important source of food for fishes, spawning ground, nursery and/or migration path Crit. 8 - important source of food for		N	N	No significant effect assuming normal measures. Operation of scheme should have no effect (put and take).
Severn Estuary SPA	DS	N	N	
Tundra swan Cygnus columbianus bewickii		N	N	No significant effect assuming normal measures. Operation of scheme should have no effect (put and take).
Common shelduck Tadorna tadorna		N	N	No significant effect assuming normal measures. Operation of scheme should have no effect (put and take).
Gadwall Anas strepera		N	N	No significant effect assuming normal measures. Operation of scheme should have no effect (put and take).
Common redshank Tringa totanus		N	N	No significant effect assuming normal measures. Operation of scheme should have no effect (put and take).
Greater white-fronted goose Anser albifrons albifrons		N	N	No significant effect assuming normal measures. Operation of scheme should have no effect (put and take).
Dunlin Calidris alpina alpina		N	N	No significant effect assuming normal measures. Operation of scheme should have no effect (put and take).
Waterfowl assemblage Waterfowl assemblage		N	N	No significant effect assuming normal measures. Operation of scheme should have no effect (put and take).
Severn Estuary/ Môr Hafren SAC	DS	N	N	
Sandbanks which are slightly covered by sea water all the time		N	N	No significant effect assuming normal measures. Operation of scheme should have no effect (put and take).
Estuaries		N	N	No significant effect assuming normal measures. Operation of scheme should have no effect (put and take).
Mudflats and sandflats not covered by seawater at low tide		N	N	No significant effect assuming normal measures. Operation of scheme should have no effect (put and take).
Reefs		N	N	No significant effect assuming normal measures. Operation of scheme should have no effect (put and take).
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	N	No significant effect assuming normal measures. Operation of scheme should have no effect (put and take).
Sea lamprey Petromyzon marinus		N	N	No significant effect assuming normal measures. Operation of scheme should have no effect (put and take).
River lamprey Lampetra fluviatilis		N	N	No significant effect assuming normal measures. Operation of scheme should have no effect (put and take).
Twaite shad Alosa fallax		N	N	No significant effect assuming normal measures. Operation of scheme should have no effect (put and take).

SEW025

Great Spring plus Wentwood Reservoir water to new WTW at Caerwent

Option Summary

40Ml/d of raw water will be abstracted from the Great Spring. A new pumping station at Sudbrook will deliver the water via a 4km 700mm dia DI main to a new WTW sited at land just to the south of the A48 at Crick. There is also another favourable site available at the MOD site just north of the A48. Wentwood reservoir will be brought back online, and a new 6.5km 300mm dia DI pipeline will deliver up to 7Ml/d of raw water to the new WTW at Crick. The new WTW will be rated for 45Ml/d and use Nanofiltration combined with a GAC to produce softened water with a DO of 34.3Ml/d. This will be pumped into the A48 main where 15Ml/d will be pumped to Crossway Green SRV, and 19.3Ml/d will be pumped to Catsash SRV via booster pumps.

General Assessment

40Ml/d of raw water will be abstracted from the Great Spring. Previous assessments of the Great Spring resource have concluded that there is a degree of uncertainty over the likely effects of the abstraction on the Severn Estuary sites, and the mobile interest features of the River Wye SAC. However, it is apparent that the freshwater input from the Great Spring is negligible in comparison to that from other sources, and the high tidal flux of the estuary is likely to ensure that any effects are local and small-scale only. Greater and lesser horseshoe bats associated with Wye Valley and Forest of Dean Bat Sites/ Safleoedd Ystlumod Dyffryn Gwy a Fforest y Ddena SAC and Wye Valley Woodlands/ Coetiroedd Dyffryn Gwy SAC have the potential to be affected by scheme construction although the new pipelines will largely follow existing roads and effects can be avoided with scheme-specific detailed design. Construction works may need to be timed to avoid breeding and migrating seasons of various bird and fish species

Recommend Option?

Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures

Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
River Wye/ Afon Gwy SAC	I	N	U	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	No impact pathways
Transition mires and quaking bogs		N	N	No impact pathways
White-clawed (or Atlantic stream) crayfish Austropotamobius pallipes		N	N	No impact pathways
Sea lamprey Petromyzon marinus		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Brook lamprey Lampetra planeri		N	N	No impact pathways
River lamprey Lampetra fluviatilis		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Allis shad Alosa alosa		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Twaite shad Alosa fallax		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Atlantic salmon Salmo salar		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Bullhead Cottus gobio		N	N	No impact pathways
Otter Lutra lutra		N	N	No impact pathways
Wye Valley Woodlands/ Coetiroedd Dyffryn Gwy SAC	I	U	N	
Asperulo-Fagetum beech forests		N	N	No impact pathways
Tilio-Acerion forests of slopes, screes and ravines		N	N	No impact pathways
Taxus baccata woods of the British Isles		N	N	No impact pathways
Lesser horseshoe bat Rhinolophus hipposideros		U	N	Construction effects avoidable with established measures.
Severn Estuary Ramsar	I/DS	N	U	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
3 - supports populations of plant/animal species important for maintaining regional biodiversity Crit. 3 - supports popul		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
4 - supports plant/animal species at a critical stage in their life cycles, or provides refuge Crit. 4 - supports plant/animal		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
5 - regularly supports 20,000 or more waterbirds Crit. 5 - regularly supports 20,000 or more waterbirds		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds Crit. 6 - regularly su		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
8 - important source of food for fishes, spawning ground, nursery and/or migration path Crit. 8 - important source of food for		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Severn Estuary SPA	I/DS	N	U	
Tundra swan Cygnus columbianus bewickii		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Common shelduck Tadorna tadorna		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Gadwall Anas strepera		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Common redshank Tringa totanus		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Greater white-fronted goose Anser albifrons albifrons		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Dunlin Calidris alpina alpina		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Waterfowl assemblage Waterfowl assemblage		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Severn Estuary/ Môr Hafren SAC	1/DS	N	U	
Sandbanks which are slightly covered by sea water all the time		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Estuaries		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Mudflats and sandflats not covered by seawater at low tide		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Reefs		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Sea lamprey Petromyzon marinus		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
River lamprey Lampetra fluviatilis		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
Twaite shad Alosa fallax		N	U	Construction effects avoidable with established measures; operational effects uncertain but unlikely to be adverse based on previous assessments
River Usk/ Afon Wysg SAC	2	N	U	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	No impact pathways
Sea lamprey Petromyzon marinus		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Brook lamprey Lampetra planeri		N	N	No impact pathways
River lamprey Lampetra fluviatilis		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Allis shad Alosa alosa		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Twaite shad Alosa fallax		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Atlantic salmon Salmo salar		N	U	May be exposed when using Severn estuary but effects unlikely to be adverse based on previous assessments
Bullhead Cottus gobio		N	N	No impact pathways
Otter Lutra lutra		N	N	No impact pathways
Wye Valley and Forest of Dean Bat Sites/ Safleoedd Ystlumod Dyffryn Gwy a Fforest y Ddena SAC	3	U	N	
Lesser horseshoe bat Rhinolophus hipposideros		U	N	Construction effects avoidable with established measures.
Greater horseshoe bat Rhinolophus ferrumequinum		U	N	Construction effects avoidable with established measures.
Avon Gorge Woodlands SAC	15	N	N	
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid site		N	N	No impact pathways
Tilio-Acerion forests of slopes, screes and ravines		N	N	No impact pathways

SEW036

Ynys-y-Fro and Pant-yr-Eos to Court Farm via LG main (bi-directional raw water main)

Option Summary

Supply an additional 9 Ml/d to Court Farm WTW from Ynys-y-Fro and Pant-yr-Eos reservoirs. 4.5 Ml/d gravitates from Pant-yr-Eos to Ynys-y-Fro and from there pump 9 Ml/d to Court Farm, by connecting to the existing LG Main. The main becomes dual purpose, retaining its function as an emergency washwater discharge.

General Assessment

A new raw water main is to be built to connect to the existing raw water main network. 9 Ml/d additional raw water is to be pumped to Court Farm (supplied from Ynys-y-Fro and Pant-yr-Eos reservoirs). A licence increase is required for this option. Ynys-y-Fro and Pant-yr-Eos sit at the head of a small stream that ultimately feeds into the Usk Estuary, although the contribution of this stream to flows in the Usk is inconsequential. Assessment of effects on the Usk is likely to be required but effects are unlikely to be significant. Construction effects can be avoided with normal best practice.

Recommend Option?

Construction: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive)

Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
River Usk/ Afon Wysg SAC	3/DS	N	U	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	U	Potential for construction effects depending on time of year, but can be avoided; operational effects uncertain but unlikely to be adverse. Further information required on licence increase
Sea lamprey Petromyzon marinus		N	U	Potential for construction effects depending on time of year, but can be avoided; operational effects uncertain but unlikely to be adverse. Further information required on licence increase
Brook lamprey Lampetra planeri		N	U	Potential for construction effects depending on time of year, but can be avoided; operational effects uncertain but unlikely to be adverse. Further information required on licence increase
River lamprey Lampetra fluviatilis		N	U	Potential for construction effects depending on time of year, but can be avoided; operational effects uncertain but unlikely to be adverse. Further information required on licence increase
Allis shad Alosa alosa		N	U	Potential for construction effects depending on time of year, but can be avoided; operational effects uncertain but unlikely to be adverse. Further information required on licence increase
Twaite shad Alosa fallax		N	U	Potential for construction effects depending on time of year, but can be avoided; operational effects uncertain but unlikely to be adverse. Further information required on licence increase
Atlantic salmon Salmo salar		N	U	Potential for construction effects depending on time of year, but can be avoided; operational effects uncertain but unlikely to be adverse. Further information required on licence increase
Bullhead Cottus gobio		N	U	Potential for construction effects depending on time of year, but can be avoided; operational effects uncertain but unlikely to be adverse. Further information required on licence increase
Otter Lutra lutra		N	U	Potential for construction effects depending on time of year, but can be avoided; operational effects uncertain but unlikely to be adverse. Further information required on licence increase
Severn Estuary Ramsar	10/DS	N	U	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	U	Potential for construction effects depending on time of year, but can be avoided; operational effects uncertain but unlikely to be adverse. Further information required on licence increase
3 - supports populations of plant/animal species important for maintaining regional biodiversity Crit. 3 - supports popul		N	U	Potential for construction effects depending on time of year, but can be avoided; operational effects uncertain but unlikely to be adverse. Further information required on licence increase
4 - supports plant/animal species at a critical stage in their life cycles, or provides refuge Crit. 4 - supports plant/animal		N	U	Potential for construction effects depending on time of year, but can be avoided; operational effects uncertain but unlikely to be adverse. Further information required on licence increase
5 - regularly supports 20,000 or more waterbirds Crit. 5 - regularly supports 20,000 or more waterbirds		N	U	Potential for construction effects depending on time of year, but can be avoided; operational effects uncertain but unlikely to be adverse. Further information required on licence increase
6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds Crit. 6 - regularly su		N	U	Potential for construction effects depending on time of year, but can be avoided; operational effects uncertain but unlikely to be adverse. Further information required on licence increase
8 - important source of food for fishes, spawning ground, nursery and/or migration path Crit. 8 - important source of food for		N	U	Potential for construction effects depending on time of year, but can be avoided; operational effects uncertain but unlikely to be adverse. Further information required on licence increase
Severn Estuary SPA	10/DS	N	U	
Tundra swan Cygnus columbianus bewickii		N	U	Potential for construction effects depending on time of year, but can be avoided; operational effects uncertain but unlikely to be adverse. Further information required on licence increase
Common shelduck Tadorna tadorna		N	U	Potential for construction effects depending on time of year, but can be avoided; operational effects uncertain but unlikely to be adverse. Further information required on licence increase
Gadwall Anas strepera		N	U	Potential for construction effects depending on time of year, but can be avoided; operational effects uncertain but unlikely to be adverse. Further information required on licence increase
Common redshank Tringa totanus		N	U	Potential for construction effects depending on time of year, but can be avoided; operational effects uncertain but unlikely to be adverse. Further information required on licence increase

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Greater white-fronted goose Anser albifrons albifrons		N	U	Potential for construction effects depending on time of year, but can be avoided; operational effects uncertain but unlikely to be adverse. Further information required on licence increase
Dunlin Calidris alpina alpina		N	U	Potential for construction effects depending on time of year, but can be avoided; operational effects uncertain but unlikely to be adverse. Further information required on licence increase
Waterfowl assemblage Waterfowl assemblage		N	U	Potential for construction effects depending on time of year, but can be avoided; operational effects uncertain but unlikely to be adverse. Further information required on licence increase
Severn Estuary/ Môr Hafren SAC	10/DS	N	U	
Sandbanks which are slightly covered by sea water all the time		N	U	Potential for construction effects depending on time of year, but can be avoided; operational effects uncertain but unlikely to be adverse. Further information required on licence increase
Estuaries		N	U	Potential for construction effects depending on time of year, but can be avoided; operational effects uncertain but unlikely to be adverse. Further information required on licence increase
Mudflats and sandflats not covered by seawater at low tide		N	U	Potential for construction effects depending on time of year, but can be avoided; operational effects uncertain but unlikely to be adverse. Further information required on licence increase
Reefs		N	U	Potential for construction effects depending on time of year, but can be avoided; operational effects uncertain but unlikely to be adverse. Further information required on licence increase
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	U	Potential for construction effects depending on time of year, but can be avoided; operational effects uncertain but unlikely to be adverse. Further information required on licence increase
Sea lamprey Petromyzon marinus		N	U	Potential for construction effects depending on time of year, but can be avoided; operational effects uncertain but unlikely to be adverse. Further information required on licence increase
River lamprey Lampetra fluviatilis		N	U	Potential for construction effects depending on time of year, but can be avoided; operational effects uncertain but unlikely to be adverse. Further information required on licence increase
Twaite shad Alosa fallax		N	U	Potential for construction effects depending on time of year, but can be avoided; operational effects uncertain but unlikely to be adverse. Further information required on licence increase
Aberbargoed Grasslands SAC	15	N	N	
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	Site is not connected via an impact pathway and is a significant distance from Scheme
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	Feature is not connected via an impact pathway and is a significant distance from Scheme
Cardiff Beech Woods SAC	15	N	N	
Asperulo-Fagetum beech forests		N	N	Site is not connected via an impact pathway and is a significant distance from Scheme
Tilio-Acerion forests of slopes, screes and ravines		N	N	Site is not connected via an impact pathway and is a significant distance from Scheme

SEW043

Tywi CUS Transfer into SEWCUS

Option Summary

This option looked at transferring water west to east from Felindre WTW into the SEWCUS system utilising some of the 30 Ml/day available at Felindre. The recommendations are to install a new 710mm PE SDR17 (internal 633.6mm) main from Cefn Hirgoed SR to Tongwynlais SR . This will allow Tongwynlais SR to recieve a supply from Felindre WTW via Birchgrove pumps, Birchgrove SR, Margam HL pumps and Cefn Hirgoed SR.

General Assessment

A network solution suggesting the transfer of water from Felindre WTW into the SEWCUS system. A new mains pipe is required from Cefn Hirgoed SR to Tongwynlais SR. Water will be pumped via Birchgrove pumps, Birchgrove SR, Margam HL pumps and Cefn Hirgoed SR. Current route runs very close to the Cardiff Beechwoods SAC, although it's likely that this site can be avoided. Construction effects canbe avoided with established measures. No operational effects (transfer of treated water).

Recommend Option?

Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures

Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Cardiff Beech Woods SAC	0	N	N	
Asperulo-Fagetum beech forests		N	N	GIS indicates intersection with this site but mapping error; pipeline in road. No effects anticipated with normal measures
Tilio-Acerion forests of slopes, screes and ravines		N	N	GIS indicates intersection with this site but mapping error; pipeline in road. No effects anticipated with normal measures
Blackmill Woodlands SAC	3	N	N	
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Scheme not linked to Site via imapct pathway. Site is upsteam from works. No operational effects anticipated
Glaswelltiroedd Cefn Cribwr/ Cefn Cribwr Grasslands SAC	10	N	N	
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	Scheme not linked to Site via imapct pathway. Site is upsteam from works. No operational effects anticipated
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	Scheme not linked to Site via imapct pathway. Site is upsteam from works. No operational effects anticipated
Kenfig/ Cynffig SAC	10	N	N	
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	N	Scheme not linked to Site via imapct pathway. No operational or construction effects anticipated
Fixed coastal dunes with herbaceous vegetation ("grey dunes")		N	N	Scheme not linked to Site via imapct pathway. No operational or construction effects anticipated
Dunes with Salix repens ssp. argentea (Salicion arenariae)		N	N	Scheme not linked to Site via imapct pathway. No operational or construction effects anticipated
Humid dune slacks		N	N	Scheme not linked to Site via imapct pathway. No operational or construction effects anticipated
Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.		N	N	Scheme not linked to Site via imapct pathway. No operational or construction effects anticipated
Petalwort Petalophyllum ralfsii		N	N	Scheme not linked to Site via imapct pathway. No operational or construction effects anticipated
Fen orchid Liparis loeselii		N	N	Scheme not linked to Site via imapct pathway. No operational or construction effects anticipated
Severn Estuary Ramsar	10/DS	N	N	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	N	Potential for construction effects but can be avoided by following best practice guidelines; operational effects not deemed to be significant.
3 - supports populations of plant/animal species important for maintaining regional biodiversity Crit. 3 - supports popul		N	N	Potential for construction effects but can be avoided by following best practice guidelines; operational effects not deemed to be significant.
4 - supports plant/animal species at a critical stage in their life cycles, or provides refuge Crit. 4 - supports plant/animal		N	N	Potential for construction effects but can be avoided by following best practice guidelines; operational effects not deemed to be significant.
5 - regularly supports 20,000 or more waterbirds Crit. 5 - regularly supports 20,000 or more waterbirds		N	N	Potential for construction effects but can be avoided by following best practice guidelines; operational effects not deemed to be significant.
6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds Crit. 6 - regularly su		N	N	Potential for construction effects but can be avoided by following best practice guidelines; operational effects not deemed to be significant.
8 - important source of food for fishes, spawning ground, nursery and/or migration path Crit. 8 - important source of food for		N	N	Potential for construction effects but can be avoided by following best practice guidelines; operational effects not deemed to be significant.
Severn Estuary SPA	10/DS	N	N	
Tundra swan Cygnus columbianus bewickii		N	N	Potential for construction effects but can be avoided by following best practice guidelines; operational effects not deemed to be significant.
Common shelduck Tadorna tadorna		N	N	Potential for construction effects but can be avoided by following best practice guidelines; operational effects not deemed to be significant.
Gadwall Anas strepera		N	N	Potential for construction effects but can be avoided by following best practice guidelines; operational effects not deemed to be significant.
Common redshank Tringa totanus		N	N	Potential for construction effects but can be avoided by following best practice guidelines; operational effects not deemed to be significant.
Greater white-fronted goose Anser albifrons albifrons		N	N	Potential for construction effects but can be avoided by following best practice guidelines; operational effects not deemed to be significant.
Dunlin Calidris alpina alpina		N	N	Potential for construction effects but can be avoided by following best practice guidelines; operational effects not deemed to be significant.

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Waterfowl assemblage Waterfowl assemblage		N	N	Potential for construction effects but can be avoided by following best practice guidelines; operational effects not deemed to be significant.
Severn Estuary/ Môr Hafren SAC	10/DS	N	N	
Sandbanks which are slightly covered by sea water all the time		N	N	Potential for construction effects but can be avoided by following best practice guidelines; operational effects not deemed to be significant.
Estuaries		N	N	Potential for construction effects but can be avoided by following best practice guidelines; operational effects not deemed to be significant.
Mudflats and sandflats not covered by seawater at low tide		N	N	Potential for construction effects but can be avoided by following best practice guidelines; operational effects not deemed to be significant.
Reefs		N	N	Potential for construction effects but can be avoided by following best practice guidelines; operational effects not deemed to be significant.
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	N	Potential for construction effects but can be avoided by following best practice guidelines; operational effects not deemed to be significant.
Sea lamprey Petromyzon marinus		N	N	Potential for construction effects but can be avoided by following best practice guidelines; operational effects not deemed to be significant.
River lamprey Lampetra fluviatilis		N	N	Potential for construction effects but can be avoided by following best practice guidelines; operational effects not deemed to be significant.
Twaite shad Alosa fallax		N	N	Potential for construction effects but can be avoided by following best practice guidelines; operational effects not deemed to be significant.
Aberbargoed Grasslands SAC	15	N	N	
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	Scheme not linked to Site via imapct pathway. No operational or construction effects anticipated
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	Scheme not linked to Site via imapct pathway. No operational or construction effects anticipated
Dunraven Bay SAC	15	N	N	
Shore dock Rumex rupestris		N	N	Scheme indirectly linked to Site with low risk of construction effects. These can be avoided by construction best practice. No significant operation effects anticipated.
River Usk/ Afon Wysg SAC	20	N	N	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	Scheme not linked via impact pathway. No significant operational effects anticipated.
Sea lamprey Petromyzon marinus		N	N	Scheme not linked via impact pathway. No significant operational effects anticipated.
Brook lamprey Lampetra planeri		N	N	Scheme not linked via impact pathway. No significant operational effects anticipated.
River lamprey Lampetra fluviatilis		N	N	Scheme not linked via impact pathway. No significant operational effects anticipated.
Allis shad Alosa alosa		N	N	Scheme not linked via impact pathway. No significant operational effects anticipated.
Twaite shad Alosa fallax		N	N	Scheme not linked via impact pathway. No significant operational effects anticipated.
Atlantic salmon Salmo salar		N	N	Scheme not linked via impact pathway. No significant operational effects anticipated.
Bullhead Cottus gobio		N	N	Scheme not linked via impact pathway. No significant operational effects anticipated.
Otter Lutra lutra		N	N	Scheme not linked via impact pathway. No significant operational effects anticipated.

SEW044a

Schwyll boreholes to SE via Coastal Route with water treatment

Option Summary

Recommission both the Bridgend WDA and Schwyll borehole systems and transfer flow north to connect up with the western end of the Bosch Main. Bridgend has an abstraction licence of just over 4 Ml/d. Schwyll has historically produced 20 Ml/d. It is licenced for higher abstraction but saline intrusion at high tides limits availability. Bridgend water would be pumped to Schwyll where the combined flow would be treated before transfer north.

General Assessment

This option would be a substantial construction scheme, involving approximately 30km of pipeline (although much of this would be within existing easements). However, all European sites (other than Kenfig SAC and Dunraven Bay SAC) are located over 5km from the pipeline route, and there are no downstream receptors for constructon effects (which can be managed with best practice in any case). Merthyr Mawr Warren, a component of Kenfig SAC, is less than 1km from the Schwyll spring site, and contains a river (Afon Ogmore) that is likely to be affected by the re-instatement of abstraction (although the abstraction is within the terms of the existing licence). The SAC also contains a number of features that may be susceptible to reductions in groundwater levels, although it is likely that these areas will be effectively isolated from the abstraction by the Afon Ogmore. However, the abstraction is within the terms of the existing licence and therefore no significant operational effects would be expected.

Recommend Option?

Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures

Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Kenfig/ Cynffig SAC	2	U	U	
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		U	U	Site potentially vulnerable to construction effects, however these are likely avoidable with scheme-specific detailed design. Operation effects are not anticipated due to Scheme within existing licence limits.
Fixed coastal dunes with herbaceous vegetation ("grey dunes")		U	U	Site potentially vulnerable to construction effects, however these are likely avoidable with scheme-specific detailed design. Operation effects are not anticipated due to Scheme within existing licence limits.
Dunes with Salix repens ssp. argentea (Salicion arenariae)		U	U	Site potentially vulnerable to construction effects, however these are likely avoidable with scheme-specific detailed design. Operation effects are not anticipated due to Scheme within existing licence limits.
Humid dune slacks		U	U	Site potentially vulnerable to construction effects, however these are likely avoidable with scheme-specific detailed design. Operation effects are not anticipated due to Scheme within existing licence limits.
Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.		N	U	Site potentially vulnerable to construction effects, however these are likely avoidable with scheme-specific detailed design. Operation effects are not anticipated due to Scheme within existing licence limits.
Petalwort Petalophyllum ralfsii		N	U	Site potentially vulnerable to construction effects, however these are likely avoidable with scheme-specific detailed design. Operation effects are not anticipated due to Scheme within existing licence limits.
Fen orchid Liparis loeselii		N	U	Site potentially vulnerable to construction effects, however these are likely avoidable with scheme-specific detailed design. Operation effects are not anticipated due to Scheme within existing licence limits.
Cardiff Beech Woods SAC	3	N	N	
Asperulo-Fagetum beech forests		N	N	No impact pathway. Site not vulnerable to likely construction or operational effects.
Tilio-Acerion forests of slopes, screes and ravines		N	N	No impact pathway. Site not vulnerable to likely construction or operational effects.
Dunraven Bay SAC	5	N	N	
Shore dock Rumex rupestris		N	N	Potential construction effects likely avoidable through construction best practice. Operational effects unlikely to significantly effect feature
Blackmill Woodlands SAC	10	N	N	
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	No impact pathway. Site not vulnerable to likely construction or operational effects.
Glaswelltiroedd Cefn Cribwr/ Cefn Cribwr Grasslands SAC	10	N	N	
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	No impact pathway. Site not vulnerable to likely construction or operational effects.
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	No impact pathway. Site not vulnerable to likely construction or operational effects.
Severn Estuary Ramsar	15/DS	N	N	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	N	Construction impacts likely avoided through best practice.
3 - supports populations of plant/animal species important for maintaining regional biodiversity Crit. 3 - supports popul		N	N	Construction impacts likely avoided through best practice.
4 - supports plant/animal species at a critical stage in their life cycles, or provides refuge Crit. 4 - supports plant/animal		N	N	Construction impacts likely avoided through best practice.
5 - regularly supports 20,000 or more waterbirds Crit. 5 - regularly supports 20,000 or more waterbirds		N	N	Construction impacts likely avoided through best practice.
6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds Crit. 6 - regularly su		N	N	Construction impacts likely avoided through best practice.
8 - important source of food for fishes, spawning ground, nursery and/or migration path Crit. 8 - important source of food for		N	N	Construction impacts likely avoided through best practice.
Severn Estuary SPA	15/DS	N	N	
Tundra swan Cygnus columbianus bewickii		N	N	Construction impacts likely avoided through best practice.
Common shelduck Tadorna tadorna		N	N	Construction impacts likely avoided through best practice.
Gadwall Anas strepera		N	N	Construction impacts likely avoided through best practice.
Common redshank Tringa totanus		N	N	Construction impacts likely avoided through best practice.
Greater white-fronted goose Anser albifrons albifrons		N	N	Construction impacts likely avoided through best practice.
Dunlin Calidris alpina alpina		N	N	Construction impacts likely avoided through best practice.

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
Waterfowl assemblage Waterfowl assemblage		N	N	Construction impacts likely avoided through best practice.
Severn Estuary/ Môr Hafren SAC	15/DS	N	N	
Sandbanks which are slightly covered by sea water all the time		N	N	Construction impacts likely avoided through best practice.
Estuaries		N	N	Construction impacts likely avoided through best practice.
Mudflats and sandflats not covered by seawater at low tide		N	N	Construction impacts likely avoided through best practice.
Reefs		N	N	Construction impacts likely avoided through best practice.
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	N	Construction impacts likely avoided through best practice.
Sea lamprey Petromyzon marinus		N	N	Construction impacts likely avoided through best practice.
River lamprey Lampetra fluviatilis		N	N	Construction impacts likely avoided through best practice.
Twaite shad Alosa fallax		N	N	Construction impacts likely avoided through best practice.

SEW044b

WDA & Schwyll Boreholes north to Bosch Main

Option Summary

Recommission both the Bridgend WDA and Schwyll borehole systems and transfer flow north to connect up with the western end of the Bosch Main. Bridgend has an abstraction licence of just over 4 Ml/d. Schwyll has historically produced 20 Ml/d. It is licenced for higher abstraction but saline intrusion at high tides limits availability. Bridgend water would be pumped to Schwyll where the combined flow would be treated before transfer north.

General Assessment

This option would be a substantial construction scheme, involving approximately 30km of pipeline (although much of this would be within existing easements). However, all European sites (other than Kenfig SAC and Dunraven Bay SAC) are located over 5km from the pipeline route, and there are no downstream receptors for constructon effects (which can be managed with best practice in any case). Merthyr Mawr Warren, a component of Kenfig SAC, is less than 1km from the Schwyll spring site, and contains a river (Afon Ogmore) that is likely to be affected by the re-instatement of abstraction (although the abstraction is within the terms of the existing licence). The SAC also contains a number of features that may be susceptible to reductions in groundwater levels, although it is likely that these areas will be effectively isolated from the abstraction by the Afon Ogmore. However, the abstraction is within the terms of the existing licence and therefore no significant operational effects would be expected.

Recommend Option?

Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures

Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Kenfig/ Cynffig SAC	2	U	U	
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		U	U	Site potentially vulnerable to construction effects, however these are likely avoidable with scheme-specific detailed design. Operation effects are not anticipated due to Scheme within existing licence limits.
Fixed coastal dunes with herbaceous vegetation ("grey dunes")		U	U	Site potentially vulnerable to construction effects, however these are likely avoidable with scheme-specific detailed design. Operation effects are not anticipated due to Scheme within existing licence limits.
Dunes with Salix repens ssp. argentea (Salicion arenariae)		U	U	Site potentially vulnerable to construction effects, however these are likely avoidable with scheme-specific detailed design. Operation effects are not anticipated due to Scheme within existing licence limits.
Humid dune slacks		U	U	Site potentially vulnerable to construction effects, however these are likely avoidable with scheme-specific detailed design. Operation effects are not anticipated due to Scheme within existing licence limits.
Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.		N	U	Site potentially vulnerable to construction effects, however these are likely avoidable with scheme-specific detailed design. Operation effects are not anticipated due to Scheme within existing licence limits.
Petalwort Petalophyllum ralfsii		N	U	Site potentially vulnerable to construction effects, however these are likely avoidable with scheme-specific detailed design. Operation effects are not anticipated due to Scheme within existing licence limits.
Fen orchid Liparis loeselii		N	U	Site potentially vulnerable to construction effects, however these are likely avoidable with scheme-specific detailed design. Operation effects are not anticipated due to Scheme within existing licence limits.
Cardiff Beech Woods SAC	3	N	N	
Asperulo-Fagetum beech forests		N	N	No impact pathway. Site not vulnerable to likely construction or operational effects.
Tilio-Acerion forests of slopes, screes and ravines		N	N	No impact pathway. Site not vulnerable to likely construction or operational effects.
Dunraven Bay SAC	5	N	N	
Shore dock Rumex rupestris		N	N	Potential construction effects likely avoidable through construction best practice. Operational effects unlikely to significantly effect feature
Blackmill Woodlands SAC	10	N	N	
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	No impact pathway. Site not vulnerable to likely construction or operational effects.
Glaswelltiroedd Cefn Cribwr/ Cefn Cribwr Grasslands SAC	10	N	N	
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	No impact pathway. Site not vulnerable to likely construction or operational effects.
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	No impact pathway. Site not vulnerable to likely construction or operational effects.
Severn Estuary Ramsar	15/DS	N	N	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	N	Construction impacts likely avoided through best practice.
3 - supports populations of plant/animal species important for maintaining regional biodiversity Crit. 3 - supports popul		N	N	Construction impacts likely avoided through best practice.
4 - supports plant/animal species at a critical stage in their life cycles, or provides refuge Crit. 4 - supports plant/animal		N	N	Construction impacts likely avoided through best practice.
5 - regularly supports 20,000 or more waterbirds Crit. 5 - regularly supports 20,000 or more waterbirds		N	N	Construction impacts likely avoided through best practice.
6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds Crit. 6 - regularly su		N	N	Construction impacts likely avoided through best practice.
8 - important source of food for fishes, spawning ground, nursery and/or migration path Crit. 8 - important source of food for		N	N	Construction impacts likely avoided through best practice.
Severn Estuary SPA	15/DS	N	N	
Tundra swan Cygnus columbianus bewickii		N	N	Construction impacts likely avoided through best practice.
Common shelduck Tadorna tadorna		N	N	Construction impacts likely avoided through best practice.
Gadwall Anas strepera		N	N	Construction impacts likely avoided through best practice.
Common redshank Tringa totanus		N	N	Construction impacts likely avoided through best practice.
Greater white-fronted goose Anser albifrons albifrons		N	N	Construction impacts likely avoided through best practice.
Dunlin Calidris alpina alpina		N	N	Construction impacts likely avoided through best practice.

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
Waterfowl assemblage Waterfowl assemblage		N	N	Construction impacts likely avoided through best practice.
Severn Estuary/ Môr Hafren SAC	15/DS	N	N	
Sandbanks which are slightly covered by sea water all the time		N	N	Construction impacts likely avoided through best practice.
Estuaries		N	N	Construction impacts likely avoided through best practice.
Mudflats and sandflats not covered by seawater at low tide		N	N	Construction impacts likely avoided through best practice.
Reefs		N	N	Construction impacts likely avoided through best practice.
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	N	Construction impacts likely avoided through best practice.
Sea lamprey Petromyzon marinus		N	N	Construction impacts likely avoided through best practice.
River lamprey Lampetra fluviatilis		N	N	Construction impacts likely avoided through best practice.
Twaite shad Alosa fallax		N	N	Construction impacts likely avoided through best practice.

SEW060a

Ponthir effluent transfer scheme to support River Usk flow regulation (below Prioress Mill)

Option Summary

Transfer 30Ml/d (350 l/s) of final effluent from Ponthir WwTW to an outfall at Prioress Mill intake to enable increased abstraction from the R.Usk at Prioress Mill. The effluent is currently discharged into the tidal Usk. The DWF from the Ponthir works is around 33Ml/d. This Option requires additional tratment at Ponthir WWTW to enable discharge of effluent into the R.Usk further upstream. A new pumping station & pipeline will be required to transfer the flows. Additional water will be abstracted from LLandegfedd Reservoir and treated at Sluvad WTW. Since this is a 'high season top up' there will be sufficient capacity in Prioress Mill pumping station and rising mains and in Llandegfedd Reservoir.

General Assessment

Construction effects can be avoided through timing works around sensitive seasons for features of the River Usk / Afon Wysg SAC. Scheme-specific detailed design is also required to avoid effects on features associated with the River Usk / Afon Wysg SAC. The bat species associated with Wye Valley and Forest of Dean Bat Sites/ Safleoedd Ystlumod Dyffryn Gwy a Fforest y Ddena SAC are sensitive to interruptions in flight pathways and therefore scheme-specific detailed design would be required to avoid effects. Further information to determine effects on water quality and flow are required to establish if the impact is significant or not on the River Usk / Afon Wysg SAC and the Severn Estuary Ramsar / SPA / SAC

Recommend Option?

Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures

Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
River Usk/ Afon Wysg SAC	0	N	U	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	U	Scheme-specific detailed design and timings are required to ensure no significant effects of construction works to the Site. Further detailed information on water quality required to determine if operational effects will impact Site.
Sea lamprey Petromyzon marinus		N	U	Scheme-specific detailed design and timings are required to ensure no significant effects of construction works to the Site. Further detailed information on water quality required to determine if operational effects will impact Site.
Brook lamprey Lampetra planeri		N	U	Scheme-specific detailed design and timings are required to ensure no significant effects of construction works to the Site. Further detailed information on water quality required to determine if operational effects will impact Site.
River lamprey Lampetra fluviatilis		N	U	Scheme-specific detailed design and timings are required to ensure no significant effects of construction works to the Site. Further detailed information on water quality required to determine if operational effects will impact Site.
Allis shad Alosa alosa		N	U	Scheme-specific detailed design and timings are required to ensure no significant effects of construction works to the Site. Further detailed information on water quality required to determine if operational effects will impact Site.
Twaite shad Alosa fallax		N	U	Scheme-specific detailed design and timings are required to ensure no significant effects of construction works to the Site. Further detailed information on water quality required to determine if operational effects will impact Site.
Atlantic salmon Salmo salar		N	U	Scheme-specific detailed design and timings are required to ensure no significant effects of construction works to the Site. Further detailed information on water quality required to determine if operational effects will impact Site.
Bullhead Cottus gobio		N	U	Scheme-specific detailed design and timings are required to ensure no significant effects of construction works to the Site. Further detailed information on water quality required to determine if operational effects will impact Site.
Otter Lutra lutra		N	U	Scheme-specific detailed design and timings are required to ensure no significant effects of construction works to the Site. Further detailed information on water quality required to determine if operational effects will impact Site.
Wye Valley and Forest of Dean Bat Sites/ Safleoedd Ystlumod Dyffryn Gwy a Fforest y Ddena SAC	10	N	N	
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Scheme-specific detailed design is required to ensure bat flyways are not damaged / altered in a significantly detrimental way to the feature. No significant operation effects are anticipated.
Greater horseshoe bat Rhinolophus ferrumequinum		N	N	Scheme-specific detailed design is required to ensure bat flyways are not damaged / altered in a significantly detrimental way to the feature. No significant operation effects are anticipated.
Severn Estuary Ramsar	10/DS	N	U	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
3 - supports populations of plant/animal species important for maintaining regional biodiversity Crit. 3 - supports popul		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
4 - supports plant/animal species at a critical stage in their life cycles, or provides refuge Crit. 4 - supports plant/animal		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
5 - regularly supports 20,000 or more waterbirds Crit. 5 - regularly supports 20,000 or more waterbirds		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds Crit. 6 - regularly su		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
8 - important source of food for fishes, spawning ground, nursery and/or migration path Crit. 8 - important source of food for		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
Severn Estuary SPA	10/DS	N	U	
Tundra swan Cygnus columbianus bewickii		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Common shelduck Tadorna tadorna		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
Gadwall Anas strepera		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
Common redshank Tringa totanus		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
Greater white-fronted goose Anser albifrons albifrons		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
Dunlin Calidris alpina alpina		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
Waterfowl assemblage Waterfowl assemblage		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
Severn Estuary/ Môr Hafren SAC	10/DS	N	U	
Sandbanks which are slightly covered by sea water all the time		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
Estuaries		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
Mudflats and sandflats not covered by seawater at low tide		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
Reefs		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
Sea lamprey Petromyzon marinus		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
River lamprey Lampetra fluviatilis		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
Twaite shad Alosa fallax		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
Usk Bat Sites/ Safleoedd Ystlumod Wysg SAC	15	N	N	
European dry heaths		N	N	Site unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Degraded raised bogs still capable of natural regeneration		N	N	Site unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Blanket bogs (* if active bog)		N	N	Site unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Calcareous rocky slopes with chasmophytic vegetation		N	N	Site unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Caves not open to the public		N	N	Site unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Tilio-Acerion forests of slopes, screes and ravines		N	N	Site unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Feature unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Wye Valley Woodlands/ Coetiroedd Dyffryn Gwy SAC	15	N	N	
Asperulo-Fagetum beech forests		N	N	Site unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Tilio-Acerion forests of slopes, screes and ravines		N	N	Site unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Taxus baccata woods of the British Isles		N	N	Site unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Feature unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Aberbargoed Grasslands SAC	20	N	N	
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	Site unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	Feature unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Cwm Clydach Woodlands / Coedydd Cwm Clydach SAC	20	N	N	
Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or		N	N	Site unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Asperulo-Fagetum beech forests		N	N	Site unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
River Wye/ Afon Gwy SAC	20	N	N	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	Site unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Transition mires and quaking bogs		N	N	Site unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
White-clawed (or Atlantic stream) crayfish Austropotamobius pallipes		N	N	Feature unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Sea lamprey Petromyzon marinus		N	N	Feature unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Brook lamprey Lampetra planeri		N	N	Feature unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
River lamprey Lampetra fluviatilis		N	N	Feature unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Allis shad Alosa alosa		N	N	Feature unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Twaite shad Alosa fallax		N	N	Feature unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Atlantic salmon Salmo salar		N	N	Feature unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Bullhead Cottus gobio		N	N	Feature unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Otter Lutra lutra		N	N	Feature unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Sugar Loaf Woodlands SAC	20	N	N	
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Site unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.

SEW060b

Ponthir Effluent Transfer to River Usk - more stringent WQ

Option Summary

Transfer around 30Ml/d (350 l/s) of final effluent from Ponthir WwTW to an outfall at Prioress Mill intake to compensate for increased abstraction from the R.Usk. The effluent is currently discharged into the tidal Usk. The DWF from the Ponthir works is around 33Ml/d. This Option 'b' requires additional treatment at Ponthir WwTW to achieve discharge 5 BOD / 10 SS / 1 NH3. A new pumping station & pipeline will be required to transfer the flows. Additional water will be abstracted from LLandegfedd Reservoir and treated at Sluvad WTW. Since this is a 'high season top up' there will be sufficient capacity.

General Assessment

Construction effects can be avoided through timing works around sensitive seasons for features of the River Usk / Afon Wysg SAC. Scheme-specific detailed design is also required to avoid effects on features associated with the River Usk / Afon Wysg SAC. The bat species associated with Wye Valley and Forest of Dean Bat Sites/ Safleoedd Ystlumod Dyffryn Gwy a Fforest y Ddena SAC are sensitive to interruptions in flight pathways and therefore scheme-specific detailed design would be required to avoid effects. Further information to determine effects on water quality and flow are required to establish if the impact is significant or not on the River Usk / Afon Wysg SAC and the Severn Estuary Ramsar / SPA / SAC. This option is significantly less likely to have adverse effects on the designated sites than SEW060a, due to the higher levels of water treatment.

Recommend Option?

Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures

Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
River Usk/ Afon Wysg SAC	0	N	U	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	U	Scheme-specific detailed design and timings are required to ensure no significant effects of construction works to the Site. Further detailed information on water quality required to determine if operational effects will impact Site.
Sea lamprey Petromyzon marinus		N	U	Scheme-specific detailed design and timings are required to ensure no significant effects of construction works to the Site. Further detailed information on water quality required to determine if operational effects will impact Site.
Brook lamprey Lampetra planeri		N	U	Scheme-specific detailed design and timings are required to ensure no significant effects of construction works to the Site. Further detailed information on water quality required to determine if operational effects will impact Site.
River lamprey Lampetra fluviatilis		N	U	Scheme-specific detailed design and timings are required to ensure no significant effects of construction works to the Site. Further detailed information on water quality required to determine if operational effects will impact Site.
Allis shad Alosa alosa		N	U	Scheme-specific detailed design and timings are required to ensure no significant effects of construction works to the Site. Further detailed information on water quality required to determine if operational effects will impact Site.
Twaite shad Alosa fallax		N	U	Scheme-specific detailed design and timings are required to ensure no significant effects of construction works to the Site. Further detailed information on water quality required to determine if operational effects will impact Site.
Atlantic salmon Salmo salar		N	U	Scheme-specific detailed design and timings are required to ensure no significant effects of construction works to the Site. Further detailed information on water quality required to determine if operational effects will impact Site.
Bullhead Cottus gobio		N	U	Scheme-specific detailed design and timings are required to ensure no significant effects of construction works to the Site. Further detailed information on water quality required to determine if operational effects will impact Site.
Otter Lutra lutra		N	U	Scheme-specific detailed design and timings are required to ensure no significant effects of construction works to the Site. Further detailed information on water quality required to determine if operational effects will impact Site.
Wye Valley and Forest of Dean Bat Sites/ Safleoedd Ystlumod Dyffryn Gwy a Fforest y Ddena SAC	10	N	N	
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Scheme-specific detailed design is required to ensure bat flyways are not damaged / altered in a significantly detrimental way to the feature. No significant operation effects are anticipated.
Greater horseshoe bat Rhinolophus ferrumequinum		N	N	Scheme-specific detailed design is required to ensure bat flyways are not damaged / altered in a significantly detrimental way to the feature. No significant operation effects are anticipated.
Severn Estuary Ramsar	10/DS	N	U	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
3 - supports populations of plant/animal species important for maintaining regional biodiversity Crit. 3 - supports popul		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
4 - supports plant/animal species at a critical stage in their life cycles, or provides refuge Crit. 4 - supports plant/animal		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
5 - regularly supports 20,000 or more waterbirds Crit. 5 - regularly supports 20,000 or more waterbirds		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds Crit. 6 - regularly su		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
8 - important source of food for fishes, spawning ground, nursery and/or migration path Crit. 8 - important source of food for		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
Severn Estuary SPA	10/DS	N	U	

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Tundra swan Cygnus columbianus bewickii		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
Common shelduck Tadorna tadorna		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
Gadwall Anas strepera		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
Common redshank Tringa totanus		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
Greater white-fronted goose Anser albifrons albifrons		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
Dunlin Calidris alpina alpina		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
Waterfowl assemblage Waterfowl assemblage		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
Severn Estuary/ Môr Hafren SAC	10/DS	N	U	
Sandbanks which are slightly covered by sea water all the time		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
Estuaries		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
Mudflats and sandflats not covered by seawater at low tide		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
Reefs		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
Sea lamprey Petromyzon marinus		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
River lamprey Lampetra fluviatilis		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
Twaite shad Alosa fallax		N	U	Construction effects avoidable with established measures; site may be vulnerable to operation, although any effects unlikely to be adverse based on available data.
Usk Bat Sites/ Safleoedd Ystlumod Wysg SAC	15	N	N	
European dry heaths		N	N	Site unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Degraded raised bogs still capable of natural regeneration		N	N	Site unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Blanket bogs (* if active bog)		N	N	Site unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Calcareous rocky slopes with chasmophytic vegetation		N	N	Site unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Caves not open to the public		N	N	Site unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Tilio-Acerion forests of slopes, screes and ravines		N	N	Site unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Feature unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Wye Valley Woodlands/ Coetiroedd Dyffryn Gwy SAC	15	N	N	
Asperulo-Fagetum beech forests		N	N	Site unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Tilio-Acerion forests of slopes, screes and ravines		N	N	Site unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Taxus baccata woods of the British Isles		N	N	Site unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Feature unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Aberbargoed Grasslands SAC	20	N	N	
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	Site unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	Feature unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Cwm Clydach Woodlands / Coedydd Cwm Clydach SAC	20	N	N	
Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or		N	N	Site unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Asperulo-Fagetum beech forests		N	N	Site unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
River Wye/ Afon Gwy SAC	20	N	N	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	Site unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Transition mires and quaking bogs		N	N	Site unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
White-clawed (or Atlantic stream) crayfish Austropotamobius pallipes		N	N	Feature unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Sea lamprey Petromyzon marinus		N	N	Feature unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Brook lamprey Lampetra planeri		N	N	Feature unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
River lamprey Lampetra fluviatilis		N	N	Feature unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Allis shad Alosa alosa		N	N	Feature unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Twaite shad Alosa fallax		N	N	Feature unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Atlantic salmon Salmo salar		N	N	Feature unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Bullhead Cottus gobio		N	N	Feature unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Otter Lutra lutra		N	N	Feature unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.
Sugar Loaf Woodlands SAC	20	N	N	
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Site unlikely to be significantly impacted by Scheme due to significant distance apart. No significant construction or operation effects anticipated.

SEW062

Use Llywnon WTW washwater to support compensation flows (Currently intermittent discharge)

Option Summary

Process water from both the Cantref and Llwyn-Onn works is intermittently discharged from the Llwyn-Onn washwater plant but cannot count as compensation water due to its intermittent nature. This option would make this discharge constant thereby substituting 2.6 Ml/d of compensation water. Existing redundant sludge tanks can be used to balance flows to give a constant discharge to the river.

General Assessment

This will allow the discharge from the Llwyn-Onn washwater plant to the Afon Taf Fawr to be constant so producing 2.6Ml/d of compensation water. No European sites are vulnerable to this option.

Recommend Option?

Construction: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive)

Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Cwm Cadlan SAC	4	N	N	
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	No impact pathway connecting the Site to Scheme. No likely operational or construction effects anticipated
Alkaline fens		N	N	No impact pathway connecting the Site to Scheme. No likely operational or construction effects anticipated
Blaen Cynon SAC	10	N	N	
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	No impact pathway connecting the Site to Scheme. No likely operational or construction effects anticipated
Brecon Beacons/ Bannau Brycheiniog SAC	10	N	N	
European dry heaths		N	N	No impact pathway connecting the Site to Scheme. No likely operational or construction effects anticipated
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels		N	N	No impact pathway connecting the Site to Scheme. No likely operational or construction effects anticipated
Calcareous rocky slopes with chasmophytic vegetation		N	N	No impact pathway connecting the Site to Scheme. No likely operational or construction effects anticipated
Siliceous rocky slopes with chasmophytic vegetation		N	N	No impact pathway connecting the Site to Scheme. No likely operational or construction effects anticipated
Coedydd Nedd a Mellte SAC	10	N	N	
Tilio-Acerion forests of slopes, screes and ravines		N	N	No impact pathway connecting the Site to Scheme. No likely operational or construction effects anticipated
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	No impact pathway connecting the Site to Scheme. No likely operational or construction effects anticipated
River Usk/ Afon Wysg SAC	15	N	N	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	No impact pathway connecting the Site to Scheme. No likely operational or construction effects anticipated
Sea lamprey Petromyzon marinus		N	N	No impact pathway connecting the Site to Scheme. No likely operational or construction effects anticipated
Brook lamprey Lampetra planeri		N	N	No impact pathway connecting the Site to Scheme. No likely operational or construction effects anticipated
River lamprey Lampetra fluviatilis		N	N	No impact pathway connecting the Site to Scheme. No likely operational or construction effects anticipated
Allis shad Alosa alosa		N	N	No impact pathway connecting the Site to Scheme. No likely operational or construction effects anticipated
Twaite shad Alosa fallax		N	N	No impact pathway connecting the Site to Scheme. No likely operational or construction effects anticipated
Atlantic salmon Salmo salar		N	N	No impact pathway connecting the Site to Scheme. No likely operational or construction effects anticipated
Bullhead Cottus gobio		N	N	No impact pathway connecting the Site to Scheme. No likely operational or construction effects anticipated
Otter Lutra lutra		N	N	No impact pathway connecting the Site to Scheme. No likely operational or construction effects anticipated
Aberbargoed Grasslands SAC	20	N	N	
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	No impact pathway connecting the Site to Scheme. No likely operational or construction effects anticipated
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	No impact pathway connecting the Site to Scheme. No likely operational or construction effects anticipated
Cwm Clydach Woodlands / Coedydd Cwm Clydach SAC	20	N	N	
Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or		N	N	No impact pathway connecting the Site to Scheme. No likely operational or construction effects anticipated
Asperulo-Fagetum beech forests		N	N	No impact pathway connecting the Site to Scheme. No likely operational or construction effects anticipated
Llangorse Lake/ Llyn Syfaddan SAC	20	N	N	
Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation		N	N	Site and Scheme significant distance apart. No construction or operation effects likely.
Usk Bat Sites/ Safleoedd Ystlumod Wysg SAC	20	N	N	
European dry heaths		N	N	Site and Scheme significant distance apart. No construction or operation effects likely.
Degraded raised bogs still capable of natural regeneration		N	N	Site and Scheme significant distance apart. No construction or operation effects likely.
Blanket bogs (* if active bog)		N	N	Site and Scheme significant distance apart. No construction or operation effects likely.
Calcareous rocky slopes with chasmophytic vegetation		N	N	Site and Scheme significant distance apart. No construction or operation effects likely.
Caves not open to the public		N	N	Site and Scheme significant distance apart. No construction or operation effects likely.
Tilio-Acerion forests of slopes, screes and ravines		N	N	Site and Scheme significant distance apart. No construction or operation effects likely.
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Site and Scheme significant distance apart. No construction or operation effects likely.
Severn Estuary Ramsar	DS	N	N	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	N	Site and Scheme significant distance apart. No construction or operation effects likely.
3 - supports populations of plant/animal species important for maintaining regional biodiversity Crit. 3 - supports popul		N	N	Site and Scheme significant distance apart. No construction or operation effects likely.
4 - supports plant/animal species at a critical stage in their life cycles, or provides refuge Crit. 4 - supports plant/animal		N	N	Site and Scheme significant distance apart. No construction or operation effects likely.

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
5 - regularly supports 20,000 or more waterbirds Crit. 5 - regularly supports 20,000 or more waterbirds		N	N	Site and Scheme significant distance apart. No construction or operation effects likely.
6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds Crit. 6 - regularly su		N	N	Site and Scheme significant distance apart. No construction or operation effects likely.
8 - important source of food for fishes, spawning ground, nursery and/or migration path Crit. 8 - important source of food for		N	N	Site and Scheme significant distance apart. No construction or operation effects likely.
Severn Estuary SPA	DS	N	N	
Tundra swan Cygnus columbianus bewickii		N	N	Site and Scheme significant distance apart. No construction or operation effects likely.
Common shelduck Tadorna tadorna		N	N	Site and Scheme significant distance apart. No construction or operation effects likely.
Gadwall Anas strepera		N	N	Site and Scheme significant distance apart. No construction or operation effects likely.
Common redshank Tringa totanus		N	N	Site and Scheme significant distance apart. No construction or operation effects likely.
Greater white-fronted goose Anser albifrons albifrons		N	N	Site and Scheme significant distance apart. No construction or operation effects likely.
Dunlin Calidris alpina alpina		N	N	Site and Scheme significant distance apart. No construction or operation effects likely.
Waterfowl assemblage Waterfowl assemblage		N	N	Site and Scheme significant distance apart. No construction or operation effects likely.
Severn Estuary/ Môr Hafren SAC	DS	N	N	
Sandbanks which are slightly covered by sea water all the time		N	N	Site and Scheme significant distance apart. No construction or operation effects likely.
Estuaries		N	N	Site and Scheme significant distance apart. No construction or operation effects likely.
Mudflats and sandflats not covered by seawater at low tide		N	N	Site and Scheme significant distance apart. No construction or operation effects likely.
Reefs		N	N	Site and Scheme significant distance apart. No construction or operation effects likely.
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	N	Site and Scheme significant distance apart. No construction or operation effects likely.
Sea lamprey Petromyzon marinus		N	N	Site and Scheme significant distance apart. No construction or operation effects likely.
River lamprey Lampetra fluviatilis		N	N	Site and Scheme significant distance apart. No construction or operation effects likely.
Twaite shad Alosa fallax		N	N	Site and Scheme significant distance apart. No construction or operation effects likely.

SEW064

Reinstate Wentwood reservoir and transfer to Court Farm WTW via Llanstrisant

Option Summary

Wentwood reservoir will be brought back into service to provide a DO of 4.3Ml/d (6). A new pumping station will be built at Wentwood to pump the raw water 10.9km to Llantrisant pumping station where it will be delivered to Court Farm via the existing raw water main. A 65m3 surge vessel will be installed at Court Farm to increase its capacity from the current 110Ml/d to the consented 127Ml/d, so it can treat the additional 7Ml/d, which is the licensesd daily average abstraction from Wentwood reservoir (6). An additional coagulation and DAF stage will be required, before the water reaches the raw water reservoir in order to deal with the anticipiated algae in the Wentwood water. It is recommended that catchment management measures are implemented in the Wentwood catchment in order to reduce the risk of algal blooms.

General Assessment

The current licence will need to be increased although the effects of this on downstream sites (Severn Estuary Ramsar/ SPA/ SAC) will be negligible as Wentwood does not contribute significantly to freshwater inputs to these sites. Works will be required in close proximity to the River Usk / Afon Wysg SAC but these will be within existing operational sites and established measures can be relied on to ensure no significant effets. Lesser and greater horseshoe bats associated with Wye Valley and Forest of Dean Bat Sites/ Safleoedd Ystlumod Dyffryn Gwy a Fforest y Ddena SAC are potentially vulnerable to construction works. Scheme-specific detailed design is required to ensure the bat flight pathways are not significantly effected by the construction works.

Recommend Option?

Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures

Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
River Usk/ Afon Wysg SAC	0	U	N	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		U	N	Construction works by pumping station require scheme-specific detailed design to avoid effects on Site due to proximity. Timings of works would need to avoid breeding season of site features. No likely significant effects from scheme
Sea lamprey Petromyzon marinus		U	N	Construction works by pump station require scheme-specific detailed design to avoid effects on Site due to proximity. Timings of works would need to avoid breeding season of site features. No likely significant effects from scheme
Brook lamprey Lampetra planeri		U	N	Construction works by pump station require scheme-specific detailed design to avoid effects on Site due to proximity. Timings of works would need to avoid breeding season of site features. No likely significant effects from scheme
River lamprey Lampetra fluviatilis		U	N	Construction works by pump station require scheme-specific detailed design to avoid effects on Site due to proximity. Timings of works would need to avoid breeding season of site features. No likely significant effects from scheme
Allis shad Alosa alosa		U	N	Construction works by pump station require scheme-specific detailed design to avoid effects on Site due to proximity. Timings of works would need to avoid breeding season of site features. No likely significant effects from scheme
Twaite shad Alosa fallax		U	N	Construction works by pump station require scheme-specific detailed design to avoid effects on Site due to proximity. Timings of works would need to avoid breeding season of site features. No likely significant effects from scheme
Atlantic salmon Salmo salar		U	N	Construction works by pump station require scheme-specific detailed design to avoid effects on Site due to proximity. Timings of works would need to avoid breeding season of site features. No likely significant effects from scheme
Bullhead Cottus gobio		U	N	Construction works by pump station require scheme-specific detailed design to avoid effects on Site due to proximity. Timings of works would need to avoid breeding season of site features. No likely significant effects from scheme
Otter Lutra lutra		U	N	Construction works by pump station require scheme-specific detailed design to avoid effects on Site due to proximity. Timings of works would need to avoid breeding season of site features. No likely significant effects from scheme
Wye Valley and Forest of Dean Bat Sites/ Safleoedd Ystlumod Dyffryn Gwy a Fforest y Ddena SAC	4	U	N	
Lesser horseshoe bat Rhinolophus hipposideros		U	N	Scheme-specific detailed design required to reduce risk of likely significant effect on bat flight paths. No operation effects anticipated.
Greater horseshoe bat Rhinolophus ferrumequinum		U	N	Scheme-specific detailed design required to reduce risk of likely significant effect on bat flight paths. No operation effects anticipated.
River Wye/ Afon Gwy SAC	10	N	N	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	No impact pathways linking Scheme and Site
Transition mires and quaking bogs		N	N	No impact pathways linking Scheme and Site
White-clawed (or Atlantic stream) crayfish Austropotamobius pallipes		N	N	No impact pathways linking Scheme and Site
Sea lamprey Petromyzon marinus		N	N	No impact pathways linking Scheme and Site
Brook lamprey Lampetra planeri		N	N	No impact pathways linking Scheme and Site
River lamprey Lampetra fluviatilis		N	N	No impact pathways linking Scheme and Site
Allis shad Alosa alosa		N	N	No impact pathways linking Scheme and Site
Twaite shad Alosa fallax		N	N	No impact pathways linking Scheme and Site
Atlantic salmon Salmo salar		N	N	No impact pathways linking Scheme and Site
Bullhead Cottus gobio		N	N	No impact pathways linking Scheme and Site
Otter Lutra lutra		N	N	No impact pathways linking Scheme and Site
Wye Valley Woodlands/ Coetiroedd Dyffryn Gwy SAC	10	N	N	
Asperulo-Fagetum beech forests		N	N	No impact pathways linking Scheme and Site
Tilio-Acerion forests of slopes, screes and ravines		N	N	No impact pathways linking Scheme and Site

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Taxus baccata woods of the British Isles		N	N	No impact pathways linking Scheme and Site
Lesser horseshoe bat Rhinolophus hipposideros		N	N	No impact pathways linking Scheme and Site
Severn Estuary Ramsar	10/DS	N	U	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	U	Construction effects possible, however avoidable with best practice. Operational effects (increased abstraction) unlikely to be significant.
3 - supports populations of plant/animal species important for maintaining regional biodiversity Crit. 3 - supports popul		N	U	Construction effects possible, however avoidable with best practice. Operational effects (increased abstraction) unlikely to be significant.
4 - supports plant/animal species at a critical stage in their life cycles, or provides refuge Crit. 4 - supports plant/animal		N	U	Construction effects possible, however avoidable with best practice. Operational effects (increased abstraction) unlikely to be significant.
5 - regularly supports 20,000 or more waterbirds Crit. 5 - regularly supports 20,000 or more waterbirds		N	U	Construction effects possible, however avoidable with best practice. Operational effects (increased abstraction) unlikely to be significant.
6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds Crit. 6 - regularly su		N	U	Construction effects possible, however avoidable with best practice. Operational effects (increased abstraction) unlikely to be significant.
8 - important source of food for fishes, spawning ground, nursery and/or migration path Crit. 8 - important source of food for		N	U	Construction effects possible, however avoidable with best practice. Operational effects (increased abstraction) unlikely to be significant.
Severn Estuary SPA	10/DS	N	U	
Tundra swan Cygnus columbianus bewickii		N	U	Construction effects possible, however avoidable with best practice. Operational effects (increased abstraction) unlikely to be significant.
Common shelduck Tadorna tadorna		N	U	Construction effects possible, however avoidable with best practice. Operational effects (increased abstraction) unlikely to be significant.
Gadwall Anas strepera		N	U	Construction effects possible, however avoidable with best practice. Operational effects (increased abstraction) unlikely to be significant.
Common redshank Tringa totanus		N	U	Construction effects possible, however avoidable with best practice. Operational effects (increased abstraction) unlikely to be significant.
Greater white-fronted goose Anser albifrons albifrons		N	U	Construction effects possible, however avoidable with best practice. Operational effects (increased abstraction) unlikely to be significant.
Dunlin Calidris alpina alpina		N	U	Construction effects possible, however avoidable with best practice. Operational effects (increased abstraction) unlikely to be significant.
Waterfowl assemblage Waterfowl assemblage		N	U	Construction effects possible, however avoidable with best practice. Operational effects (increased abstraction) unlikely to be significant.
Severn Estuary/ Môr Hafren SAC	10/DS	N	U	
Sandbanks which are slightly covered by sea water all the time		N	U	Construction effects possible, however avoidable with best practice. Operational effects (increased abstraction) unlikely to be significant.
Estuaries		N	U	Construction effects possible, however avoidable with best practice. Operational effects (increased abstraction) unlikely to be significant.
Mudflats and sandflats not covered by seawater at low tide		N	U	Construction effects possible, however avoidable with best practice. Operational effects (increased abstraction) unlikely to be significant.
Reefs		N	U	Construction effects possible, however avoidable with best practice. Operational effects (increased abstraction) unlikely to be significant.
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	U	Construction effects possible, however avoidable with best practice. Operational effects (increased abstraction) unlikely to be significant.
Sea lamprey Petromyzon marinus		N	U	Construction effects possible, however avoidable with best practice. Operational effects (increased abstraction) unlikely to be significant.
River lamprey Lampetra fluviatilis		N	U	Construction effects possible, however avoidable with best practice. Operational effects (increased abstraction) unlikely to be significant.
Twaite shad Alosa fallax		N	U	Construction effects possible, however avoidable with best practice. Operational effects (increased abstraction) unlikely to be significant.
Usk Bat Sites/ Safleoedd Ystlumod Wysg SAC	20	N	N	
European dry heaths		N	N	Site and Scheme significant distance apart. No significant construction or operational effects anticipated.
Degraded raised bogs still capable of natural regeneration		N	N	Site and Scheme significant distance apart. No significant construction or operational effects anticipated.
Blanket bogs (* if active bog)		N	N	Site and Scheme significant distance apart. No significant construction or operational effects anticipated.
Calcareous rocky slopes with chasmophytic vegetation		N	N	Site and Scheme significant distance apart. No significant construction or operational effects anticipated.
Caves not open to the public		N	N	Site and Scheme significant distance apart. No significant construction or operational effects anticipated.

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Tilio-Acerion forests of slopes, screes and ravines		N	N	Site and Scheme significant distance apart. No significant construction or operational effects anticipated.
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Site and Scheme significant distance apart. No significant construction or operational effects anticipated.

SEW067

Raise overflow at Llandegfedd Reservoir

Option Summary

This scheme would raise Llandegfedd Reservoir overflow by ~200-300 mm to increase storage capacity by attaching a steel plate to the existing tower overflow. No works to the embankment as nominated during the screening assessment. DO increases unknown (awaiting DO modelling).

General Assessment

Scheme requires attaching a steel plate to existing tower overflow to raise Llandegfedd Reservoir overfly by ~200-300mm. The operational effects of this are uncertain - the reservoir currently overflows to the Afon Llwyd which feeds the Usk at Caerleon, and raising the overflow will presumably reduce spill frequency; it will be necessary to understand provisions (etc) for any compensation releases and consequent effects on the River Usk / Afon Wysg SAC that lies 4km downstream of the reservoir and Severn Estuary Ramsar / SAC / SPA. Construction effects will be minimal and avoidable with normal best practice.

Recommend Option?

Construction: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive)

Operation: Uncertain - significant effects cannot be excluded without additional analysis (modelling etc) of scheme operation and / or identification of acceptable operational mitigation measures

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
River Usk/ Afon Wysg SAC	4/DS	N	U	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	U	Anticipated construction effects can likely be avoided through construction best practice and timings of works to avoided breeding season of Site features. Operational effects unknown; require further information on the increase in licence
Sea lamprey Petromyzon marinus		N	U	Anticipated construction effects can likely be avoided through construction best practice and timings of works to avoided breeding season of Site features. Operational effects unknown; require further information on the increase in licence
Brook lamprey Lampetra planeri		N	U	Anticipated construction effects can likely be avoided through construction best practice and timings of works to avoided breeding season of Site features. Operational effects unknown; require further information on the increase in licence
River lamprey Lampetra fluviatilis		N	U	Anticipated construction effects can likely be avoided through construction best practice and timings of works to avoided breeding season of Site features. Operational effects unknown; require further information on the increase in licence
Allis shad Alosa alosa		N	U	Anticipated construction effects can likely be avoided through construction best practice and timings of works to avoided breeding season of Site features. Operational effects unknown; require further information on the increase in licence
Twaite shad Alosa fallax		N	U	Anticipated construction effects can likely be avoided through construction best practice and timings of works to avoided breeding season of Site features. Operational effects unknown; require further information on the increase in licence
Atlantic salmon Salmo salar		N	U	Anticipated construction effects can likely be avoided through construction best practice and timings of works to avoided breeding season of Site features. Operational effects unknown; require further information on the increase in licence
Bullhead Cottus gobio		N	U	Anticipated construction effects can likely be avoided through construction best practice and timings of works to avoided breeding season of Site features. Operational effects unknown; require further information on the increase in licence
Otter Lutra lutra		N	U	Anticipated construction effects can likely be avoided through construction best practice and timings of works to avoided breeding season of Site features. Operational effects unknown; require further information on the increase in licence
Aberbargoed Grasslands SAC	15	N	N	
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	Site and Scheme significant distance apart. No likely significant effects of construction or operation anticipated.
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	Site and Scheme significant distance apart. No likely significant effects of construction or operation anticipated.
Usk Bat Sites/ Safleoedd Ystlumod Wysg SAC	15	N	N	
European dry heaths		N	N	Site and Scheme significant distance apart. No likely significant effects of construction or operation anticipated.
Degraded raised bogs still capable of natural regeneration		N	N	Site and Scheme significant distance apart. No likely significant effects of construction or operation anticipated.
Blanket bogs (* if active bog)		N	N	Site and Scheme significant distance apart. No likely significant effects of construction or operation anticipated.
Calcareous rocky slopes with chasmophytic vegetation		N	N	Site and Scheme significant distance apart. No likely significant effects of construction or operation anticipated.
Caves not open to the public		N	N	Site and Scheme significant distance apart. No likely significant effects of construction or operation anticipated.
Tilio-Acerion forests of slopes, screes and ravines		N	N	Site and Scheme significant distance apart. No likely significant effects of construction or operation anticipated.
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Site and Scheme significant distance apart. No likely significant effects of construction or operation anticipated.
Wye Valley and Forest of Dean Bat Sites/ Safleoedd Ystlumod Dyffryn Gwy a Fforest y Ddena SAC	15	N	N	
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Site and Scheme significant distance apart. No likely significant effects of construction or operation anticipated.
Greater horseshoe bat Rhinolophus ferrumequinum		N	N	Site and Scheme significant distance apart. No likely significant effects of construction or operation anticipated.
Severn Estuary Ramsar	15/DS	N	U	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique		N	U	Anticipated construction effects can likely be avoided through construction best practice. Operational effects unknow; require further information on the increase in licence however they are unlikely to be adverse
3 - supports populations of plant/animal species important for maintaining regional biodiversity Crit. 3 - supports popul		N	U	Anticipated construction effects can likely be avoided through construction best practice and timings of works to avoided breeding season of Site features. Operational effects unknow; require further information on the increase in licence however they are unlikely to be adverse

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
4 - supports plant/animal species at a critical stage in their life cycles, or provides refuge Crit. 4 - supports plant/animal		N	U	Anticipated construction effects can likely be avoided through construction best practice and timings of works to avoided breeding season of Site features. Operational effects unknow; require further information on the increase in licence however they are unlikely to be adverse
5 - regularly supports 20,000 or more waterbirds Crit. 5 - regularly supports 20,000 or more waterbirds		N	U	Anticipated construction effects can likely be avoided through construction best practice and timings of works to avoided breeding season of Site features. Operational effects unknow; require further information on the increase in licence however they are unlikely to be adverse
6 - regularly supports 1% of the individuals in a population of one species/subspecies of waterbirds Crit. 6 - regularly su		N	U	Anticipated construction effects can likely be avoided through construction best practice and timings of works to avoided breeding season of Site features. Operational effects unknow; require further information on the increase in licence however they are unlikely to be adverse
8 - important source of food for fishes, spawning ground, nursery and/or migration path Crit. 8 - important source of food for		N	U	Anticipated construction effects can likely be avoided through construction best practice and timings of works to avoided breeding season of Site features. Operational effects unknow; require further information on the increase in licence however they are unlikely to be adverse
Severn Estuary SPA	15/DS	N	U	
Tundra swan Cygnus columbianus bewickii		N	U	Anticipated construction effects can likely be avoided through construction best practice and timings of works to avoided breeding season of Site features. Operational effects unknow; require further information on the increase in licence however they are unlikely to be adverse
Common shelduck Tadorna tadorna		N	U	Anticipated construction effects can likely be avoided through construction best practice and timings of works to avoided breeding season of Site features. Operational effects unknow; require further information on the increase in licence however they are unlikely to be adverse
Gadwall Anas strepera		N	U	Anticipated construction effects can likely be avoided through construction best practice and timings of works to avoided breeding season of Site features. Operational effects unknow; require further information on the increase in licence however they are unlikely to be adverse
Common redshank Tringa totanus		N	U	Anticipated construction effects can likely be avoided through construction best practice and timings of works to avoided breeding season of Site features. Operational effects unknow; require further information on the increase in licence however they are unlikely to be adverse
Greater white-fronted goose Anser albifrons albifrons		N	U	Anticipated construction effects can likely be avoided through construction best practice and timings of works to avoided breeding season of Site features. Operational effects unknow; require further information on the increase in licence however they are unlikely to be adverse
Dunlin Calidris alpina alpina		N	U	Anticipated construction effects can likely be avoided through construction best practice and timings of works to avoided breeding season of Site features. Operational effects unknow; require further information on the increase in licence however they are unlikely to be adverse
Waterfowl assemblage Waterfowl assemblage		N	U	Anticipated construction effects can likely be avoided through construction best practice and timings of works to avoided breeding season of Site features. Operational effects unknow; require further information on the increase in licence however they are unlikely to be adverse
Severn Estuary/ Môr Hafren SAC	15/DS	N	U	
Sandbanks which are slightly covered by sea water all the time		N	U	Anticipated construction effects can likely be avoided through construction best practice. Operational effects unknow; require further information on the increase in licence however they are unlikely to be adverse
Estuaries		N	U	Anticipated construction effects can likely be avoided through construction best practice. Operational effects unknow; require further information on the increase in licence however they are unlikely to be adverse
Mudflats and sandflats not covered by seawater at low tide		N	U	Anticipated construction effects can likely be avoided through construction best practice. Operational effects unknow; require further information on the increase in licence however they are unlikely to be adverse
Reefs		N	U	Anticipated construction effects can likely be avoided through construction best practice. Operational effects unknow; require further information on the increase in licence however they are unlikely to be adverse
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	U	Anticipated construction effects can likely be avoided through construction best practice. Operational effects unknow; require further information on the increase in licence however they are unlikely to be adverse
Sea lamprey Petromyzon marinus		N	U	Anticipated construction effects can likely be avoided through construction best practice and timings of works to avoided breeding season of Site features. Operational effects unknow; require further information on the increase in licence however they are unlikely to be adverse
River lamprey Lampetra fluviatilis		N	U	Anticipated construction effects can likely be avoided through construction best practice and timings of works to avoided breeding season of Site features. Operational effects unknow; require further information on the increase in licence however they are unlikely to be adverse

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Twaite shad Alosa fallax		N	U	Anticipated construction effects can likely be avoided through construction best practice and timings of works to avoided breeding season of Site features. Operational effects unknow; require further information on the increase in licence however they are unlikely to be adverse
Cwm Clydach Woodlands / Coedydd Cwm Clydach SAC	20	N	N	
Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or		N	N	Scheme significant distance from Site. No likely significant construction or operation effects.
Asperulo-Fagetum beech forests		N	N	Scheme significant distance from Site. No likely significant construction or operation effects.
River Wye/ Afon Gwy SAC	20	N	N	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	Scheme significant distance from Site. No likely significant construction or operation effects.
Transition mires and quaking bogs		N	N	Scheme significant distance from Site. No likely significant construction or operation effects.
White-clawed (or Atlantic stream) crayfish Austropotamobius pallipes		N	N	Scheme significant distance from Site. No likely significant construction or operation effects.
Sea lamprey Petromyzon marinus		N	N	Scheme significant distance from Site. No likely significant construction or operation effects.
Brook lamprey Lampetra planeri		N	N	Scheme significant distance from Site. No likely significant construction or operation effects.
River lamprey Lampetra fluviatilis		N	N	Scheme significant distance from Site. No likely significant construction or operation effects.
Allis shad Alosa alosa		N	N	Scheme significant distance from Site. No likely significant construction or operation effects.
Twaite shad Alosa fallax		N	N	Scheme significant distance from Site. No likely significant construction or operation effects.
Atlantic salmon Salmo salar		N	N	Scheme significant distance from Site. No likely significant construction or operation effects.
Bullhead Cottus gobio		N	N	Scheme significant distance from Site. No likely significant construction or operation effects.
Otter Lutra lutra		N	N	Scheme significant distance from Site. No likely significant construction or operation effects.
Sugar Loaf Woodlands SAC	20	N	N	
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Scheme significant distance from Site. No likely significant construction or operation effects.
Wye Valley Woodlands/ Coetiroedd Dyffryn Gwy SAC	20	N	N	
Asperulo-Fagetum beech forests		N	N	Scheme significant distance from Site. No likely significant construction or operation effects.
Tilio-Acerion forests of slopes, screes and ravines		N	N	Scheme significant distance from Site. No likely significant construction or operation effects.
Taxus baccata woods of the British Isles		N	N	Scheme significant distance from Site. No likely significant construction or operation effects.
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Scheme significant distance from Site. No likely significant construction or operation effects.

TYA001

Afon Dysynni pumped to Afon Fathew for reabstraction and treatment (new WTW), with a pipeline to Abergynolwyn to replace existing works (0.1 Mld)

Option Summary

An abstraction licence exists for the Afon Dysynni. This is not currently being used. The scheme would allow transfer of abstracted water to the Afon Fathew at a point upstream of Pen y Bont WTW and thereby allow an increased abstraction at the WTW. Small yield so the relative cost is likely to be high. No provision for storage at the abstraction so reliant on river flow. This will not be as resilient as some other source types.

General Assessment

The Lleyn Peninsula and the Sarnau SAC is the main downstream receptor of the Afon Dysynni; however, the scheme would use an existing licence (albeit it currently unused) and so operational effects would not be anticipated. Construction effects can be avoided with normal bets-practice. Scheme-specific detailed design and sensitive timings of works for the red-billed cough (associated with Craig yr Aderyn (bird's Rock) SPA).

Recommend Option?

Construction: Uncertain - significant effects cannot be excluded and may require the identification of bespoke mitigation measures or amendments to scheme design at the plan level

Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Craig yr Aderyn (Bird`s Rock) SPA	1	N	N	
Red-billed chough Pyrrhocorax pyrrhocorax		N	N	Feature potentially vulnerable to construction effects. Scheme-specific detailed design required to ensure feature is not effected and timings of works to avoid breeding season required. No likely significant iperational effects anticipated.
Cadair Idris SAC	3	N	N	
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanoju		N	N	Site upstream from scheme. Unlikely to be exposed to significant construction or operation effects.
Northern Atlantic wet heaths with Erica tetralix		N	N	Site upstream from scheme. Unlikely to be exposed to significant construction or operation effects.
European dry heaths		N	N	Site upstream from scheme. Unlikely to be exposed to significant construction or operation effects.
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	Site upstream from scheme. Unlikely to be exposed to significant construction or operation effects.
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels		N	N	Site upstream from scheme. Unlikely to be exposed to significant construction or operation effects.
Blanket bogs (* if active bog)		N	N	Site upstream from scheme. Unlikely to be exposed to significant construction or operation effects.
Alkaline fens		N	N	Site upstream from scheme. Unlikely to be exposed to significant construction or operation effects.
Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani)		N	N	Site upstream from scheme. Unlikely to be exposed to significant construction or operation effects.
Calcareous rocky slopes with chasmophytic vegetation		N	N	Site upstream from scheme. Unlikely to be exposed to significant construction or operation effects.
Siliceous rocky slopes with chasmophytic vegetation		N	N	Site upstream from scheme. Unlikely to be exposed to significant construction or operation effects.
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Site upstream from scheme. Unlikely to be exposed to significant construction or operation effects.
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	Site upstream from scheme. Unlikely to be exposed to significant construction or operation effects.
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus		N	N	Site upstream from scheme. Unlikely to be exposed to significant construction or operation effects.
Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC	5	N	N	
Sandbanks which are slightly covered by sea water all the time		N	N	Construction effects possible but likely avoidance with construction best practice. Water abstraction small and adverse significant operation effects unlikely.
Estuaries		N	N	Construction effects possible but likely avoidance with construction best practice. Water abstraction small and adverse significant operation effects unlikely.
Mudflats and sandflats not covered by seawater at low tide		N	N	Construction effects possible but likely avoidance with construction best practice. Water abstraction small and adverse significant operation effects unlikely.
Coastal lagoons		N	N	Construction effects possible but likely avoidance with construction best practice. Water abstraction small and adverse significant operation effects unlikely.
Large shallow inlets and bays		N	N	Construction effects possible but likely avoidance with construction best practice. Water abstraction small and adverse significant operation effects unlikely.
Reefs		N	N	Construction effects possible but likely avoidance with construction best practice. Water abstraction small and adverse significant operation effects unlikely.
Salicornia and other annuals colonizing mud and sand		N	N	Construction effects possible but likely avoidance with construction best practice. Water abstraction small and adverse significant operation effects unlikely.
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	N	Construction effects possible but likely avoidance with construction best practice. Water abstraction small and adverse significant operation effects unlikely.
Submerged or partially submerged sea caves		N	N	Construction effects possible but likely avoidance with construction best practice. Water abstraction small and adverse significant operation effects unlikely.
Bottlenose dolphin Tursiops truncatus		N	N	Construction effects possible but likely avoidance with construction best practice. Water abstraction small and adverse significant operation effects unlikely.
Otter Lutra lutra		N	N	Construction effects possible but likely avoidance with construction best practice. Water abstraction small and adverse significant operation effects unlikely.
Grey seal Halichoerus grypus		N	N	Construction effects possible but likely avoidance with construction best practice. Water abstraction small and adverse significant operation effects unlikely.

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
West Wales Marine / Gorllewin Cymru Forol cSAC	5/DS	N	N	
Harbour porpoise Phocoena phocoena		N	N	Construction effects possible but likely avoidance with construction best practice. Water abstraction small and adverse significant operation effects unlikely.
Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC	10	N	N	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	No impact pathway and significant distance apart from Scheme. Construction and operational effects deemed unlikely to be significant.
Northern Atlantic wet heaths with Erica tetralix		N	N	No impact pathway and significant distance apart from Scheme. Construction and operational effects deemed unlikely to be significant.
European dry heaths		N	N	No impact pathway and significant distance apart from Scheme. Construction and operational effects deemed unlikely to be significant.
Tilio-Acerion forests of slopes, screes and ravines		N	N	No impact pathway and significant distance apart from Scheme. Construction and operational effects deemed unlikely to be significant.
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	No impact pathway and significant distance apart from Scheme. Construction and operational effects deemed unlikely to be significant.
Bog woodland		N	N	No impact pathway and significant distance apart from Scheme. Construction and operational effects deemed unlikely to be significant.
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	No impact pathway and significant distance apart from Scheme. Construction and operational effects deemed unlikely to be significant.
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Within lesser horseshoe range and therefore scheme-specific detailed design to avoid significant effects on bat flyways. No significant operational effects anticipated.
Cors Fochno and Dyfi Ramsar	10	N	N	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique wetlar		N	N	Significant distance from Scheme. No likely significant construction or operational effects.
Dyfi Estuary / Aber Dyfi SPA	10	N	N	
Greenland white-fronted goose Anser albifrons flavirostris		N	N	Significant distance from Scheme. No likely significant construction or operational effects.
Northern Cardigan Bay / Gogledd Bae Ceredigion pSPA	10/DS	N	N	
Red-throated diver Gavia stellata		N	N	Anticipated construction effects avoidable through construction best practice. Operation effects deemed unlikely to be adverse and feature is not sensitive to effects.
Afon Eden - Cors Goch Trawsfynydd SAC	15	N	N	
Active raised bogs		N	N	No direct impact pathway due to geographical separation. No likely significant construction or operational effects.
Freshwater pearl mussel Margaritifera margaritifera		N	N	No direct impact pathway due to geographical separation. No likely significant construction or operational effects.
Atlantic salmon Salmo salar		N	N	No direct impact pathway due to geographical separation. No likely significant construction or operational effects.
Otter Lutra lutra		N	N	No direct impact pathway due to geographical separation. No likely significant construction or operational effects.
Floating water-plantain Luronium natans		N	N	No direct impact pathway due to geographical separation. No likely significant construction or operational effects.
Cors Fochno SAC	15	N	N	
Active raised bogs		N	N	No direct impact pathway due to geographical separation. No likely significant construction or operational effects.
Degraded raised bogs still capable of natural regeneration		N	N	No direct impact pathway due to geographical separation. No likely significant construction or operational effects.
Depressions on peat substrates of the Rhynchosporion		N	N	No direct impact pathway due to geographical separation. No likely significant construction or operational effects.
Coed Cwm Einion SAC	15/DS	N	N	
Tilio-Acerion forests of slopes, screes and ravines		N	N	No impact pathways
Morfa Harlech a Morfa Dyffryn SAC	20	N	N	
Embryonic shifting dunes		N	N	Geographically separate; no likely significant construction or operational effects anticipated.
Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")		N	N	Geographically separate; no likely significant construction or operational effects anticipated.
Dunes with Salix repens ssp. argentea (Salicion arenariae)		N	N	Geographically separate; no likely significant construction or operational effects anticipated.
Humid dune slacks		N	N	Geographically separate; no likely significant construction or operational effects anticipated.
Petalwort Petalophyllum ralfsii		N	N	Geographically separate; no likely significant construction or operational effects anticipated.
Rhinog SAC	20	N	N	
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanoju		N	N	Geographically separate; no likely significant construction or operational effects anticipated.
Northern Atlantic wet heaths with Erica tetralix		N	N	Geographically separate; no likely significant construction or operational effects anticipated.
European dry heaths		N	N	Geographically separate; no likely significant construction or operational effects anticipated.
Alpine and Boreal heaths		N	N	Geographically separate; no likely significant construction or operational effects anticipated.
Blanket bogs (* if active bog)		N	N	Geographically separate; no likely significant construction or operational effects anticipated.
Depressions on peat substrates of the Rhynchosporion		N	N	Geographically separate; no likely significant construction or operational effects anticipated.
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Geographically separate; no likely significant construction or operational effects anticipated.

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Floating water-plantain Luronium natans		N	N	Geographically separate; no likely significant construction or operational effects anticipated.

TYA004

New abstraction from Afon Dysynni at Pont y Garth (to Pen y Bont WTW)

Option Summary

An abstraction licence exists for the Afon Dysinni. This is not currently being used. The scheme would allow Pen y Bont WTW to receive abstracted water from the Afon Dysynni directly via a new raw water transfer main. Due to topography the supply will need to be pumped from source. No provision for storage at the abstraction so reliant on river flow. This will not be as resilient as some other source types. NOTE: This proposal may allow abandonment of the existing abstraction points with associated change in fixed OPEX, however DCWW may choose to maintain the licence.

General Assessment

The Lleyn Peninsula and the Sarnau SAC is the main downstream receptor of the Afon Dysynni; however, the scheme would use an existing licence (albeit it currently unused) and so operational effects would not be anticipated. Construction effects can be avoided with normal best-practice. Scheme-specific detailed design and sensitive timings of works for the red-billed cough (associated with Craig yr Aderyn (bird's Rock) SPA).

Recommend Option?

Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures

Operation: Yes - no effects or clearly no LSE alone or in combination (e.g. no impact pathways; features not sensitive; within existing licence; transfer of spare water; etc.)

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
Craig yr Aderyn (Bird`s Rock) SPA	1	N	N	
Red-billed chough Pyrrhocorax pyrrhocorax		N	N	Feature potentially vulnerable to construction effects. Scheme-specific detailed design required to ensure feature is not effected and timings of works to avoid breeding season required. No likely significant iperational effects anticipated.
Cadair Idris SAC	3	N	N	
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanoju		N	N	Site upstream from scheme. Unlikely to be exposed to significant construction or operation effects.
Northern Atlantic wet heaths with Erica tetralix		N	N	Site upstream from scheme. Unlikely to be exposed to significant construction or operation effects.
European dry heaths		N	N	Site upstream from scheme. Unlikely to be exposed to significant construction or operation effects.
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	Site upstream from scheme. Unlikely to be exposed to significant construction or operation effects.
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels		N	N	Site upstream from scheme. Unlikely to be exposed to significant construction or operation effects.
Blanket bogs (* if active bog)		N	N	Site upstream from scheme. Unlikely to be exposed to significant construction or operation effects.
Alkaline fens		N	N	Site upstream from scheme. Unlikely to be exposed to significant construction or operation effects.
Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani)		N	N	Site upstream from scheme. Unlikely to be exposed to significant construction or operation effects.
Calcareous rocky slopes with chasmophytic vegetation		N	N	Site upstream from scheme. Unlikely to be exposed to significant construction or operation effects.
Siliceous rocky slopes with chasmophytic vegetation		N	N	Site upstream from scheme. Unlikely to be exposed to significant construction or operation effects.
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Site upstream from scheme. Unlikely to be exposed to significant construction or operation effects.
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	Site upstream from scheme. Unlikely to be exposed to significant construction or operation effects.
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus		N	N	Site upstream from scheme. Unlikely to be exposed to significant construction or operation effects.
Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC	5	N	N	
Sandbanks which are slightly covered by sea water all the time		N	N	Construction effects possible but likely avoidance with construction best practice. Water abstraction small and adverse significant operation effects unlikely.
Estuaries		N	N	Construction effects possible but likely avoidance with construction best practice. Water abstraction small and adverse significant operation effects unlikely.
Mudflats and sandflats not covered by seawater at low tide		N	N	Construction effects possible but likely avoidance with construction best practice. Water abstraction small and adverse significant operation effects unlikely.
Coastal lagoons		N	N	Construction effects possible but likely avoidance with construction best practice. Water abstraction small and adverse significant operation effects unlikely.
Large shallow inlets and bays		N	N	Construction effects possible but likely avoidance with construction best practice. Water abstraction small and adverse significant operation effects unlikely.
Reefs		N	N	Construction effects possible but likely avoidance with construction best practice. Water abstraction small and adverse significant operation effects unlikely.
Salicornia and other annuals colonizing mud and sand		N	N	Construction effects possible but likely avoidance with construction best practice. Water abstraction small and adverse significant operation effects unlikely.
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	N	Construction effects possible but likely avoidance with construction best practice. Water abstraction small and adverse significant operation effects unlikely.
Submerged or partially submerged sea caves		N	N	Construction effects possible but likely avoidance with construction best practice. Water abstraction small and adverse significant operation effects unlikely.
Bottlenose dolphin Tursiops truncatus		N	N	Construction effects possible but likely avoidance with construction best practice. Water abstraction small and adverse significant operation effects unlikely.
Otter Lutra lutra		N	N	Construction effects possible but likely avoidance with construction best practice. Water abstraction small and adverse significant operation effects unlikely.

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Grey seal Halichoerus grypus		N	N	Construction effects possible but likely avoidance with construction best practice. Water abstraction small and adverse significant operation effects unlikely.
Northern Cardigan Bay / Gogledd Bae Ceredigion pSPA	5/DS	N	N	
Red-throated diver Gavia stellata		N	N	Construction effects possible but likely avoidance with construction best practice. Water abstraction small and adverse significant operation effects unlikely.
West Wales Marine / Gorllewin Cymru Forol cSAC	5/DS	N	N	
Harbour porpoise Phocoena phocoena		N	N	No impact pathway and significant distance apart from Scheme. Construction and operational effects deemed unlikely to be significant.
Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC	10	N	N	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	No impact pathway and significant distance apart from Scheme. Construction and operational effects deemed unlikely to be significant.
Northern Atlantic wet heaths with Erica tetralix		N	N	No impact pathway and significant distance apart from Scheme. Construction and operational effects deemed unlikely to be significant.
European dry heaths		N	N	No impact pathway and significant distance apart from Scheme. Construction and operational effects deemed unlikely to be significant.
Tilio-Acerion forests of slopes, screes and ravines		N	N	No impact pathway and significant distance apart from Scheme. Construction and operational effects deemed unlikely to be significant.
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	No impact pathway and significant distance apart from Scheme. Construction and operational effects deemed unlikely to be significant.
Bog woodland		N	N	No impact pathway and significant distance apart from Scheme. Construction and operational effects deemed unlikely to be significant.
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	Within lesser horseshoe range and therefore scheme-specific detailed design to avoid significant effects on bat flyways. No significant operational effects anticipated.
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Significant distance from Scheme. No likely significant construction or operational effects.
Cors Fochno and Dyfi Ramsar	10	N	N	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique wetlar		N	N	Significant distance from Scheme. No likely significant construction or operational effects.
Dyfi Estuary / Aber Dyfi SPA	10	N	N	
Greenland white-fronted goose Anser albifrons flavirostris		N	N	Anticipated construction effects avoidable through construction best practice. Operation effects deemed unlikely to be adverse and feature is not sensitive to effects.
Afon Eden - Cors Goch Trawsfynydd SAC	15	N	N	
Active raised bogs		N	N	No direct impact pathway due to geographical separation. No likely significant construction or operational effects.
Freshwater pearl mussel Margaritifera margaritifera		N	N	No direct impact pathway due to geographical separation. No likely significant construction or operational effects.
Atlantic salmon Salmo salar		N	N	No direct impact pathway due to geographical separation. No likely significant construction or operational effects.
Otter Lutra lutra		N	N	No direct impact pathway due to geographical separation. No likely significant construction or operational effects.
Floating water-plantain Luronium natans		N	N	No direct impact pathway due to geographical separation. No likely significant construction or operational effects.
Cors Fochno SAC	15	N	N	
Active raised bogs		N	N	No direct impact pathway due to geographical separation. No likely significant construction or operational effects.
Degraded raised bogs still capable of natural regeneration		N	N	No direct impact pathway due to geographical separation. No likely significant construction or operational effects.
Depressions on peat substrates of the Rhynchosporion		N	N	No direct impact pathway due to geographical separation. No likely significant construction or operational effects.
Coed Cwm Einion SAC	15/DS	N	N	
Tilio-Acerion forests of slopes, screes and ravines		N	N	No impact pathways
Morfa Harlech a Morfa Dyffryn SAC	20	N	N	
Embryonic shifting dunes		N	N	Geographically separate; no likely significant construction or operational effects anticipated.
Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")		N	N	Geographically separate; no likely significant construction or operational effects anticipated.
Dunes with Salix repens ssp. argentea (Salicion arenariae)		N	N	Geographically separate; no likely significant construction or operational effects anticipated.
Humid dune slacks		N	N	Geographically separate; no likely significant construction or operational effects anticipated.
Petalwort Petalophyllum ralfsii		N	N	Geographically separate; no likely significant construction or operational effects anticipated.
Rhinog SAC	20	N	N	
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanoju		N	N	Geographically separate; no likely significant construction or operational effects anticipated.
Northern Atlantic wet heaths with Erica tetralix		N	N	Geographically separate; no likely significant construction or operational effects anticipated.
European dry heaths		N	N	Geographically separate; no likely significant construction or operational effects anticipated.
Alpine and Boreal heaths		N	N	Geographically separate; no likely significant construction or operational effects anticipated.
Blanket bogs (* if active bog)		N	N	Geographically separate; no likely significant construction or operational effects anticipated.

Sites within 20km and Interest Features	Dist.	Vulnerable? C	Vulnerable? O	Notes
Depressions on peat substrates of the Rhynchosporion		N	N	Geographically separate; no likely significant construction or operational effects anticipated.
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	Geographically separate; no likely significant construction or operational effects anticipated.
Floating water-plantain Luronium natans		N	N	Geographically separate; no likely significant construction or operational effects anticipated.

TYA009a

Pen-y-Bont WTW Bankside Storage (8Ml)

Option Summary

This option would involve construction of a non-impounding raw water reservoir adjacent to Pen-y-Bont WTW to provide a buffer raw water supply and improve resilience of Pen-y-Bont under dry weather/peak demand conditions when run-of-river abstraction may not supply sufficient inflow to the WTW. The reservoir would be sized at 8 Ml to provide short-term buffer, and would require an increase in licensed abstraction volumes.

General Assessment

The Lleyn Peninsula and the Sarnau SAC is the main downstream receptor of the Afon Fatthew, from which the abstraction would presumably be made; however, the nature of the abstraction (periodic, to provide refill for short-term buffering) is unlikely to affect this site although further information on scheme operation will be required. The features of the coincident downstream sites (e.g. West Wales Marine cSAC; Northern Cardigan Bay pSPA) are not particularly sensitive to the likely effects of the scheme. Construction effects can be avoided with normal best-practice.

Recommend Option?

Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures

Operation: Yes - effects possible but significant or significant adverse effects avoidable with established operational mitigation (e.g. licence controls)

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
Craig yr Aderyn (Bird`s Rock) SPA	5	N	N	
Red-billed chough Pyrrhocorax pyrrhocorax		N	N	Feature unlikely to be exposed to effects
Northern Cardigan Bay / Gogledd Bae Ceredigion pSPA	5/DS	N	N	
Red-throated diver Gavia stellata		N	N	Feature not sensitive to likely effects
Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC	5/DS	N	U	
Sandbanks which are slightly covered by sea water all the time		N	N	Feature not sensitive to likely effects
Estuaries		N	U	Feature sensitive / potentially exposed to operational effects but unlikely to be significant.
Mudflats and sandflats not covered by seawater at low tide		N	U	Feature sensitive / potentially exposed to operational effects but unlikely to be significant.
Coastal lagoons		N	U	Feature sensitive / potentially exposed to operational effects but unlikely to be significant.
Large shallow inlets and bays		N	N	Feature not sensitive to likely effects
Reefs		N	U	Feature sensitive / potentially exposed to operational effects but unlikely to be significant.
Salicornia and other annuals colonizing mud and sand		N	U	Feature sensitive / potentially exposed to operational effects but unlikely to be significant.
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	U	Feature sensitive / potentially exposed to operational effects but unlikely to be significant.
Submerged or partially submerged sea caves		N	N	Feature not sensitive to likely effects
Bottlenose dolphin Tursiops truncatus		N	N	Feature not sensitive to likely effects
Otter Lutra lutra		N	N	Feature not sensitive to likely effects
Grey seal Halichoerus grypus		N	N	Feature not sensitive to likely effects
West Wales Marine / Gorllewin Cymru Forol cSAC	5/DS	N	N	
Harbour porpoise Phocoena phocoena		N	N	Feature not sensitive to likely effects
Cadair Idris SAC	10	N	N	
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanoju		N	N	No impact pathways (upstream site)
Northern Atlantic wet heaths with Erica tetralix		N	N	No impact pathways (upstream site)
European dry heaths		N	N	No impact pathways (upstream site)
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	No impact pathways (upstream site)
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels		N	N	No impact pathways (upstream site)
Blanket bogs (* if active bog)		N	N	No impact pathways (upstream site)
Alkaline fens		N	N	No impact pathways (upstream site)
Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani)		N	N	No impact pathways (upstream site)
Calcareous rocky slopes with chasmophytic vegetation		N	N	No impact pathways (upstream site)
Siliceous rocky slopes with chasmophytic vegetation		N	N	No impact pathways (upstream site)
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	No impact pathways (upstream site)
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	No impact pathways (upstream site)
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus		N	N	No impact pathways (upstream site)
Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC	10	N	N	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	No impact pathways (separate catchment)
Northern Atlantic wet heaths with Erica tetralix		N	N	No impact pathways (separate catchment; distance)
European dry heaths		N	N	No impact pathways (separate catchment; distance)
Tilio-Acerion forests of slopes, screes and ravines		N	N	No impact pathways (separate catchment; distance)
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	No impact pathways (separate catchment; distance)
Bog woodland		N	N	No impact pathways (separate catchment; distance)
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	No impact pathways (separate catchment; distance)

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Option within foraging etc range but scale of works very unlikely to result in significant effects; avoidable with normal measures
Cors Fochno and Dyfi Ramsar	10	N	N	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique wetlar		N	N	No impact pathways (separate catchment; distance)
Dyfi Estuary / Aber Dyfi SPA	10	N	N	
Greenland white-fronted goose Anser albifrons flavirostris		N	N	No impact pathways (separate catchment; distance)
Coed Cwm Einion SAC	15	N	N	
Tilio-Acerion forests of slopes, screes and ravines		N	N	No impact pathways (upstream site)
Cors Fochno SAC	15	N	N	
Active raised bogs		N	N	No impact pathways (separate catchment; distance)
Degraded raised bogs still capable of natural regeneration		N	N	No impact pathways (separate catchment; distance)
Depressions on peat substrates of the Rhynchosporion		N	N	No impact pathways (separate catchment; distance)
Afon Eden - Cors Goch Trawsfynydd SAC	20	N	N	
Active raised bogs		N	N	No impact pathways (separate catchment; distance)
Freshwater pearl mussel Margaritifera margaritifera		N	N	No impact pathways (separate catchment; distance)
Atlantic salmon Salmo salar		N	N	No impact pathways (separate catchment; distance)
Otter Lutra lutra		N	N	No impact pathways (separate catchment; distance)
Floating water-plantain Luronium natans		N	N	No impact pathways (separate catchment; distance)
Morfa Harlech a Morfa Dyffryn SAC	20	N	N	
Embryonic shifting dunes		N	N	No impact pathways (separate catchment; distance)
Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")		N	N	No impact pathways (separate catchment; distance)
Dunes with Salix repens ssp. argentea (Salicion arenariae)		N	N	No impact pathways (separate catchment; distance)
Humid dune slacks		N	N	No impact pathways (separate catchment; distance)
Petalwort Petalophyllum ralfsii		N	N	No impact pathways (separate catchment; distance)

TYA009b

Pen-y-Bont WTW Bankside Storage (35Ml)

Option Summary

This option would involve construction of a non-impounding raw water reservoir adjacent to Pen-y-Bont WTW to provide a buffer raw water supply and improve resilience of Pen-y-Bont under dry weather/peak demand conditions when run-of-river abstraction may not supply sufficient inflow to the WTW. The reservoir would be sized at 35 Ml to provide longer-term dry period buffer, and would require an increase in licensed abstraction volumes.

General Assessment

The Lleyn Peninsula and the Sarnau SAC is the main downstream receptor of the Afon Fatthew, from which the abstraction would presumably be made; however, the nature of the abstraction (periodic, to provide refill for short-term buffering) is unlikely to affect this site although further information on scheme operation will be required. The features of the coincident downstream sites (e.g. West Wales Marine cSAC; Northern Cardigan Bay pSPA) are not particularly sensitive to the likely effects of the scheme. Construction effects can be avoided with normal best-practice.

Recommend Option?

Construction: Yes - effects possible but significant or significant adverse effects clearly avoidable with established scheme-level avoidance or mitigation measures

Operation: Yes - effects possible but significant or significant adverse effects avoidable with established operational mitigation (e.g. licence controls)

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
Craig yr Aderyn (Bird`s Rock) SPA	5	N	N	
Red-billed chough Pyrrhocorax pyrrhocorax		N	N	Feature unlikely to be exposed to effects
Northern Cardigan Bay / Gogledd Bae Ceredigion pSPA	5/DS	N	N	
Red-throated diver Gavia stellata		N	N	Feature not sensitive to likely effects
Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC	5/DS	N	U	
Sandbanks which are slightly covered by sea water all the time		N	N	Feature not sensitive to likely effects
Estuaries		N	U	Feature sensitive / potentially exposed to operational effects but unlikely to be significant.
Mudflats and sandflats not covered by seawater at low tide		N	U	Feature sensitive / potentially exposed to operational effects but unlikely to be significant.
Coastal lagoons		N	U	Feature sensitive / potentially exposed to operational effects but unlikely to be significant.
Large shallow inlets and bays		N	N	Feature not sensitive to likely effects
Reefs		N	U	Feature sensitive / potentially exposed to operational effects but unlikely to be significant.
Salicornia and other annuals colonizing mud and sand		N	U	Feature sensitive / potentially exposed to operational effects but unlikely to be significant.
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)		N	U	Feature sensitive / potentially exposed to operational effects but unlikely to be significant.
Submerged or partially submerged sea caves		N	N	Feature not sensitive to likely effects
Bottlenose dolphin Tursiops truncatus		N	N	Feature not sensitive to likely effects
Otter Lutra lutra		N	N	Feature not sensitive to likely effects
Grey seal Halichoerus grypus		N	N	Feature not sensitive to likely effects
West Wales Marine / Gorllewin Cymru Forol cSAC	5/DS	N	N	
Harbour porpoise Phocoena phocoena		N	N	Feature not sensitive to likely effects
Cadair Idris SAC	10	N	N	
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanoju		N	N	No impact pathways (upstream site)
Northern Atlantic wet heaths with Erica tetralix		N	N	No impact pathways (upstream site)
European dry heaths		N	N	No impact pathways (upstream site)
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)		N	N	No impact pathways (upstream site)
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels		N	N	No impact pathways (upstream site)
Blanket bogs (* if active bog)		N	N	No impact pathways (upstream site)
Alkaline fens		N	N	No impact pathways (upstream site)
Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani)		N	N	No impact pathways (upstream site)
Calcareous rocky slopes with chasmophytic vegetation		N	N	No impact pathways (upstream site)
Siliceous rocky slopes with chasmophytic vegetation		N	N	No impact pathways (upstream site)
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	No impact pathways (upstream site)
Marsh fritillary butterfly Euphydryas (Eurodryas, Hypodryas) aurinia		N	N	No impact pathways (upstream site)
Slender green feather-moss Drepanocladus (Hamatocaulis) vernicosus		N	N	No impact pathways (upstream site)
Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC	10	N	N	
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation		N	N	No impact pathways (separate catchment)
Northern Atlantic wet heaths with Erica tetralix		N	N	No impact pathways (separate catchment; distance)
European dry heaths		N	N	No impact pathways (separate catchment; distance)
Tilio-Acerion forests of slopes, screes and ravines		N	N	No impact pathways (separate catchment; distance)
Old sessile oak woods with Ilex and Blechnum in the British Isles		N	N	No impact pathways (separate catchment; distance)
Bog woodland		N	N	No impact pathways (separate catchment; distance)
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)		N	N	No impact pathways (separate catchment; distance)

Sites within 20km and Interest Features	Dist.	Vulnerable?		Notes
		C	O	
Lesser horseshoe bat Rhinolophus hipposideros		N	N	Option within foraging etc range but scale of works very unlikely to result in significant effects; avoidable with normal measures
Cors Fochno and Dyfi Ramsar	10	N	N	
1 - sites containing representative, rare or unique wetland types Crit. 1 - sites containing representative, rare or unique wetlar		N	N	No impact pathways (separate catchment; distance)
Dyfi Estuary / Aber Dyfi SPA	10	N	N	
Greenland white-fronted goose Anser albifrons flavirostris		N	N	No impact pathways (separate catchment; distance)
Coed Cwm Einion SAC	15	N	N	
Tilio-Acerion forests of slopes, screes and ravines		N	N	No impact pathways (upstream site)
Cors Fochno SAC	15	N	N	
Active raised bogs		N	N	No impact pathways (separate catchment; distance)
Degraded raised bogs still capable of natural regeneration		N	N	No impact pathways (separate catchment; distance)
Depressions on peat substrates of the Rhynchosporion		N	N	No impact pathways (separate catchment; distance)
Afon Eden - Cors Goch Trawsfynydd SAC	20	N	N	
Active raised bogs		N	N	No impact pathways (separate catchment; distance)
Freshwater pearl mussel Margaritifera margaritifera		N	N	No impact pathways (separate catchment; distance)
Atlantic salmon Salmo salar		N	N	No impact pathways (separate catchment; distance)
Otter Lutra lutra		N	N	No impact pathways (separate catchment; distance)
Floating water-plantain Luronium natans		N	N	No impact pathways (separate catchment; distance)
Morfa Harlech a Morfa Dyffryn SAC	20	N	N	
Embryonic shifting dunes		N	N	No impact pathways (separate catchment; distance)
Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")		N	N	No impact pathways (separate catchment; distance)
Dunes with Salix repens ssp. argentea (Salicion arenariae)		N	N	No impact pathways (separate catchment; distance)
Humid dune slacks		N	N	No impact pathways (separate catchment; distance)
Petalwort Petalophyllum ralfsii		N	N	No impact pathways (separate catchment; distance)

Appendix F
In combination plans and projects

Appendix F - Key 'in combination' plans and likely effects

Plan	Summary	In combination effects with Preferred Options?	In combination effects with WRMP	Conclusion
Environment Agency (various) Drought Plans	Drought Plans prepared by the EA: - outline how the EA will manage water resources during a drought and defines their role and responsibilities; - aim to reconcile the competing interests of the environment, the need for public water supply and other abstractions; - show what additional environmental monitoring the EA will carry out; - provide a framework for liaison with water companies, awareness campaigns and determination of drought permits; - range from high-level activities where they co-ordinate drought management over England and Wales to a local level where they outline specific operational activities. Those plans particularly relevant to the Welsh Water area include the Head Office Drought Plan (covering England and Wales), Drought Plans for Wales and the Midlands as well as area plans for south east, south west and north Wales and the west Midlands.	Potential 'in combination' effects between other Drought Plans and the WRMP options cannot be meaningfully identified and assessed at this level. This is because the WRMP options cannot, in theory, operate in combination with the DP options: if the WRMP options are implemented then they will become a part of the baseline against which the effects of the DP options will be assessed (with the DP options then permitted or not at the application stage).	Potential 'in combination' effects between the Drought Plans and the WRMP options cannot be meaningfully identified and assessed at this level. This is because the WRMP options cannot, in theory, operate in combination with the DP options: if the WRMP options are implemented then they will become a part of the baseline against which the effects of the DP options will be assessed (with the DP options then permitted or not at the application stage).	No likely significant effects.
Welsh Government (2015) The Welsh National Marine Plan – Initial Draft	This draft plan sets out how the Welsh Government will achieve sustainable development in the Welsh marine area through the sustainable management of marine natural resources. It covers both Welsh inshore and offshore waters and sets out the following vision, which will be achieved through the plan's objectives and policies: • By 2036, Welsh seas are clean, healthy, safe, productive and biologically diverse: • Through an ecosystem based approach, our seas are healthy and resilient and support a sustainable and thriving economy. • Through access to and enjoyment of the marine environment, health and wellbeing are improving. • Blue growth is creating more jobs and wealth; and, is helping coastal communities become more resilient, prosperous and equitable with a vibrant culture. The Welsh marine area is making a strong contribution to energy security and climate change emissions targets through the responsible deployment of low carbon technologies.	The WNMP is a high-level policy document that does not identify specific schemes (etc) that could be reviewed for possible interactions with the WRMP options, and so assessment is not possible at the plan-level.	The WNMP is a high-level policy document that does not identify specific schemes (etc) and which has limited possibilities for interaction with the WRMP and so assessment is not possible at the plan-level.	No likely significant effects.
Water Company (various) Drought Plans	Drought Plans set out the steps that each water company will take through the stages of developing drought, drought, severe drought and recovery from drought to ensure their supply of water resources. Drought Plans must be produced by all water companies to fulfil their requirements under the Water Act 2003. Those Drought Plans relevant to the WRMP are: - Dee Valley Water Drought Plan; - Albion Water Draft Drought Plan; - Severn Trent Water Drought Plan; - United Utilities Drought Plan; and - Thames Water.	These cannot be reviewed at this stage - however, there is no risk of option-level in combination effects with other WRMPs given the location of the DCWW options in West Wales.	Potential 'in combination' effects between the Drought Plans and the WRMP cannot be meaningfully identified and assessed at this level. This is because the WRMP options cannot, in theory, operate in combination with the DP options: if the WRMP options are implemented then they will become a part of the baseline against which the effects of the DP options will be assessed (with the DP options then permitted or not at the application stage).	No likely significant effects.

Appendix F - Key 'in combination' plans and likely effects

Plan	Summary	In combination effects with Preferred Options?	In combination effects with WRMP	Conclusion
Water Company (various) Water Resources Management Plans	Water companies in England and Wales, are required to prepare, maintain and publish a WRMP under the Water Industry Act 1991, updated by the provisions in section 37A-D of the Water Act 2003 and the Water Act 2014 and the Environment (Wales) Act 2016. The plan must set out how a water company intends to maintain the balance between supply and demand for water over a minimum of a 25 year period. This is complemented by a water company drought plan, which sets out the short-term operational steps a company will take as a drought progresses. Those neighbouring Water Resource Management Plans relevant to the plan are: - Dee Valley; - Severn Trent Water - United Utilities - Bristol Water - Thames Water.	These cannot be reviewed at this stage - however, there is no risk of option-level in combination effects with other WRMPs given the location of the DCWW options in West Wales.	No additional interactions with these plans would be expected at the plan-level. Water company plans are catchment-specific, and designed to be complemetary, so in combination effects (e.g. two companies aiming to exploit the same resource) are very unlikely; this can only be confirmed when the options are finalised.	No likely significant effects.
Environment Agency / Natural Resources Wales (various) Flood Risk Management Plans	Flood Risk Management Plans (FRMPs) give an overview of the flood risk across each river catchment. They recommend ways of managing those risks now and over the next 50-100 years. FRMPs consider all types of inland flooding, from rivers, ground water, surface water and tidal flooding, but not flooding directly from the sea, (coastal flooding), which is covered in Shoreline Management Plans. They also take into account the likely impacts of climate change, the effects of how we use and manage the land, and how areas could be developed to meet our present day needs without compromising the ability of future generations to meet their own needs. Those FRMPs present in the Welsh Water area are: - The Dee - The Severn - Western Wales	The preferred options only have the potential to interact with the Western Wales FRMP, specifically the Merionydd catchment (TYA004 / TYA009a) and the Cleddau and Pembrokeshire Coast catchment (PEM024a / 024b). Based on a review of these FRMPs it is not possible to identify specfic in combination risks (the FRMPs have broad policy positions for sections of river (e.g. Maintain existing defences and inspection regime) but do not idenitfy specific schemes); and in reality the WRMP options are of a scale whereby significant effects in combination effects would not be expected.	No additional interactions with these plans would be expected at the plan-level.	No likely significant effects.

Appendix F - Key 'in combination' plans and likely effects

Plan	Summary	In combination effects with Preferred Options?	In combination effects with WRMP	Conclusion
Environment Agency / Natural Resources Wales (various) River Basin Management Plans	River Basin Management Plans (RBMPs) set out how the water environment will be managed and provide a framework for more detailed decisions to be made. RBMPs set out a more integrated approach to river basin management based on the following principles: - Integrate and streamline plans and processes; - Set out a clear, transparent and accessible process of analysis and decision-making; - Focus at the river basin district level; - Work in partnership with other regulators; - Encourage active involvement of a broad cross-section of stakeholders; - Make use of the alternative objectives to deliver sustainable development; - Use Better Regulation principles and consider the cost-effectiveness of the full range of possible measures; - Seek to be even handed across different sectors of society and sectors of industry; - Seek to be even handed and transparent in the management of uncertainty; - Develop methodologies and refine analyses as more information becomes available. RBMPs in the Welsh Water area are Severn, Western Wales and Dee.	The preferred options only have the potential to interact with the Western Wales RBMP, specifically the Merionydd catchment (TYA004 / TYA009a) and the Cleddau and Pembrokeshire Coast catchment (PEM024a / 024b). Based on a review of RBMP it is not possible to identify specfic in combination risks (the RBMPs have broad policy positions but do not idenitfy specific schemes, and the HRA of the RBMPs concluded that project detail was not sufficient for meaningful assessment). In reality the WRMP options are of a scale whereby significant effects in combination effects would not be expected.	No additional interactions with these plans would be expected at the plan-level.	No likely significant effects.
Environment Agency / Natural Resources Wales (various) Catchment Abstraction Management Strategies	Catchment Abstraction Management Strategies (CAMS) set out how water resources will be managed in each catchment and provide information on how existing abstraction licenses are managed and the availability of water for further abstraction. Within each CAMS, river flows and groundwater levels are monitored and assessed alongside the amount of water which has been abstracted on average over the previous six years and the situation if all abstraction licences were used to full capacity. This data is used to determine the water availability for each water body. CAMS within the Welsh Water area include: - River Wye - Teifi and North Ceredigion - Carmarthen Bay - Anglesey - Conwy - Llŷn and Eryri - River Usk - Thaw and Cadoxton - The Cleddau and Pembrokeshire Coastal Rivers - The Swansea Bay - Clwyd - Dee - Meirionnydd	The CAMS do not necessarily provide a mechanism for 'in combination' effects with the Options, but are used to guide the choice of options particularly where 'new water' may be required. It should be noted that TYA004 will require a new abstraction but that the 2015 Meirionnydd Catchment Abstraction Management Strategy (CAMS) states that water is available for abstraction without restrictions within the Dysynni.	The WRMP explicitly accounts for the CAMS when calculating future water availability (and hence areas with potential deficits). This means that 'in combination' water-resource effects with the CAMS will not occur.	No likely significant effects.

Appendix F - Key 'in combination' plans and likely effects

Plan	Summary	In combination effects with Preferred Options?	In combination effects with WRMP	Conclusion
Local Planning Authority (various) Land Use Plans	The Welsh Water area covers a number of Local Planning Authorities. The main objectives of the existing and emerging Land Use Plans in these areas are related to the sustainable development of the area.	The preferred options only have the potential to interact with the Local Plans of Gywnedd (TYA004 / TYA009a) and Pembrokeshire / Pembrokeshire National Park (PEM024a / 024b) due to the scale of the schemes and local nature of any effects. Based on a review of these plans there are no allocations (etc) that are likely to interact significantly with the WRMP options, and in reality the options are of a scale whereby significant effects would not be expected.	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. Potential 'in combination' effects in respect of water-resource demands due to other plans or projects are unlikely since these demands are explicitly modelled when determining deficit	No likely significant effects.
Shoreline Management Plans (various)	Shore Lline Management Plans are prepared in England and Wales. They are developed by Coastal Groups with members drawn from local authorities and other stakeholders. They identify the most sustainable approach to managing the flood and coastal risks to the coastline in the short term (up to 20 years), medium term (20 to 50 years) and long term (50 to 100 years). Relevant plans include: • North West England and North Wales Shoreline Management Plan • Severn Estuary Shoreline Management Plan Review • Lavernock Point to St Ann's Head Shoreline Management Plan • West of Wales Shoreline Management Plan	The preferred options only have the potential to interact with the West of Wales SMP (TYA004 / TYA009a) and the Lavernock Point to St Ann's Head SMP (PEM024a / 024b). Based on a review of these plans it is not possible to identify specfic in combination risks (the SMPs have broad policy positions for sections of coast (e.g. hold the line; managed re-alignment) but do not idenitfy specific schemes); and in reality the WRMP options are of a scale whereby significant effects in combination effects would not be expected as the SMPs cover shoreline areas that are some distance from the location of the options.	No additional interactions with the SMPs would be expected.	No likely significant effects.

Appendix G
Standard avoidance measures and best-practice

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 scheme-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 regimes required to ensure no adverse effects occur (e.g. compensation releases - although note that these measures can only be identified through detailed investigation schemes and agreed through the abstraction licensing process).

Pollution Prevention

The habitats of European sites are most likely to be affected indirectly, through construction-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 current industry best-practices in construction that are likely to be relevant to the proposed schemes:

- Environment Agency Pollution Prevention Guidance Notes[39], including:
  - PPG1: General guide to the prevention of pollution (May 2001);
  - PPG5: Works and maintenance in or near water (October 2007);

[39] 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.

- 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 WRMP 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 (WRMP) 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 NE.
- 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.

Option-Specific Measures

The following tables summarise the Option-specific measures that will be employed (in addition to the general measures outlined above) to avoid specific potential effects on European sites that have been identified during the assessment process.

The interest features will be taken into account during the design-phase for the schemes, and it may be possible to design the scheme such that these measures are not required; otherwise, **these measures will be refined during the scheme design and employed during construction/operation unless project-level HRAs or scheme-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 more appropriate/required.** Agreement on appropriate measures will be made with NRW / NE where potential significant effects are identified at the project-level.

Note that only those European sites for which specific measures have been identified are noted in the following sections; all other sites potentially affected by each Option will be protected by use of the general measures outlined above.

Table G1 Receptor-specific measures for Option TYA004

Site	Feature	Avoidance Measures (in addition to general measures)
Craig yr Aderyn (Bird's Rock) SPA	▶ Chough	Construction of the scheme will avoid the breeding period (March – August) to minimise the risk of disturbance to chough, unless scheme-specific surveys or analyses demonstrate that any effects associated with construction works can be avoided (e.g. through construction site supervision / monitoring), will be 'not significant' (i.e. chough will not be exposed to construction effects), or will have no adverse effect on the integrity of the SPA.
Dyfi Estuary / Aber Dyfi SPA	▶ Greenland white-fronted goose	Construction of the scheme will avoid the winter period (October – March) to minimise the risk of disturbance to wintering Greenland white-fronted geese, unless scheme-specific surveys or analyses demonstrate that any effects associated with construction works can be avoided (e.g. through construction site supervision / monitoring), will be 'not significant' (i.e. geese will not be exposed to construction effects), or will have no adverse effect on the integrity of the SPA.

Table G2 Receptor-specific avoidance measures for Options PEM024a / PEM024b

Site	Feature	Avoidance Measures (in addition to general measures)
Afonydd Cleddau/ Cleddau Rivers SAC	▶ Sea lamprey ▶ River lamprey	Construction of the scheme will avoid the main migration period for lamprey species (late October – April) to minimise the risk of displacement or barrier effects due to noise, vibration or site-derived pollutants, unless scheme-specific analyses demonstrate that any effects associated with construction works will be 'not significant', can be avoided using appropriate mitigation, or will have no adverse effect on the integrity of the SAC.
Pembrokeshire Marine/ Sir Benfro Forol SAC	▶ Sea lamprey ▶ River lamprey	Construction of the scheme will avoid the main migration period for lamprey species (late October – April) to minimise the risk of displacement or barrier effects due to noise, vibration or site-derived pollutants, unless scheme-specific analyses demonstrate that any effects associated with construction works will be 'not significant', can be avoided using appropriate mitigation, or will have no adverse effect on the integrity of the SAC.
Pembrokeshire Bat Sites and Bosherston Lakes/ Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston SAC	▶ Lesser horseshoe bat ▶ Greater horseshoe bat	Construction works should avoid removal of scrub/trees, or damage to stream corridors and other linear features, to prevent possible fragmentation of habitats which may be used by local bat populations, unless surveys or additional investigations establish that they are unlikely to be significant or critical resources for bats from this SAC.

Site	Feature	Avoidance Measures (in addition to general measures)
Limestone Coast of South West Wales/ Arfordir Calchfaen de Orllewin Cymru SAC	▶ Greater horseshoe bat	As for Pembrokeshire Bat Sites and Bosherston Lakes/ Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston SAC
North Pembrokeshire Woodlands/ Coedydd Gogledd Sir Benfro SAC	▶ Barbastelle	As for Pembrokeshire Bat Sites and Bosherston Lakes/ Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston SAC

Table G3 Receptor-specific avoidance measures for Option VOW2a

Site	Feature	Avoidance Measures (in addition to general measures)
River Wye/ Afon Gwy SAC / Severn Estuary/ Môr Hafren SAC / Severn Estuary Ramsar	▶ Water courses of plain to montane levels with the Ranunculion (etc) ▶ Sea lamprey ▶ Brook lamprey ▶ River lamprey ▶ Allis shad ▶ Twaite shad ▶ Atlantic salmon ▶ Bullhead ▶ Otter	In addition to normal project-level planning and best-practice, the following construction-stage measures will be employed unless project-level HRAs 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: ▶ construction of the scheme near the Wye will avoid the main migration period for salmon, and shad and lamprey species (September – May) to minimise the risk of displacement or barrier effects due to noise, vibration or site-derived pollutants; and ▶ the river crossing will be completed using a non-invasive crossing method that does not require in-channel disturbance (e.g. Horizontal Directional Drill (HDD) or similar)