

Habitats Regulations Assessment of the Monmouthshire Replacement Local Development Plan

Preferred Strategy

Monmouthshire County Council

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Quality information

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Executive Summary for the Habitats Regulations Assessment of the Monmouthshire Local Development Plan Preferred Strategy

Introduction

AECOM was appointed by Monmouthshire County Council (MCC) to undertake a Habitats Regulations Assessment of its Replacement Local Development Plan (RLDP) Preferred Strategy, which sets out the development in Monmouthshire between 2018 and 2033 that includes provision for 8,366 new residential dwellings, 43ha of employment land and the delivery of 7,215 additional jobs. The objective of this assessment is to identify any aspects of the Plan that would cause an adverse effect on the integrity of internationally important wildlife sites, otherwise known as European sites (Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and, as a matter of Government policy, Ramsar sites), either in isolation or in combination with other plans and projects, and to advise on appropriate policy mechanisms for delivering mitigation where such effects are identified. However, given its relatively early stage the RLDP does not yet set out the specific site allocations nor detailed policy wording. While it does contain potential development site options in Appendix 3 these are subject to considerable change between Preferred Strategy and Deposit Plan. As such, the Appropriate Assessment (the second stage of the HRA process) of some of the impact pathways is deferred to the Deposit Plan HRA and areas of further work are identified, to inform that HRA.

Legislative Context

The need for an assessment of impacts on European sites is set out in the Conservation of Habitats and Species Regulations 2017 (as amended). To ascertain whether the integrity of any European sites will be affected, competent authorities must therefore undertake an HRA of the plan or project in question, including an Appropriate Assessment if necessary, before approving it.

Scope

Given an initial assessment of the relevant European sites within 15km of Monmouthshire and the impact pathways present, the HRA addresses the following European sites: **Usk Bat Sites SAC, Cwm Clydach Woodlands SAC, Wye Valley Woodlands SAC, Wye Valley and Forest of Dean Bat Sites SAC, Severn Estuary SPA / Ramsar, Severn Estuary SAC, River Wye SAC, Avon Gorge Woodlands SAC, River Usk SAC, Aberbargoed Grasslands SAC, Sugar Loaf Woodlands SAC, Llangorse Lake SAC and Coed y Cerrig SAC.**

HRA tasks

Following initial evidence gathering, the first stage of any Habitats Regulations Assessment is a screening for Likely Significant Effects (LSEs), essentially an assessment of the risks for European sites, associated with a development plan. If LSEs cannot be excluded, and a mechanism for an adverse interaction between a plan and a receptor site is present, the next stage of HRA, known as Appropriate Assessment, needs to be undertaken. The Appropriate Assessment is a more detailed analysis of the impact pathways and European sites considered at the screening stage. One of the key elements of an Appropriate Assessment is the consideration of mitigation measures, which might protect a European site from potential harmful adverse effects¹. Furthermore, a recent ruling established that habitats or species outside a European site, which are essential for the functioning of the protected site, must be taken into account in the HRA process². For this HRA, both Task 1 (Screening for Likely Significant Effects; LSEs) and Task 2 (Appropriate Assessment) were carried out.

Findings & Recommendations

The HRA shows that LSEs can be excluded for the identified impact pathways in relation to most European sites. However, due to the combination of missing scientific evidence (i.e. no air quality modelling or visitor data being available) and lacking detail in the current Preferred Strategy (i.e. no site allocations, limited policy wording), a definitive Appropriate Assessment of the following impacts pathways relating to specific European sites is deferred to the Deposit Plan HRA:

¹ According to a decision by the European Court of Justice, these can no longer be taken into account at the screening stage of HRA. *People Over Wind and Sweetman v Coillte Teoranta* (C-323/17)

² The 2018 Holohan ruling. Case C-461/17

- Atmospheric pollution impacts on the Usk Bat Sites SAC, Cwm Clydach Woodlands SAC, Wye Valley Woodlands SAC and the Severn Estuary SAC / SPA / Ramsar
- Recreational pressure in the Severn Estuary SAC / SPA / Ramsar
- Functionally linked land relating to the Usk Bat Sites SAC, Wye Valley and Forest of Dean Bat Sites SAC
- Water quality in the River Usk SAC and the River Wye SAC
- Water quantity, level and flow in the River Usk SAC and the River Wye SAC

Regarding atmospheric pollution adverse effects on the site integrity of the Usk Bat Sites SAC, Cwm Clydach Woodlands SAC, Wye Valley Woodlands SAC and the Severn Estuary SAC / SPA / Ramsar cannot be excluded, because air quality modelling for sensitive habitat components within these sites is not available. **It is recommended to model a minimum of one road transect** in the Usk Bat Sites SAC and the Cwm Clydach Woodlands SAC to inform the Deposit Plan HRA. A transect should also be modelled along each of the M4 and M48, traversing the Severn Estuary SAC / SPA / Ramsar within 200m of coastal saltmarsh. Furthermore, due to the length of the Wye Valley Woodlands SAC along a potential north-south commuter route, it is advised that **two road transects are modelled** along this site.

Regarding recreational pressure in the Severn Estuary SPA / Ramsar it is concluded that, given the allocation of new residential dwellings in Monmouthshire and that there are suitable access points to the SPA / Ramsar in the authority, further evidence is required. **This will include a visitor survey** at the two access points identified (Black Rock Picnic Site car park, Caldicot coastal path), **an investigation into recreational use of potential functionally linked land parcels** in southern Monmouthshire and, if the visitor survey indicates a requirement, **setting up an Interim Avoidance Strategy**. Furthermore, it is recommended to introduce protective policy wording into the Deposit Plan, which assesses the acceptability of proposals that increase recreational access to sensitive SAC components (see HRA for detailed policy wording).

Adverse effects on site integrity cannot be excluded regarding land that is functionally linked to the Usk Bat Sites SAC, Wye Valley and Forest of Dean Bat Sites SAC and the Severn Estuary SPA / Ramsar, because proposed candidate sites in the Strategic Growth Areas of Monmouth, Chepstow and Severnside comprise suitable habitats and are sufficiently large to support Bewick's swans, lesser horseshoe bats and greater horseshoe bats. A definitive Appropriate Assessment of this impact pathway is deferred to the Deposit Plan HRA, when site allocations will be available. Nonetheless, to help reduce the potential for adverse effects, it is recommended to **insert protective policy wording into the Deposit Plan that recognises the importance of functionally linked supporting habitats to these SACs, including the typical 2km and 3km Core Sustainance Zones (CSZ)**, for lesser and greater horseshoe bats (see HRA for detailed wording). Scientific evidence indicates that foraging and / or commuting habitat outside the designated site boundaries is essential for the integrity of the bat SACs. Furthermore, it is advised that, regarding the Severn Estuary SPA / Ramsar and allocated greenfield sites of sufficient size (at least 2ha) in southern Monmouthshire, **policy wording requiring the need for detailed habitat assessment and, if suitable, bird surveys** is inserted into the Deposit Plan (see HRA for detailed wording).

Finally, **regarding both water quality and water quantity, level and flow**, a definitive Appropriate Assessment will be undertaken for the Deposit Plan, when the spatial distribution of development and its associated Wastewater Treatment Works (WwTWs) infrastructure is available. However, given the sensitivity of both riverine SACs to these impact pathways, **it is recognised that mitigation in the form of policy wording needs to be inserted into the Deposit Plan**. This is to ensure that new development can be accommodated within the permitted headroom of WwTW infrastructure and that the supply of water to new development will not change the natural flow regimes in the two rivers (see HRA for detailed wording). The emerging issue of phosphorus neutrality was also investigated in this HRA. All of the potential sites assessed in the Strategic Growth Areas of Abergavenny and Monmouth would result in a phosphorus surplus in the River Wye SAC and River Usk SAC. Therefore, mitigation measures, tailored to the quantum and spatial distribution of growth allocated in the Deposit Plan, will be required to allow development to come forward.

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1. Background

Introduction

AECOM was appointed by Monmouthshire County Council (MCC) to undertake a Habitats Regulations Assessment of its Replacement Local Development Plan (RLDP) Preferred Strategy and Deposit Plan. The objective of this assessment is to identify any aspects of the Plan that would cause an adverse effect on the integrity of internationally important wildlife sites, otherwise known as European sites (Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and, as a matter of Government policy, Ramsar sites), either in isolation or in combination with other plans and projects, and to advise on appropriate policy mechanisms for delivering mitigation where such effects are identified.

This RLDP is a replacement for the adopted LDP that covered the period between 2011 and 2021. The new RLDP will cover the years 2018 to 2033, building upon the previous LDP. The emerging RLDP is the Council's statutory land use plan, supporting the delivery of sustainable and resilient communities within Monmouthshire. The RLDP will determine where and how much development will take place in the County, but it will also outline which areas are to be protected from development. The RLDP Preferred Strategy sets out the housing and employment needs (and other strategic approaches) within Monmouthshire. It is projected within the RLDP that provision will be made for 8,366 new residential dwellings and 7,215 new jobs to be delivered across the County throughout the RLDP's period.

The Preferred Growth Strategy for the County is based on a population-led growth scenario, focussing on the primary settlements of Abergavenny, Monmouth, Chepstow and the Severnside area (comprising several settlements, such as Caldicot). Although the growth strategy is still relatively broad, MCC has identified four Strategic Growth Areas (SGAs; Abergavenny, Monmouth, Chepstow and Severnside) in Monmouthshire. The SGAs differ in their proximity to European sites and the precise distribution of development will determine the magnitude of some relevant impact pathways (e.g. recreational pressure) affecting European sites. Furthermore, in each of these potential SGAs, several spatial growth options are proposed. For example, in Chepstow, three options are suggested (Option D – Land north of the Bayfield Estate, 10.07ha; Option E – two potential sites on Land between the Bayfield estate and A48, totalling 33.2ha; Option F – Land between the A48 and M48, 100ha). Given that the RLDP Preferred Strategy is a relatively broad plan, it does not provide for specific site allocations, but instead sets out candidate sites to be brought forward at the Deposit Plan stage. The SGAs and potential sites differ in area (ha) and their distance to nearby European sites, which both might have potential implications for their linking impact pathways. Despite the relatively broad nature of the SGAs and allocations not being confirmed at this stage of the RLDP, this HRA examines their likely implications for European sites regarding the identified impact pathways. However, due to the (intentional) lack of detail, it is not within the scope of this HRA to provide definitive conclusions. A definitive analysis would involve Appropriate Assessment of all relevant impact pathways, which will be fully undertaken for the Deposit Plan, when the site allocations and more detailed policy text is available. Furthermore, some of the evidence base needed to make an informed judgment is not yet available (see later discussion), meaning that this HRA also identifies some areas for further work.

An initial assessment of the designated sites within and surrounding Monmouthshire, and the associated impact pathways linking them to the Monmouthshire RLDP was undertaken. This indicates that several European sites require consideration, most notably the Severn Estuary SPA / Ramsar, the Severn Estuary SAC, the River Usk SAC, the River Wye SAC and two sites designated for bat species, which all lie partly within the authority. Under the Conservation of Habitats and Species Regulations (2017, as amended), an Appropriate Assessment is required, where a plan or project is likely to have a significant effect upon a European Site, either individually or 'in combination' with other projects.

Legislative Context

The UK left the EU on 31 January 2020 under the terms set out in the European Union (Withdrawal Agreement) Act 2020 ("the Withdrawal Act"). This established a transition period, which ended on 31 December 2020. The Withdrawal Act retains the body of existing EU-derived law within our domestic law, meaning that legislation relating to nature conservation continues to apply to and in the UK. The need for Appropriate Assessment is set out by the Conservation of Habitats and Species Regulations

2017 (as amended) and is retained in the EU Exit Regulations 2019. The Regulations apply the precautionary principle³ to assessments of European Sites, which form part of the newly coined National Site Network. Consent should only be granted for plans and projects once the relevant competent authority has ascertained that there will either be no likelihood of significant effects, or that a mechanism is in place to ensure that no adverse effect on the integrity of the European Site(s) in question arises. Where an Appropriate Assessment has been carried out and results in a negative assessment, or if uncertainty remains over the significant effect, consent can only be granted if there are no alternative solutions and there are Imperative Reasons of Over-Riding Public Interest (IROPI) for the development and compensatory measures have been secured.

To ascertain whether site integrity will be affected, an Appropriate Assessment should be undertaken of the plan or project in question. Figure 1 provides the legislative basis for an Appropriate Assessment.

Conservation of Habitats and Species Regulations 2017 (as amended)

The Regulations state that:

"A competent authority, before deciding to ... give any consent for a plan or project which is likely to have a significant effect on a European site ... must make an appropriate assessment of the implications for the plan or project in view of that site's conservation objectives... The competent authority may agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the European site."

Figure 1. The legislative basis for Appropriate Assessment

Over the years, 'Habitats Regulations Assessment' (HRA) has come into wide currency to describe the overall process set out in the Habitats Regulations, from screening through to identification of IROPI. This has arisen in order to distinguish the overall process from the individual stage of "Appropriate Assessment". Throughout this Report the term HRA is used for the overall process and restricts the use of Appropriate Assessment to the specific stage of that name.

Scope of the Project

There is no pre-defined guidance that dictates the physical scope of an HRA of a Plan document. Therefore, in considering the physical scope of the assessment, we were guided primarily by the identified impact pathways (called the source-pathway-receptor model) rather than by arbitrary 'zones'. Current guidance suggests that the following European sites be included in the scope of assessment:

- All European sites within the boundary of the County of Monmouthshire; and,
- Other European sites within 15km shown to be linked to development within the County's boundary through a known 'pathway' (discussed below).

Briefly defined, impact pathways are routes by which the implementation of a policy within a Local Plan document can lead to an effect upon a European designated site. An example of this would be new residential development resulting in an increased population and thus increased recreational pressure, which could then affect European sites by, for example, disturbance of wintering or breeding birds. Guidance from the English Ministry of Housing, Communities and Local Government (MHCLG) states that the HRA should be '*proportionate to the geographical scope of the [plan policy]*' and that '*an AA need not be done in any more detail, or using more resources, than is useful for its purpose*' (MHCLG, 2006, p.6).

While MHCLG does not have authority in Wales, this basic principle has also been reflected in court rulings. The Court of Appeal⁴ has ruled that providing the Council (competent authority) was duly satisfied that proposed mitigation could be 'achieved in practice' to satisfy that the proposed development would have no adverse effect, then this would suffice. This ruling has since been applied

³ The Precautionary Principle, which is referenced in Article 191 of the Treaty on the Functioning of the European Union, has been defined by the United Nations Educational, Scientific and Cultural Organisation (UNESCO, 2005) as:
"When human activities may lead to morally unacceptable harm [to the environment] that is scientifically plausible but uncertain, actions shall be taken to avoid or diminish that harm. The judgement of plausibility should be grounded in scientific analysis".

⁴ No Adastral New Town Ltd (NANT) v Suffolk Coastal District Council Court of Appeal, 17th February 2015

to a planning permission (rather than a Core Strategy document)⁵. In this case the High Court ruled that for ‘a multistage process, so long as there is sufficient information at any particular stage to enable the authority to be satisfied that the proposed mitigation can be achieved in practice it is not necessary for all matters concerning mitigation to be fully resolved before a decision maker is able to conclude that a development will satisfy the requirements of Reg 61 of the Habitats Regulations’.

Given an initial assessment of the relevant European sites and the impact pathways present, and referring to the HRA work that was undertaken for the adopted LDP, this HRA will discuss the following European sites:

- Usk Bat Sites SAC
- Cwm Clydach Woodlands SAC
- Wye Valley Woodlands SAC
- Severn Estuary SAC
- River Wye SAC
- Avon Gorge Woodlands SAC
- Severn Estuary SPA / Ramsar
- River Usk SAC
- Wye Valley and Forest of Dean Bat Sites SAC
- Aberbargoed Grasslands SAC
- Sugar Loaf Woodlands SAC
- Llangorse Lake SAC; and
- Coed y Cerrig SAC

An introduction to these sites, their qualifying features (species and habitats), conservation objectives, and threats and pressures to site integrity are set out in Chapter 3 of this report.

In order to fully inform the screening process, several studies and information databases have been consulted to determine Likely Significant Effects (LSEs) that could arise from the draft RLDP. These include:

- Future development proposed (and, where available, HRAs) for the adjoining authorities of Powys, Torfaen, Newport, Blaenau Gwent, Herefordshire, Forest of Dean, South Gloucestershire and Bristol;
- Road traffic statistics from the Department for Transport (<https://roadtraffic.dft.gov.uk>);
- Journey-to-work data from the Population Census 2011 (<https://www.nomisweb.co.uk/census/2011/WU03UK>);
- Visitor surveys carried out in Lydney⁶ and Stroud District⁷, as they are both relevant to the Severn Estuary SPA / Ramsar;
- The HRA produced for the adopted Monmouthshire LDP;
- Core Management Plans for relevant European sites;
- The UK Air Pollution Information System (www.apis.ac.uk);

⁵High Court case of R (Devon Wildlife Trust) v Teignbridge District Council, 28 July 2015

⁶Liley D., Panter C. & Hoskin R. 2017. Lydney Severn Estuary Visitor Survey and Recreation Strategy. Unpublished report by Footprint Ecology for the Forest of Dean District Council. 55pp. Available at: <https://www.footprint-ecology.co.uk/reports/Liley%20et%20al%202017%20Lydney%20Severn%20Estuary%20Visitor%20Survey%20and%20Recreation%20Strategy.pdf> [Accessed on the 05/11/2019]

⁷Southgate J. & Colebourn K. 2016. Severn Estuary (Stroud District) Visitor Survey Report. Report for Stroud District Council. Ecological Planning & Research, Winchester. 68pp. Available at: https://www.stroud.gov.uk/media/2902/severnsestuaryvs_report_15581c_final_060616.pdf [Accessed on the 05/11/2019]

- Multi Agency Geographic Information for the Countryside (MAGIC) and its links to SSSI citations and the JNCC website (www.magic.gov.uk);
- Habitat mapping on the Wales Environmental Information Portal⁸; and
- DTA Habitats Regulations Assessment Handbook⁹.

Quality Assurance

This report was undertaken in line with AECOM's Integrated Management System (IMS). Our IMS places great emphasis on professionalism, technical excellence, quality, environmental and Health and Safety management. All staff members are committed to establishing and maintaining our certification to the international standards BS EN ISO 9001:2008 and 14001:2004 and BS OHSAS 18001:2007. In addition, our IMS requires careful selection and monitoring of the performance of all sub-consultants and contractors.

All AECOM Ecologists working on this project are members (at the appropriate level) of the Chartered Institute of Ecology and Environmental Management (CIEEM) and follow their code of professional conduct (CIEEM, 2017).

⁸ Available online at: <https://naturalresources.wales/evidence-and-data/accessing-our-data/beta-environmental-data/?lang=en> [Accessed on the 11/06/2021]

⁹ Available online at: <https://www.dtapublications.co.uk/> [Accessed on the 11/06/2021]

2. Methodology

Introduction

The HRA has been carried out with reference to the general EC guidance on HRA¹⁰ and the Welsh Government's guidance on HRA: Technical Advice Note 5 (Nature Conservation and Planning) 2009 and The Planning Series: 16 – Habitats Regulations Assessment. AECOM has also been mindful of the implications of European case law in 2018, notably the Holohan ruling and the People over Wind ruling, both discussed below.

Figure 2 below outlines the stages of HRA according to current EC guidance. The stages are essentially iterative, being revisited as necessary in response to more detailed information, recommendations, and any relevant changes to the plan until no significant adverse effects remain.

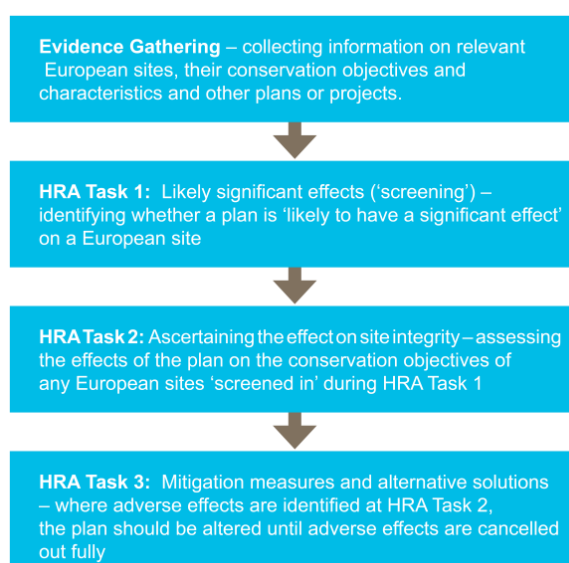


Figure 2. Four Stage Approach to Habitats Regulations Assessment. Source EC, 2001¹.

Description of HRA Tasks

HRA Task 1 – Likely Significant Effects (LSE)

Following evidence gathering, the first stage of any Habitats Regulations Assessment is a Likely Significant Effect (LSE) test - essentially a risk assessment to decide whether the full subsequent stage known as Appropriate Assessment is required. The essential question is:

"Is the project, either alone or in combination with other relevant projects and plans, likely to result in a significant effect upon European sites?"

The objective is to 'screen out' those plans and projects that can, without any detailed appraisal, be said to be unlikely to result in significant adverse effects upon European sites, usually because there is no mechanism for an adverse interaction with European sites. This stage is undertaken in Chapter 4 of this report and in Appendix A.

HRA Task 2 – Appropriate Assessment (AA)

Where it is determined that a conclusion of 'no likely significant effect' cannot be drawn, the analysis has proceeded to the next stage of HRA known as Appropriate Assessment. Case law has clarified that 'appropriate assessment' is not a technical term. In other words, there are no particular technical

¹⁰ European Commission (2001): Assessment of plans and projects significantly affecting Natura 2000 Sites: Methodological Guidance on the Provisions of Article 6(3) and 6(4) of the Habitats Directive.

analyses, or level of technical analysis, that are classified by law as belonging to appropriate assessment rather than determination of likely significant effects.

By virtue of the fact that it follows Screening, there is a clear implication that the analysis will be more detailed than undertaken at the Screening stage and one of the key considerations during appropriate assessment is whether there is available mitigation that would entirely address the potential effect. In practice, the appropriate assessment would take any policies or allocations that could not be dismissed following the high-level Screening analysis and analyse the potential for an effect in more detail, with a view to concluding whether there would actually be an adverse effect on integrity (in other words, disruption of the coherent structure and function of the European site(s)).

A decision by the European Court of Justice¹¹ concluded that measures intended to avoid or reduce the harmful effects of a proposed project on a European site may no longer be taken into account by competent authorities at the Likely Significant Effects or 'screening' stage of HRA. That ruling has been taken into account in producing this HRA.

In 2018 the Holohan ruling¹² was also handed down by the European Court of Justice. Among other provisions paragraph 39 of the ruling states that '*As regards other habitat types or species, which are present on the site, but for which that site has not been listed, and with respect to habitat types and species located outside that site, ... typical habitats or species must be included in the appropriate assessment, if they are necessary to the conservation of the habitat types and species listed for the protected area*' [emphasis added]. Due account of this decision has been taken in this HRA, particularly regarding habitat outside the Usk Bat Sites SAC, Wye Valley & Forest of Dean Bat Sites SAC and Severn Estuary SPA / Ramsar but which may be important for sustaining the SAC bat populations and SPA / Ramsar bird populations.

HRA Task 3 – Avoidance and Mitigation

Where necessary, measures are recommended for incorporation into the Plan in order to avoid or mitigate adverse effects on European sites. There is considerable precedent concerning the level of detail that a Local Plan document needs to contain regarding mitigation for recreational impacts on European sites. The implication of this precedent is that it is not necessary for all measures that will be deployed to be fully developed prior to adoption of the Plan, but the Plan must provide an adequate policy framework within which these measures can be delivered.

In evaluating significance, AECOM has relied on professional judgement as well as the results of previous stakeholder consultation regarding development impacts on the European sites considered within this assessment.

When discussing 'mitigation' for a Local Development Plan document, one is concerned primarily with the policy framework to enable the delivery of such mitigation rather than the details of the mitigation measures themselves since the Local Development Plan document is a high-level policy document.

¹¹ People Over Wind and Sweetman v Coillte Teoranta (C-323/17)

¹² Case C-461/17

3. European Designated Sites

Usk Bat Sites SAC

Introduction

The SAC comprises a wide variety of different habitats, including bogs and marshes (40.2%), heath and scrub (32.2%), Alpine and sub-alpine grassland (3.9%), dry grassland and steppes (3.8%) and broad-leaved deciduous woodland (3.4%).

Mynydd Llangatwg, the area making up large parts of the SAC, consists mainly of open moorland and bog, and represents one of the largest sections of exposed upland limestone crag in south Wales. The Craig y Cilau National Nature Reserve (NNR), which covers a large portion of the limestone escarpment, comprises areas of limestone grassland, scree, woodland and scrub. An extensive system of caves and sinkholes has developed beneath the Mynydd Llangatwg.

The NNR has been established primarily to protect the lesser horseshoe bat roosts in the caves, a primary reason for selection of this site as a SAC. However, the site also supports a noteworthy assemblage of plants, such as the small-leaved lime, several species of whitebeam, limestone fern, endemic hawkweeds and the alpine enchanter's-nightshade. The various micro-habitats on the cliffs and boulders harbour a typical range of fern, bryophytes and calcareous lichens. Notable lichen species include the jelly lichen *Collema cristatum*, *Leproplacetum chrysodetae* and *Aspicilion calcarean*.

Other Annex I habitats are also present, but not a primary reason for site selection. For example, these include *Tilio-Acerion* forest along the cliffs, which support rare whitebeams and are intermixed with beechwood in the Clydach Gorge. This SAC is located partly within the north-west corner of Monmouthshire near Gilwern.

Qualifying Features¹³

The site has been designated as a SAC, a site of European importance, for a variety of features.

Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:

- European dry heaths
- Degraded raised bogs still capable of natural regeneration
- Blanket bogs
- Calcareous rocky slopes with chasmophytic vegetation
- Caves not open to the public
- *Tilio-Acerion* forests of slopes, screes and ravines

Annex II species that are **a primary reason** for selection of this site

- Lesser horseshoe bat *Rhinolophus hipposideros*

Conservation Objectives¹⁴

The overarching conservation objectives are outlined in the Core Management Plan for the Usk Bat Sites published by the Countryside Council for Wales. While this document also provides conservation vision statements for the Annex I habitats, only the conservation objectives for the primary site feature are outlined below.

¹³ <https://sac.jncc.gov.uk/site/UK0014784> [Accessed on 21/08/2019]

¹⁴ <https://naturalresources.wales/media/674281/Usk%20Bat%20Sites%20Management%20Plan%20Feb%2008.pdf>. As published by the Countryside Council for Wales (2008). [Accessed on 21/08/2019]

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- The site will support a sustainable population of lesser horseshoe bats in the River Usk area;
- The population will be viable in the long term, acknowledging the population fluctuations of the species;
- Buildings, structures and habitats on the site will be in optimal condition to support the populations;
- Sufficient foraging habitat is available, in which factors such as disturbance, interruption to flight lines, and mortality from predation or vehicle collision, changes in habitat management that would reduce the available food source are not at levels which could cause any decline in population size or range;
- Management of the surrounding habitats is of the appropriate type and sufficiently secure to ensure there is likely to be no reduction in population size or range, nor any decline in the extent or quality of breeding, foraging or hibernating habitat;
- There will be no loss or decline in quality of linear features (such as hedgerows and tree lines) which the bats use as flight lines;
- There will be no loss of foraging habitat use by the bats or decline in its quality, such as due to over-intensive woodland management; and
- All factors affecting the achievement of the above conditions are under control.

Threats / Pressures to Site Integrity¹⁵

While there is no Site Improvement Plan for the SAC, the main pressures and threats to site integrity can be inferred from the site's Core Management Plan, which outlines the management techniques that are required to achieve the conservation objectives for the SAC.

The main threats and pressures to the site integrity of the SAC are the following:

- Recreational pressure
- Inappropriate management of main habitats
- Inappropriate water level (in bogs)
- Inappropriate grazing levels
- Impact of atmospheric nitrogen deposition
- Quarrying / mining in the area
- Risk of arson / wildfires

Cwm Clydach Woodlands SAC

Introduction

The Cwm Clydach Woodlands SAC mainly comprises broad-leaved deciduous woodland (88.9%), heath and scrub (9.4%), and some dry grassland and steppes (1.7%). Primarily, the site is characterised by *Asperulo-Fagetum* beech forests that lie close to the limit of their north-western distribution in the UK and within Europe. The main part of the wood is on a steep valley side with a mature canopy of large trees and abundant deadwood. There are also transitions to more acidic beech woodland.

¹⁵ <https://naturalresources.wales/media/674281/Usk%20Bat%20Sites%20Management%20Plan%20Feb%202008.pdf> [Accessed on 21/08/2019]

The SAC harbours some rare and characteristic plant species including the whitebeam *Sorbus porrigentifomis*, mountain sedge *Carex montana*, yellow bird's-nest *Monotropa hypopitys* and bird's-nest orchid *Neottia nidus-avis*. This SAC lies in the north-west corner of the County near Gilwern.

Qualifying Features¹⁶

The site has been designated as a SAC, a site of European importance, for several features.

Annex I habitats that are a primary reason for selection of this site:

- *Asperulo-Fagetum* beech forests

Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:

- Atlantic acidophilous beech forests with *Ilex* and sometimes also *Taxus* in the shrublayer

Conservation Objectives¹⁷

The overarching conservation objectives are outlined in the Core Management Plan for the Cwm Clydach Woodland published by the Countryside Council for Wales. While this document also provides conservation vision statements for the non-primary Annex I habitat, only the conservation objectives for the primary site feature are outlined below.

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- At least 50% of the canopy-forming trees are beech;
- The canopy cover is at least 80% (excluding areas of crag) and composed of locally native trees;
- The woodland has trees of all age classes with a scattering of standing and fallen dead wood;
- Regeneration of trees is sufficient to maintain the woodland cover in the long term;
- The shrub layer and ground flora can be quite sparse, but where present consist of locally native plants such as yew, hawthorn, wych elm, ash, hazel, field maple and elder, bramble, dog's mercury, enchanter's-nightshade, lords-and-ladies, woodruff, male fern, sanicle, wood melick, ivy, false brome, violets, herb robert, wood avens, and tufted hair-grass;
- Scarcer plants, such as soft-leaved sedge and bird's-nest orchid are locally frequent and, more rarely, yellow bird's-nest orchid can be found; and
- All factors affecting the achievement of the above conditions are under control.

Threats and Pressures to Site Integrity¹⁸

While there is no Site Improvement Plan for the SAC, the main pressures and threats to site integrity can be inferred from the site's Core Management Plan, which outlines the management techniques that are required to achieve the conservation objectives for the SAC.

The main threats and pressures to the site integrity of the SAC are the following:

- Recreational disturbance (fly-tipping)
- Inappropriate habitat management
- Inappropriate grazing levels

¹⁶ <https://sac.jncc.gov.uk/site/UK0030127> [Accessed on 21/08/2019]

¹⁷ <https://naturalresources.wales/media/675017/cwm-clydach-sac-plan-english.pdf>. As published by the Countryside Council for Wales (2008). [Accessed on 21/08/2019]

¹⁸ <https://naturalresources.wales/media/675017/cwm-clydach-sac-plan-english.pdf> [Accessed on 21/08/2019]

- Invasive species

River Usk SAC

Introduction

The River Usk SAC originates in the west of the Brecon Beacons National Park and flows south-east, joining the Severn Estuary at Newport. The overall form of the catchment is long and narrow, with steep tributaries inflowing along the way to the Severn Estuary. The underlying geology is primarily Devonian Old Red Sandstone resulting in well buffered low-acidity waters. This geology also drives the low-moderate nutrient that characterises the SAC. However, along its course the nutrient status of the SAC is significantly modified by land use within the catchment, which is mainly pastoral and occasional woodland forestry.

The ecological structure and function of the site is highly dependent on hydrological and geomorphological processes, as well as the quality and connectivity of riparian habitats. This is especially the case for mobile animals, such as migratory fish and otters that move throughout the site. For example, the maintenance of a good hydrological regime (i.e. water quality and flows) and a consequent maintenance of current velocity, water depth, dissolved oxygen levels and nutrient status are integral for fish to move around the river.

Example of the species that the SAC is designated for include the sea lamprey *Petromyzon marinus*, Atlantic salmon *Salmo salar* and bullhead *Cottus gobio*. Especially the Atlantic salmon requires unmodified river channels and an obstruction-free migratory route to its spawning gravels. The River Usk SAC is also an important site for otters, acting as a refuge for the species in the 1950s and subsequently as a source population for the re-colonisation of south-east Wales. This SAC river flows through Monmouthshire.

Qualifying Features¹⁹

The site has been designated as a SAC, a site of European importance, for several features.

Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:

- Water courses of plain to montane levels with the *Ranunculus fluitantis* and *Callitriche-Batrachion* vegetation

Annex II species that are a primary reason for selection of this site:

- Sea lamprey *Petromyzon marinus*
- Brook lamprey *Lampetra planeri*
- River lamprey *Lampetra fluviatilis*
- Twaite shad *Alosa fallax*
- Atlantic salmon *Salmo salar*
- Bullhead *Cottus gobio*
- Otter *Lutra lutra*

Annex II species present as a qualifying feature, but not a primary reason for site selection:

- Allis shad *Alosa alosa*

¹⁹ <https://sac.incc.gov.uk/site/UK0013007> [Accessed on 21/08/2019]

Conservation Objectives²⁰

The overarching conservation objectives are outlined in the Core Management Plan for the River Usk SAC published by the Countryside Council for Wales. While this document provides conservation vision statements for all Annex II species, only the conservation objectives for the water course are presented here, as this is essential to maintain the species in favourable conservation status.

- The capacity of the habitats in the SAC to support each feature at near-natural population levels, as determined by predominantly unmodified ecological and hydromorphological processes and characteristics, should be maintained as far as possible, or restored where necessary;
- The ecological status of the water environment should be sufficient to maintain a stable or increasing population of each feature. This will include elements of water quantity and quality, physical habitat and community composition and structure. It is anticipated that these limits will concur with the relevant standards used by the Review of Consents process given in Annexes 1-3;
- Flow regime, water quality and physical habitat should be maintained in, or restored as far as possible to, a near-natural state, in order to support the coherence of ecosystem structure and function across the whole area of the SAC;
- All known breeding, spawning and nursery sites of species features should be maintained as suitable habitat as far as possible, except where natural processes cause them to change;
- Flows, water quality, substrate quality and quantity at fish spawning sites and nursery areas will not be depleted by abstraction, discharges, engineering or gravel extraction activities or other impacts to the extent that these sites are damaged or destroyed;
- The river planform and profile should be predominantly unmodified. Physical modifications having an adverse effect on the integrity of the SAC, including, but not limited to, revetments on active alluvial river banks using stone, concrete or waste materials, unsustainable extraction of gravel, addition or release of excessive quantities of fine sediment, will be avoided;
- River habitat SSSI features should be in favourable condition. In the case of the Usk Tributaries SSSI, the SAC habitat is not underpinned by a river habitat SSSI feature. In this case, the target is to maintain the characteristic physical features of the river channel, banks and riparian zone;
- Artificial factors impacting on the capability of each species feature to occupy the full extent of its natural range should be modified where necessary to allow passage, eg. weirs, bridge sills, acoustic barriers;
- Natural factors such as waterfalls, which may limit the natural range of a species feature or dispersal between naturally isolated populations, should not be modified;
- Flows during the normal migration periods of each migratory fish species feature will not be depleted by abstraction to the extent that passage upstream to spawning sites is hindered;
- Flow objectives for assessment points in the Usk Catchment Abstraction Management Strategy will be set by Natural Resources Wales (NRW) as necessary. It is anticipated that these limits will concur with the standards used by the Review of Consents process given in Annex 1 of this document;
- Levels of nutrients, in particular phosphate, will be set by NRW for each Water Framework Directive water body in the Usk SAC, and measures taken to maintain nutrients below these levels. It is anticipated that these limits will concur with the standards used by the Review of Consents process given in Annex 2 of this document;
- Levels of water quality parameters that are known to affect the distribution and abundance of SAC features will be set by NRW for each Water Framework Directive water body in the Usk

²⁰ https://naturalresources.wales/media/673384/River_Usk%20SAC%20core%20plan.pdf. As published by the Countryside Council for Wales (2008). [Accessed on 21/08/2019]

SAC, and measures taken to maintain pollution below these levels. It is anticipated that these limits will concur with the 16 standards used by the Review of Consents process given in Annex 3 of this document;

- Potential sources of pollution not addressed in the Review of Consents, such as contaminated land, will be considered in assessing plans and projects; and
- Levels of suspended solids will be set by NRW for each Water Framework Directive water body in the Usk SAC. Measures including, but not limited to, the control of suspended sediment generated by agriculture, forestry and engineering works, will be taken to maintain suspended solids below these levels.

Threats and Pressures to Site Integrity²¹

While there is no Site Improvement Plan for the SAC, the main pressures and threats to site integrity can be inferred from the site's Core Management Plan, which outlines the management techniques that are required to achieve the conservation objectives for the SAC.

The main threats and pressures to the site integrity of the SAC are the following:

- Inappropriate habitat management (e.g. barriers to migration)
- Water quality
- Water flow / level
- Noise / acoustic disturbance
- Non-marine fisheries: recreational and commercial
- Increased sedimentation / siltation

Aberbargoed Grasslands SAC

Introduction

The Aberbargoed Grasslands SAC comprises multiple habitats, including humid grassland (48%), broad-leaved deciduous woodland (32.6%), and heath and scrub (12.8%). The SAC covers 42.5ha and lies on a southwest facing hillside in the Rhymney Valley, 1km east of Bargoed and thus occupying an urban fringe position.

The fields in the south-western part of the site have reduced drainage and harbour a mixture of marshy grassland communities. Areas of high conservation value include abundant purple moor grass *Molinia caerulea*, meadow thistle *Cirsium dissectum*, devil's bit scabious *Succisa pratensis* and carnation sedge *Carex panicea*. Associated stands of *Molinia caerulea* – *Potentilla erecta* mire contain abundant purple moor grass with other important plant species, such as common sedge *Carex nigra* and spotted orchid *Dactylorhiza maculata*. This SAC lies approximately 12km west of Monmouthshire.

Qualifying Features²²

The site has been designated as a SAC, a site of European importance, for several features.

Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:

- *Molinia* meadows on calcareous, peaty or clayey-silt laden soils (*Molinia caerulea*)

Annex II species that are a primary reason for selection of this site:

²¹ https://naturalresources.wales/media/673384/River_Usk%20SAC%20core%20plan.pdf. [Accessed on 21/08/2019]

²² <https://sac.incc.gov.uk/site/UK0030071> [Accessed on 21/08/2019]

- Marsh fritillary butterfly *Euphydryas aurinia*

Conservation Objectives²³

The overarching conservation objectives are outlined in the Core Management Plan for the Aberbargoed Grasslands SAC published by the Countryside Council for Wales. While this document also provides conservation vision statements for the Annex I habitat, only the conservation objectives for the primary qualifying feature are presented here.

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- The site will support a sustainable metapopulation of the marsh fritillary in the Aberbargoed area. This will require at least 50ha of suitable habitat, although not all of this will be within the SAC;
- The population will be viable in the long term, acknowledging the extreme population fluctuations of the species;
- Habitats on the site will be in optimal condition to support the metapopulation;
- At least 25ha of the total site area will be marshy grassland suitable for supporting marsh fritillary, with *Succisa pratensis* present and only a low cover of scrub;
- At least 6.25ha will be good marsh fritillary breeding habitat, dominated by purple moor-grass *Molinia caerulea*, with *S. pratensis* present throughout and a vegetation height of 10-20cm over the winter period; and
- All factors affecting the achievement of the foregoing conditions are under control.

Threats and Pressures to Site Integrity²⁴

While there is no Site Improvement Plan for the SAC, the main pressures and threats to site integrity can be inferred from the site's Core Management Plan, which outlines the management techniques that are required to achieve the conservation objectives for the SAC.

The main threats and pressures to the site integrity of the SAC are the following:

- Appropriate grazing levels
- Recreational pressure

Sugar Loaf Woodlands SAC

Introduction

The Sugar Loaf Woodlands SAC comprises 173.1ha of broad-leaved deciduous woodland (76.7%), and heath and scrub (23.3%). It is the largest area of old sessile oak woods near the south-eastern fringe of the habitat's range in the UK and Europe. Due to the relatively dry conditions in the SAC, the development of the Atlantic flora is restricted. However, the main plant components of the site are sessile oak *Quercus petraea*, bilberry *Vaccinium myrtillus*, wavy hair-grass *Deschampsia flexuosa*, and extensive fern and bryophyte cover. While the woodland is grazed, it regenerates around the fringes, where transitions to upland grassland and heathland communities occur. This SAC lies within Monmouthshire, close to Abergavenny.

²³ <https://naturalresources.wales/media/670637/Aberbargoed%20Grasslands%20Core%20SAC%20plan%20jan08.pdf>. As published by the Countryside Council for Wales (2008). [Accessed on 21/08/2019]

²⁴ <https://naturalresources.wales/media/670637/Aberbargoed%20Grasslands%20Core%20SAC%20plan%20jan08.pdf>. [Accessed on 21/08/2019]

Qualifying Features²⁵

The site has been designated as a SAC, a site of European importance, for several features.

Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:

- *Molinia* meadows on calcareous, peaty or clayey-silt laden soils (*Molinion caeruleae*)

Annex II species that are a primary reason for selection of this site:

- Marsh fritillary butterfly *Euphydryas aurinia*

Conservation Objectives²⁶

The overarching conservation objectives are outlined in the Core Management Plan for the Sugar Loaf Woodlands SAC published by the Countryside Council for Wales.

The vision for this feature is for it to be in favourable conservation status within the site, as a functioning and regenerating* oak wood, where all of the following conditions are satisfied:

- The wooded area is no less than 122 ha;
- The remainder of the site is semi-natural acid grassland, heathland, bracken and scrub, often forming a transition zone at the woodland edge;
- Saplings of birch *betula* spp, oak *Quercus petraea*, alder *Alnus glutinosa* or holly *Ilex aquifolium* dominate the tree regeneration;
- Young beech *Fagus sylvatica* and sycamore *Acer pseudoplatanus* trees are rare;
- The woodland ground flora is composed of a range of typical native plants including bilberry *Vaccinium myrtillus*, wavy-hair grass *Deschampsia flexuosa* and the mosses *Plagiothecium undulatum*, *Rhytidiadelphus loreus*, *Dicranum majus*;
- The liverwort *Bazzania trilobata* to continue to be present in its core area of Unit 1; and
- All factors affecting the achievement of these conditions will under control.

* A "functioning and regenerating oak woodland" would include all the positive attributes described in the performance indicators.

Threats and Pressures to Site Integrity²⁷

While there is no Site Improvement Plan for the SAC, the main pressures and threats to site integrity can be inferred from the site's Core Management Plan, which outlines the management techniques that are required to achieve the conservation objectives for the SAC.

The main threats and pressures to the site integrity of the SAC are the following:

- Inappropriate habitat management
- Invasive species

²⁵ <https://sac.jncc.gov.uk/site/UK0030072> [Accessed on 21/08/2019]

²⁶ https://naturalresources.wales/media/674063/Sugar_Loaf_Woodlands_core_management_plan_Mar_2008%20A_.pdf. As published by the Countryside Council for Wales (2008). [Accessed on 21/08/2019]

²⁷ https://naturalresources.wales/media/674063/Sugar_Loaf_Woodlands_core_management_plan_Mar_2008%20A_.pdf. [Accessed on 21/08/2019]

Llangorse Lake SAC

Introduction

The Llangorse Lake SAC comprises several habitats, including inland water bodies (56.8%), bogs and marshes (11.9%), humid grassland (8.9%), improved grassland (16%) and broad-leaved deciduous woodland (5.1%). Its main feature is a large shallow lake with a mean depth of 2-3 metres, lying in a natural depression of Devonian Old Red Sandstone. It is the largest natural lowland water in south Wales and one of the few natural eutrophic lakes in Britain.

The site's mineral-rich geology has encouraged growth of a wide range of aquatic and marginal plants, including several species that are rare in Wales. The SAC shows a gradation from open water with submerged and floating plant beds, to patches of willow scrub and wet woodland. The lake has a diverse plankton community supporting a wide variety of invertebrates, including many rare species. Its flora is dominated by pondweed, such as yellow water-lily *Potamogetonaceae* – *Nupharetum* associations. The shoreline flora is largely dominated by club-rush-common reed *Scirpo* - *Phragmitetum* associations. It is also rich in shining pondweed *Potamogeton lucens*. This SAC lies approximately 11km north-west of Monmouthshire.

Qualifying Features²⁸

The site has been designated as a SAC, a site of European importance, for several features.

Annex I habitats that are a primary reason for selection of this site:

- Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* – type vegetation

Conservation Objectives²⁹

The overarching conservation objectives are outlined in the Core Management Plan for the Llangorse Lake SAC published by the Countryside Council for Wales.

Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* – type vegetation

- There is no loss of lake area, as defined in 2006 aerial photographs for summer levels;
- The aquatic plant community is typical of this lake type in terms of composition and structure, including species such as water-starworts, stoneworts, duckweeds, broad-leaved and fineleaved pondweeds, water lilies, amphibious bistort, water-crowfoots, rigid hornwort, spiked water-milfoil, mare's-tail and horned pondweed;
- Plants indicating very high nutrient levels and excessive silt loads are not dominant and invasive non-native water plants do not threaten to out-compete the native flora;
- The nutrient, pH and dissolved oxygen levels are typical for a lake of this type and there is no excessive growth of cyanobacteria or green algae;
- There is a natural hydrological regime;
- The natural shoreline is maintained;
- The natural and characteristic substrate is maintained;
- The natural sediment load maintained; and
- All factors affecting the achievement of these conditions are under control.

²⁸ <https://sac.jncc.gov.uk/site/UK0012985> [Accessed on 21/10/2019]

²⁹ <https://naturalresources.wales/media/672671/Llangorse%20lake%20core%20management%20plan.pdf>. As published by the Countryside Council for Wales (2008). [Accessed on 21/10/2019]

Threats and Pressures to Site Integrity³⁰

While there is no Site Improvement Plan for the SAC, the main pressures and threats to site integrity can be inferred from the site's Core Management Plan, which outlines the management techniques that are required to achieve the conservation objectives for the SAC.

The main threats and pressures to the site integrity of the SAC are the following:

- Water quality
- Sedimentation
- Non-native invasive species
- Loss of surrounding habitats

Coed y Cerrig SAC

Introduction

The Coed y Cerrig SAC is 8.99ha in size and comprises two main habitats, namely broad-leaved deciduous woodland (91.2%), and bogs and marshes (6.6%). The SAC is a good example of alluvial forest in southern Wales. It lies in the bottom of a valley and its canopy is dominated by alder *Alnus glutinosa* and ash *Fraxinus excelsior*, and a rich understorey with guelder-rose *Viburnum opulus* and bird cherry *Prunus padus*. Its ground flora includes large sedges *Carex* spp. and wet woodland species. There are gradations to ash-elm *Fraxinus-Ulmus* and oak *Quercus* spp. on the valley sides. The site includes a large area of species-rich fen meadow and some rush pasture.

Historically, the wet alder dominated woodland has been managed through a mixture of coppicing and grazing. Coppice management was traditionally undertaken to provide timber for the charcoal and clog making industries but ceased before the Second World War. The dry woodland sections were managed for oak and beech timber. The SAC is located within north Monmouthshire.

Qualifying Features³¹

The site has been designated as a SAC, a site of European importance, for several features.

Annex I habitats that are a primary reason for selection of this site:

- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)

Conservation Objectives³²

The overarching conservation objectives are outlined in the Core Management Plan for the Coed y Cerrig SAC published by the Countryside Council for Wales.

Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)

- Around a third of the site is covered by wet alder and willow woodland;
- This wet woodland grades into areas of permanent open swamp dominated by lesser pond-sedge or other typical wetland plants, where the hydrological conditions are suitable. Adjacent areas of marshy grassland and spring-fed mire are intimately linked to the wet woodland and swamp;

³⁰ <https://naturalresources.wales/media/672671/Llangorse%20lake%20core%20management%20plan.pdf>. [Accessed on 21/10/2019]

³¹ <https://sac.jncc.gov.uk/site/UK0012766> [Accessed on 21/10/2019]

³² https://naturalresources.wales/media/671319/Coed%20y%20Cerrig%20SAC%20Management%20Plan%20_English_.pdf. As published by the Countryside Council for Wales (2008). [Accessed on 21/10/2019]

- The remainder of the site supports mainly dry semi-natural woodland;
- The wet woodland has a variable canopy structure, based on a small-scale patchwork, with alder of different ages and some standing as well as fallen dead wood. Ash does not make up more than 25% of the canopy;
- Young trees/saplings and/or vegetative re-growth of the above species are present;
- The understorey includes locally native shrubs typical of this habitat and the ground flora consists of a variety of typical wetland plants, such as lesser pond-sedge, common marsh-bedstraw, meadowsweet, yellow pimpernel, opposite-leaved golden-saxifrage, marsh-marigold, hemlock water-dropwort, water mint, lady fern and rushes;
- Plants associated with nutrient enrichment, such as stinging nettle and cleavers, are not dominant over large areas and invasive alien plants like Japanese knotweed and Indian balsam are absent;
- This wet woodland grades into areas of permanent open swamp dominated by lesser pond-sedge or other typical wetland plants, where the hydrological conditions are suitable. Adjacent areas of marshy grassland and spring-fed mire are intimately linked to the wet woodland and swamp;
- There is no significant input of nutrient-rich water from ditches and surrounding land; and
- All factors affecting the achievement of these conditions are under control.

Threats and Pressures to Site Integrity³³

While there is no Site Improvement Plan for the SAC, the main pressures and threats to site integrity can be inferred from the site's Core Management Plan, which outlines the management techniques that are required to achieve the conservation objectives for the SAC.

The main threats and pressures to the site integrity of the SAC are the following:

- Inadequate woodland management
- Inappropriate grazing levels
- Inappropriate hydrological regime
- Atmospheric pollution
- Recreational pressure

Severn Estuary SPA / Ramsar

Introduction

The Severn Estuary SPA / Ramsar is located between the borders of Wales and England in south-western Britain. It is a 24,700.91ha large estuary with extensive intertidal mudflats, sandflats, rocky platforms and small islands. The coastline is fringed by saltmarsh, grazing marsh, freshwater and brackish ditches. Its seabed is mainly rocky, gravelly and sub-tidal sandbanks. Due to the estuary's funnel shape, the Severn experiences the second highest tidal range in the world.

Because of this extreme tidal condition, the SPA / Ramsar is inhabited by plant and animal assemblages that tolerate the physical conditions in the tidal-swept liquid mud, sand and rock. The invertebrate community is species-poor and harbours high densities of ragworms and lugworms. These form important food sources for migrant and wintering waders. The SPA / Ramsar has particular importance as a stopover point for spring and autumn migrant waders, and overwintering swans, ducks and waders.

³³

https://naturalresources.wales/media/671319/Coed%20y%20Cerrig%20%20SAC%20%20Management%20Plan%20_English_.pdf. [Accessed on 21/10/2019]

The site also has an extensive intertidal zone, as a consequence of its tidal range. The SPA forms the southern boundary of Monmouthshire.

SPA Qualifying Features³⁴

This site qualifies under **Article 4.1** of the Directive (79/409/EEC) by supporting populations (counts are all at time of designation and could have changed since) of European importance of the following species listed on Annex I of the Directive:

Over winter

- Bewick's swan *Cygnus columbianus bewickii*, 280 individuals representing at least 4.0% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6)

This site also qualifies under **Article 4.2** of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species:

On passage

- Ringed plover *Charadrius hiaticula*, 655 individuals representing at least 1.3% of the Europe/Northern Africa - wintering population (5 year peak mean 1991/2 - 1995/6)

Over winter

- Curlew *Numenius arquata*, 3,903 individuals representing at least 1.1% of the wintering Europe - breeding population (5 year peak mean 1991/2 - 1995/6)
- Dunlin *Calidris alpina alpina*, 44,624 individuals representing at least 3.2% of the wintering Northern Siberia/Europe/Western Africa population (5 year peak mean 1991/2 - 1995/6)
- Pintail *Anas acuta*, 599 individuals representing at least 1.0% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6)
- Redshank *Tringa totanus*, 2,330 individuals representing at least 1.6% of the wintering Eastern Atlantic - wintering population (5 year peak mean 1991/2 - 1995/6)
- Shelduck *Tadorna tadorna*, 3,330 individuals representing at least 1.1% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6)

Assemblage qualification: A wetland of international importance

The area qualifies under **Article 4.2** of the Directive (79/409/EEC) by regularly supporting at least 20,000 waterfowl.

Over winter, the area regularly supports 93,986 individual waterfowl (5 year peak mean 1991/2 - 1995/6) including: Gadwall *Anas strepera*, shelduck *Tadorna tadorna*, pintail *Anas acuta*, dunlin *Calidris alpina alpina*, curlew *Numenius arquata*, redshank *Tringa totanus*, Bewick's swan *Cygnus columbianus bewickii*, wigeon *Anas penelope*, lapwing *Vanellus vanellus*, teal *Anas crecca*, mallard *Anas platyrhynchos*, shoveler *Anas clypeata*, pochard *Aythya ferina*, tufted duck *Aythya fuligula*, grey plover *Pluvialis squatarola*, white-fronted goose *Anser albifrons albifrons*, whimbrel *Numenius phaeopus*.

Ramsar Qualifying Features³⁵

The Ribble & Alt Estuaries is designated as a Ramsar site under the following criteria:

Criterion 1

- Due to the immense tidal range (second-largest in world), which affects both the physical environment and biological communities

³⁴ <http://archive.jncc.gov.uk/default.aspx?page=2066> [Accessed on the 23/10/2019]

³⁵ <https://jncc.gov.uk/jncc-assets/RIS/UK11081.pdf> [Accessed on the 23/10/2019]

- Habitats Directive Annex I features present include sandbanks which are slightly covered by sea water all the time, estuaries, mudflats and sandflats not covered by seawater at low tide and Atlantic salt meadows (*Glauco-Puccinellietalia maritima*)

Criterion 3

- Due to unusual estuarine communities, reduced diversity and high productivity

Criterion 4

- This site is important for the run of migratory fish between sea and river via estuary. Species include salmon *Salmo salar*, sea trout *S. trutta*, sea lamprey *Petromyzon marinus*, river lamprey *Lampetra fluviatilis*, allis shad *Alosa alosa*, twaite shad *A. fallax*, and eel *Anguilla anguilla*. It is also of particular importance for migratory birds during spring and autumn.

Criterion 5: Assemblages of international importance

Species with peak counts in winter

70,919 waterfowl (5 year peak mean 1998/99-2002/2003).

Criterion 6: Species / populations occurring at levels of international importance

Species with peak counts in winter

- Tundra swan *Cygnus columbianus bewickii*; 229 individuals representing an average of 2.8% of the GB population (5 year peak mean 1998/99-2002/03)
- Greater white-fronted goose *Anser albifrons*; 2,076 individuals representing an average of 35.8% of the GB population (5 year peak mean 1996/97-2000/01)
- Common shelduck *Tadorna tadorna*; 3,223 individuals representing an average of 1% of the NW Europe population (5 year peak mean 1998/99-2002/03)
- Gadwall *Anas strepera strepera*; 241 individuals representing an average of 1.4% of the GB population (5 year peak mean 1998/99-2002/03)
- Dunlin *Calidris alpina alpina*; 25,082 individuals representing an average of 1.8% of the W Siberia and W Europe population (5 year peak mean 1998/99-2002/03)
- Common redshank *Tringa totanus totanus*; 2,616 individuals representing an average of 1% of the population (5 year peak mean 1998/99-2002/03)

Species / populations identified subsequent to designation for possible future consideration under criterion 6

Species regularly supported during the breeding season

- Lesser black-backed gull *Larus fuscus graellsii*; 4,167 apparently occupied nests, representing an average of 2.8% of the breeding population (Seabird 2000 Census)

Species with peak counts in spring / autumn

- Ringed plover *Charadrius hiaticula*; 740 individuals representing an average of 1% of the Europe and NW Africa population (5 year peak mean 1998/99-2002/03)

Species with peak counts in winter

- Eurasian teal *Anas crecca*; 4,456 individuals representing an average of 1.1% of the NW Europe population (5 year peak mean 1998/99-2002/03)
- Northern pintail *Anas acuta*; 756 individuals representing an average of 1.2% of the NW Europe population (5 year peak mean 1998/99-2002/03)

Criterion 8

The fish of the whole estuarine and river system is one of the most diverse in Britain, with over 110 species recorded. Salmon *Salmo salar*, sea trout *S. trutta*, sea lamprey *Petromyzon marinus*, river lamprey *Lampetra fluviatilis*, allis shad *Alosa alosa*, twaite shad *A. fallax*, and eel *Anguilla anguilla* use the Severn Estuary as a key migration route to their spawning grounds in the many tributaries that flow into the estuary. The site is important as a feeding and nursery ground for many fish species particularly allis shad *Alosa alosa* and twaite shad *A. fallax* which feed on mysid shrimps in the salt wedge.

Conservation Objectives³⁶

With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified (the 'Qualifying Features' listed below), and subject to natural change;

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

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

Threats and Pressures to Site Integrity³⁷

The following threats and pressures to the site integrity of the Severn Estuary SPA have been identified in Natural England's Site Improvement Plan:

- Public access / disturbance
- Physical modification
- Impacts of development
- Coastal squeeze
- Change in land management
- Changes in species distributions
- Water pollution
- Air pollution: Impact of atmospheric nitrogen deposition
- Marine consents and permits: Minerals and waste
- Fisheries: Recreational marine and estuarine
- Fisheries: Commercial marine and estuarine
- Invasive species
- Marine litter
- Marine pollution incidents

³⁶ <http://publications.naturalengland.org.uk/publication/5601088380076032> [Accessed on the 23/10/2019]

³⁷ <http://publications.naturalengland.org.uk/publication/4590676519944192> [Accessed on the 23/10/2019]

Severn Estuary SAC

Introduction

The Severn Estuary SAC was designated as a SAC in 2009, because it support a significant number of habitats and species. It covers an area of 74,000ha and is designated partly for its estuary feature. Within this feature, subtidal sandbanks, intertidal mudflats and sandflats, Atlantic salt meadows and biogenic reefs are included. The SAC also harbours three migratory fish species, including river lamprey, sea lamprey and twaite shad. The Severn Estuary also comprises hard substrate habitats, an assemblage of 114 estuarine and marine fish species and various waterfowl species. The SAC forms the southern boundary of Monmouthshire.

Qualifying Features³⁸

The site is classified as a SAC for various qualifying features.

Annex I habitats that are a primary reason for selection of this site:

- Estuaries
- Mudflats and sandflats not covered by seawater at low tide
- Atlantic salt meadows (*Glauco-Puccinellietalia maritima*)

Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site

- Sandbanks which are slightly covered by sea water all the time
- Reefs

Annex II species that are a primary reason for selection of this site

- Sea lamprey *Petromyzon marinus*
- River lamprey *Lampetra fluviatilis*
- Twaite shad *Alosa fallax*

Conservation Objectives³⁹

With regard to the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change;

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- The extent and distribution of qualifying natural habitats and habitats of qualifying species
- The structure and function (including typical species) of qualifying natural habitats
- The structure and function of the habitats of qualifying species
- The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
- The populations of qualifying species, and,
- The distribution of qualifying species within the site.

³⁸ <https://sac.jncc.gov.uk/site/UK0013030> [Accessed on the 24/10/2019]

³⁹ <http://publications.naturalengland.org.uk/publication/6081105098702848> [Accessed on the 24/10/2019]

Threats and Pressures to Site Integrity⁴⁰

The following threats and pressures to the site integrity of the Severn Estuary SAC have been identified in Natural England's Site Improvement Plan:

- Public access / disturbance
- Physical modification
- Impacts of development
- Coastal squeeze
- Change in land management
- Changes in species distributions
- Water pollution
- Air pollution: Impact of atmospheric nitrogen deposition
- Marine consents and permits: Minerals and waste
- Fisheries: Recreational marine and estuarine
- Fisheries: Commercial marine and estuarine
- Invasive species
- Marine litter
- Marine pollution incidents

Wye Valley and Forest of Dean Bat Sites SAC

Introduction

The Wye Valley and Forest of Dean Bat Sites SAC lies within the Forest of Dean and Lower Wye National Character Area, straddling the England-Wales border. It includes 13 individual component sites (9 in England and 4 in Wales), which are all individually notified as SSSIs and that total an area of 144.82ha. The sites include both maternity roosts and hibernation sites in old buildings and mines / caves.

The wider surrounding landscape of the SAC is heavily wooded and edged by predominantly grazed farmland. This mixed landscape with trees and grazed pastures provides good conditions for both lesser horseshoe bat *Rhinolophus hipposideros* and greater horseshoe bat *Rhinolophus ferrumequinum*. The designated SAC components harbour the highest density of lesser horseshoe bats in the UK, making up about 26% of the national population. The complex of sites harbours approx. 6% of the national greater horseshoe bat population.

The qualifying bat populations are supported by numerous summer roosts and hibernation sites in the area that are not designated, but form part of the wider ecological network of the SAC. Flightlines, commuting routes and feeding grounds are also critical in maintaining the integrity of the Wye Valley and Forest of Dean Bat Sites SAC. Additionally, there is some evidence of connectivity between the populations in the SAC, the Cotswolds to the east, the Malvern Hills to the north and areas in Wales to the west. The SAC lies in various places along the eastern boundary of Monmouthshire.

Qualifying Features⁴¹

Annex II species that are a primary reason for selection of this site

⁴⁰ <http://publications.naturalengland.org.uk/publication/4590676519944192> [Accessed on the 24/10/2019]

⁴¹ <https://sac.incc.gov.uk/site/UK0014794> [Accessed on the 24/10/2019]

- Lesser horseshoe bat *Rhinolophus hipposideros*
- Greater horseshoe bat *Rhinolophus ferrumequinum*

Conservation Objectives⁴²

With regard to the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change;

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- The extent and distribution of the habitats of qualifying species
- The structure and function of the habitats of qualifying species
- The supporting processes on which the habitats of qualifying species rely
- The populations of qualifying species, and
- The distribution of qualifying species within the site.

Threats and Pressures to Site Integrity⁴³

The following threats and pressures to the site integrity of the Wye Valley and Forest of Dean Bat Sites SAC have been identified in Natural England's Site Improvement Plan:

- Physical modification
- Public access / disturbance
- Habitat connectivity

Wye Valley Woodlands SAC

Introduction

The Wye Valley Woodlands SAC is a 913.32ha site that occupies the border between England and Wales. It comprises several habitats, most notably broad-leaved deciduous woodland (87%), and heath and scrub (10%). The SAC's components significantly contribute to a semi-natural woodland corridor connecting Chepstow and Monmouth. Much of the site is a gorge with a very steep topography, which dictates the available habitat types. In combination with woodlands in the Forest of Dean and Wentwood, this region is one of the most densely wooded areas in the UK. The SAC supports numerous wildlife species at the edge of their ecological range.

A total of 16 SSSI components make up the SAC, of which eight lie entirely in Wales and seven entirely in England. All SSSI components support the best examples of *Tilio-Acerion* forests, *Asperulo-Fagetum* beech forests and *Taxus baccata* woods of the British Isles. These woodlands also form important roosting and foraging habitat for the lesser horseshoe bat. A large proportion of the broadleaved woodland stands dates back to the Second World War and has developed a high forest structure due to the cessation of woodland management. The SAC lies in various places along the eastern boundary of Monmouthshire.

Qualifying Features⁴⁴

Annex I habitats that are a primary reason for selection of this site:

⁴² <http://publications.naturalengland.org.uk/publication/4907653293670400> [Accessed on the 24/10/2019]

⁴³ <http://publications.naturalengland.org.uk/publication/6102625057505280> [Accessed on the 24/10/2019]

⁴⁴ <https://sac.incc.gov.uk/site/UK0012727> [Accessed on the 24/10/2019]

- *Asperulo-Fagetum* beech forests
- *Tilio-Acerion* forests of slopes, screes and ravines
- *Taxus baccata* woods of the British Isles

Annex II species present as a qualifying feature, but not a primary reason for site selection:

- Lesser horseshoe bat *Rhinolophus hipposideros*

Conservation Objectives⁴⁵

With regard to the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change;

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- The extent and distribution of qualifying natural habitats and habitats of qualifying species
- The structure and function (including typical species) of qualifying natural habitats
- The structure and function of the habitats of qualifying species
- The supporting processes on which qualifying natural habitats and habitats of qualifying species rely
- The populations of qualifying species, and,
- The distribution of qualifying species within the site.

Threats and Pressures to Site Integrity⁴⁶

The following threats and pressures to the site integrity of the Wye Valley Woodlands SAC have been identified in Natural England's Site Improvement Plan:

- Deer
- Forestry and woodland management
- Invasive species
- Habitat connectivity
- Species decline
- Air pollution: Impact of atmospheric nitrogen deposition
- Disease
- Public access / disturbance

River Wye SAC

Introduction

The River Wye SAC is 25km in length and represents one of the longest near natural rivers in England and Wales, which drains a catchment of 4,136km². It is situated within the Forest of Dean and Lower Wye National Character Area, rising at 680m at Plynlimon in mountainous Wales before reaching the English border. The Wye flows through Hay-on-Wye, Hereford and Ross-on-Wye, then past Monmouth

⁴⁵ <http://publications.naturalengland.org.uk/publication/6331090281168896> [Accessed on the 24/10/2019]

⁴⁶ <http://publications.naturalengland.org.uk/publication/4735117343850496> [Accessed on the 24/10/2019]

and eventually meeting the Severn Estuary below Chepstow. The SAC shows a transition from bryophyte dominated upland areas to crowfoot dominated lower stretches. Notably, in contrast to many other river systems, the Wye has not been significantly straightened or modified by human activity. It is predominantly low-lying, meandering and only falling by 72m between Hay-on-Wye and the sea.

The SAC comprises a variety of substrate types ranging from silt to boulders, which form diverse habitats for a range of species. This substrate diversity has enabled a varied morphology with more active sections of river (with associated back channels and oxbow lakes) and gravel substrate, where pools and riffles are found. The SAC harbours a diverse submerged aquatic and riparian flora. Furthermore, the transitional zone in the lower reaches between freshwater and brackish water supports its own characteristic flora, particularly saltmarsh species. There is also a diverse invertebrate community with nationally rare river flies and dragonflies. All 6 species of unionid mussels are found here, which is unique in the UK.

A wide range of migratory and non-migratory fish is found in the Wye, including salmonids, such as Atlantic salmon, brown trout, sea trout and grayling, all of which are commercially exploited. All three species of lamprey are found as well as migratory eel. Also, allis shad and twaite shad enter the River Wye from the Severn Estuary to spawn further upstream. The riverine ecosystem is home to several other uncommon species, including otter, water vole and several bird species, such as dipper, grey wagtail and kingfisher. The SAC forms the eastern boundary of Monmouthshire.

Qualifying Features⁴⁷

Annex I habitats that are a primary reason for selection of this site:

- Water courses of plain to montane levels with the *Ranunculus fluitantis* and *Callitriche-Batrachion* vegetation

Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:

- Transition mires and quaking bogs

Annex II species that are a primary reason for selection of this site:

- White-clawed (or Atlantic stream) crayfish *Austropotamobius pallipes*
- Sea lamprey *Petromyzon marinus*
- Brook lamprey *Lampetra planeri*
- River lamprey *Lampetra fluviatilis*
- Twaite shad *Alosa fallax*
- Atlantic salmon *Salmo salar*
- Bullhead *Cottus gobio*
- Otter *Lutra lutra*

Annex II species present as a qualifying feature, but not a primary reason for site selection:

- Allis shad *Alosa alosa*

Conservation Objectives⁴⁸

With regard to the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change;

⁴⁷ <https://sac.jncc.gov.uk/site/UK0012642> [Accessed on the 24/10/2019]

⁴⁸ <http://publications.naturalengland.org.uk/publication/6096799802589184> [Accessed on the 24/10/2019]

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- The extent and distribution of qualifying natural habitats and habitats of qualifying species
- The structure and function (including typical species) of qualifying natural habitats
- The structure and function of the habitats of qualifying species
- The supporting processes on which qualifying natural habitats and habitats of qualifying species rely
- The populations of qualifying species, and,
- The distribution of qualifying species within the site.

Threats and Pressures to Site Integrity⁴⁹

The following threats and pressures to the site integrity of the River Wye SAC have been identified in Natural England's Site Improvement Plan:

- Water pollution
- Physical modification
- Invasive species
- Hydrological changes
- Forestry and woodland management
- Fisheries: Freshwater
- Fisheries: Fish stocking
- Water abstraction
- Public access / disturbance
- Air pollution: Impact of atmospheric nitrogen deposition
- Inappropriate scrub control
- Undergrazing
- Transportation and service corridors

Avon Gorge Woodlands SAC

Introduction

The Avon Gorge Woodlands SAC is a 151.07ha site that is a nationally important example of *Tilio-Acerion* forest in south-west England. The site includes ash *Fraxinus excelsior*, wych elm *Ulmus glabra* and small-leaved lime *Tilia cordata*. This habitat type is here found on calcareous substrates associated with the limestone cliffs and screes of a large river gorge with reduced human influence. It is a sub-community of W8 *Fraxinus excelsior* – *Acer campestre* – *Mercurialis perennis* woodland.

The site's ground flora typically includes Hart's-tongue *Asplenium scolopendrium*, soft shield-fern *Polystichum setiferum*, buckler-ferns *Dryopteris* spp., ramsons *Allium ursinum*, dog's-mercury *Mercurialis perennis* and enchanter's nightshade *Circaea lutetiana*. In some of the stonier locations, small groves of yew *Taxus baccata* occur. Part of the Leigh Woods is old wood pasture, managed for

⁴⁹ <http://publications.naturalengland.org.uk/publication/5178575871279104> [Accessed on the 24/10/2019]

several hundreds of years, which contains large number of veteran pollards. The *Tilio-Acerion* woodland contains transitions to scrub, grassland and other woodland elements, including five whitebeam species. The Avon Gorge Woodlands SAC is important for both lesser and greater horseshoe bats *Rhinolophus* spp., breeding peregrine falcon *Falco peregrinus* and raven *Corvus corax*. Rare invertebrates include the silky wave moth *Idaea dilutaria*, Chalkhill blue *Polyommatus coridon* and small blue *Cupido minimus*. Most of these species rely on SAC habitats and their future status therefore depends on the condition of the SAC. The SAC lies approximately 13km from Monmouthshire on the opposite side of the Severn Estuary in England.

Qualifying Features⁵⁰

Annex I habitats that are a primary reason for selection of this site:

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

Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:

- Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*; important orchid sites)

Conservation Objectives⁵¹

With regard to the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change;

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- The extent and distribution of qualifying natural habitats
- The structure and function (including typical species) of qualifying natural habitats, and
- The supporting processes on which qualifying natural habitats rely

Threats and Pressures to Site Integrity⁵²

The following threats and pressures to the site integrity of the Avon Gorge Woodlands SAC have been identified in Natural England's Site Improvement Plan:

- Invasive species
- Undergrazing
- Public access / disturbance
- Disease
- Changes in species distributions
- Air pollution: Impact of atmospheric nitrogen deposition

⁵⁰ <https://sac.jncc.gov.uk/site/UK0012734> [Accessed on the 24/10/2019]

⁵¹ <http://publications.naturalengland.org.uk/publication/6740736611450880> [Accessed on the 24/10/2019]

⁵² <http://publications.naturalengland.org.uk/publication/5021516609617920> [Accessed on the 24/10/2019]

4. Test of Likely Significant Effects (LSE)

Introduction

This chapter provides background to the relevant impact pathways linked to the Replacement Local Development Plan (RLDP), highlights the European sites that are sensitive to these pathways, and identifies the policies that could (prior to the consideration of mitigation) result in Likely Significant Effects (LSE) on European sites. The broad Strategic Growth Areas (and growth options within these areas) are discussed in Chapter 5. The identified European sites and Strategic Policies are then carried forward into the Appropriate Assessment that is undertaken in Chapter 6. For a map of the European sites relevant to the Monmouthshire RLDP please see Appendix 1. For the full LSE assessment of the strategic policies outlined within the RLDP please see Appendix 2.

Impact Pathways Considered

The following impact pathways are considered relevant to the Monmouthshire RLDP:

- Atmospheric pollution (due to an increase in traffic generation);
- Recreational pressure (due to the local population growth);
- Loss of functionally linked land (due to the allocation of greenfield sites for development);
- Water quality (due to increases in sewage effluent and industrial pollutant input) and
- Water quantity, level and flow (due to an increased abstraction of water for dwellings and employment space).

Background to Atmospheric Pollution

Table 1: Main sources and effects of air pollutants on habitats and species⁵³

| Pollutant | Source | Effects on habitats and species |
|------------------------------------|--|---|
| Sulphur Dioxide (SO ₂) | <p>The main sources of SO₂ are electricity generation, and industrial and domestic fuel combustion. However, total SO₂ emissions in the UK have decreased substantially since the 1980's.</p> <p>Another origin of sulphur dioxide is the shipping industry and high atmospheric concentrations of SO₂ have been documented in busy ports. In future years shipping is likely to become one of the most important contributors to SO₂ emissions in the UK.</p> | <p>Wet and dry deposition of SO₂ acidifies soils and freshwater, and may alter the composition of plant and animal communities.</p> <p>The magnitude of effects depends on levels of deposition, the buffering capacity of soils and the sensitivity of impacted species.</p> <p>However, SO₂ background levels have fallen considerably since the 1970's and are now not regarded a threat to plant communities. For example, decreases in Sulphur dioxide concentrations have been linked to returning lichen species and improved tree health in London.</p> |
| Acid deposition | <p>Leads to acidification of soils and freshwater via atmospheric deposition of SO₂, NO_x, ammonia and hydrochloric acid. Acid deposition from rain has declined by 85% in the last 20 years, which most of this contributed by lower sulphate levels.</p> <p>Although future trends in S emissions and subsequent deposition to terrestrial and aquatic ecosystems will continue to decline, increased N emissions may cancel out any gains produced by reduced S levels.</p> | <p>Gaseous precursors (e.g. SO₂) can cause direct damage to sensitive vegetation, such as lichen, upon deposition.</p> <p>Can affect habitats and species through both wet (acid rain) and dry deposition. The effects of acidification include lowering of soil pH, leaf chlorosis, reduced decomposition rates, and compromised reproduction in birds / plants.</p> |

⁵³ Information summarised from the Air Pollution Information System (<http://www.apis.ac.uk/>)

| Pollutant | Source | Effects on habitats and species |
|---------------------------------------|--|---|
| | | Not all sites are equally susceptible to acidification. This varies depending on soil type, bed rock geology, weathering rate and buffering capacity. For example, sites with an underlying geology of granite, gneiss and quartz rich rocks tend to be more susceptible. |
| Ammonia (NH ₃) | <p>Ammonia is a reactive, soluble alkaline gas that is released following decomposition and volatilisation of animal wastes. It is a naturally occurring trace gas, but ammonia concentrations are directly related to the distribution of livestock.</p> <p>Ammonia reacts with acid pollutants such as the products of SO₂ and NO_x emissions to produce fine ammonium (NH₄⁺) - containing aerosol. Due to its significantly longer lifetime, NH₄⁺ may be transferred much longer distances (and can therefore be a significant trans-boundary issue).</p> <p>While ammonia deposition may be estimated from its atmospheric concentration, the deposition rates are strongly influenced by meteorology and ecosystem type.</p> | <p>The negative effect of NH₄⁺ may occur via direct toxicity, when uptake exceeds detoxification capacity and via N accumulation.</p> <p>Its main adverse effect is eutrophication, leading to species assemblages that are dominated by fast-growing and tall species. For example, a shift in dominance from heath species (lichens, mosses) to grasses is often seen.</p> <p>As emissions mostly occur at ground level in the rural environment and NH₃ is rapidly deposited, some of the most acute problems of NH₃ deposition are for small relict nature reserves located in intensive agricultural landscapes.</p> |
| Nitrogen oxides (NO _x) | <p>Nitrogen oxides are mostly produced in combustion processes. Half of NO_x emissions in the UK derive from motor vehicles, one quarter from power stations and the rest from other industrial and domestic combustion processes.</p> <p>In contrast to the steep decline in Sulphur dioxide emissions, nitrogen oxides are falling slowly due to control strategies being offset by increasing numbers of vehicles.</p> | <p>Direct toxicity effects of gaseous nitrates are likely to be important in areas close to the source (e.g. roadside verges). A critical level of NO_x for all vegetation types has been set to 30 ug/m³.</p> <p>Deposition of nitrogen compounds (nitrates (NO₃), nitrogen dioxide (NO₂) and nitric acid (HNO₃)) contributes to the total nitrogen deposition and may lead to both soil and freshwater acidification.</p> <p>In addition, NO_x contributes to the eutrophication of soils and water, altering the species composition of plant communities at the expense of sensitive species.</p> |
| Nitrogen deposition | <p>The pollutants that contribute to the total nitrogen deposition derive mainly from oxidized (e.g. NO_x) or reduced (e.g. NH₃) nitrogen emissions (described separately above). While oxidized nitrogen mainly originates from major conurbations or highways, reduced nitrogen mostly derives from farming practices.</p> <p>The N pollutants together are a large contributor to acidification (see above).</p> | <p>All plants require nitrogen compounds to grow, but too much overall N is regarded as the major driver of biodiversity change globally.</p> <p>Species-rich plant communities with high proportions of slow-growing perennial species and bryophytes are most at risk from N eutrophication. This is because many semi-natural plants cannot assimilate the surplus N as well as many graminoid (grass) species.</p> <p>N deposition can also increase the risk of damage from abiotic factors, e.g. drought and frost.</p> |
| Ozone (O ₃) | <p>A secondary pollutant generated by photochemical reactions involving NO_x, volatile organic compounds (VOCs) and sunlight. These precursors are mainly released by the combustion of fossil fuels (as discussed above).</p> | <p>Concentrations of O₃ above 40 ppb can be toxic to both humans and wildlife, and can affect buildings.</p> <p>High O₃ concentrations are widely documented to cause damage to vegetation, including visible leaf damage, reduction in floral biomass, reduction in crop yield (e.g. cereal grains, tomato, potato), reduction in</p> |

| Pollutant | Source | Effects on habitats and species |
|-----------|---|---|
| | Increasing anthropogenic emissions of ozone precursors in the UK have led to an increased number of days when ozone levels rise above 40ppb ('episodes' or 'smog'). Reducing ozone pollution is believed to require action at international level to reduce levels of the precursors that form ozone. | the number of flowers, decrease in forest production and altered species composition in semi-natural plant communities. |

The main pollutants of concern for European sites are oxides of nitrogen (NO_x), ammonia (NH₃) and sulphur dioxide (SO₂) and are summarised in Table 1. Ammonia can have a directly toxic effect upon vegetation, particularly at close distances to the source such as near road verges⁵⁴. NO_x can also be toxic at very high concentrations (far above the annual average critical level). However, in particular, high levels of NO_x and NH₃ are likely to increase the total N deposition to soils, potentially leading to deleterious knock-on effects in resident ecosystems. Increases in nitrogen deposition from the atmosphere is widely known to enhance soil fertility and to lead to eutrophication. This often has adverse effects on the community composition and quality of semi-natural, nitrogen-limited terrestrial and aquatic habitats^{55 56}.

Sulphur dioxide emissions overwhelmingly derive from power stations and industrial processes that require the combustion of coal and oil, as well as (particularly on a local scale) shipping⁵⁷. Ammonia emissions originate from agricultural practices⁵⁸, with some chemical processes also making notable contributions. As such, it is unlikely that material increases in SO₂ or NH₃ emissions will be associated with the available RLDP. NO_x emissions, however, are dominated by the output of vehicle exhausts (more than half of all emissions). A 'typical' housing development will contribute by far the largest portion to its overall NO_x footprint (92%) through the associated road traffic. Other sources, although relevant, are of minor importance (8%) in comparison⁵⁹. Emissions of NO_x could therefore be reasonably expected to increase because of a higher number of vehicles due to implementation of the RLDP.

According to the World Health Organisation, the critical NO_x concentration (critical threshold) for the protection of vegetation is 30 µgm⁻³; the threshold for sulphur dioxide is 20 µgm⁻³. In addition, ecological studies have determined 'critical loads'⁶⁰ of atmospheric nitrogen deposition (that is, NO_x combined with ammonia NH₃).

The Department of Transport's Transport Analysis Guidance outlines that, beyond 200m, the contribution of vehicle emissions from the roadside to local pollution levels is not significant (Figure 3 and ⁶¹). This is therefore the distance that has been used throughout this HRA in order to determine whether European sites are likely to be significantly affected by development outlined in the RLDP. Exhaust emissions from vehicles are capable of adversely affecting heathland habitats.

⁵⁴ http://www.apis.ac.uk/overview/pollutants/overview_NOx.htm.

⁵⁵ Wolseley, P. A.; James, P. W.; Theobald, M. R.; Sutton, M. A. **2006**. Detecting changes in epiphytic lichen communities at sites affected by atmospheric ammonia from agricultural sources. *Lichenologist* 38: 161-176

⁵⁶ Dijk, N. **2011**. Dry deposition of ammonia gas drives species change faster than wet deposition of ammonium ions: evidence from a long-term field manipulation *Global Change Biology* 17: 3589-3607

⁵⁷ http://www.apis.ac.uk/overview/pollutants/overview_SO2.htm.

⁵⁸ Pain, B.F.; Weerden, T.J.; Chambers, B.J.; Phillips, V.R.; Jarvis, S.C. 1998. A new inventory for ammonia emissions from U.K. agriculture. *Atmospheric Environment* 32: 309-313

⁵⁹ Proportions calculated based upon data presented in Dore CJ et al. 2005. UK Emissions of Air Pollutants 1970 – 2003. UK National Atmospheric Emissions Inventory. <http://www.airquality.co.uk/archive/index.php>

⁶⁰ The critical load is the rate of deposition beyond which research indicates that adverse effects can reasonably be expected to occur

⁶¹ <http://www.dft.gov.uk/webtag/documents/expert/unit3.3.3.php#013> [Accessed on the 06/11/2019]

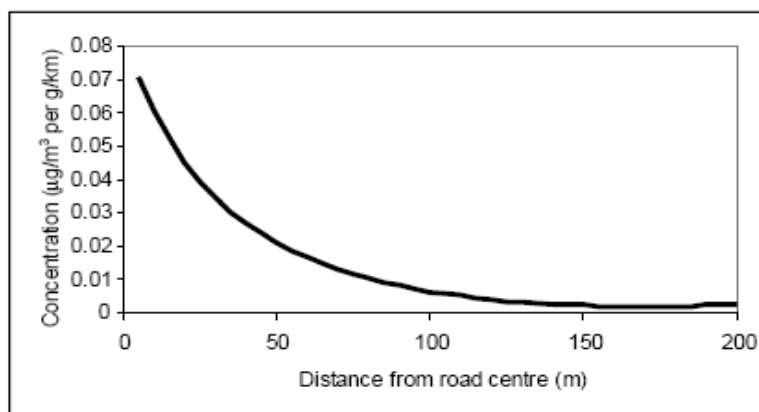


Figure 3: Traffic contribution to concentrations of pollutants at different distances from a road (Source: DfT⁶²)

Screening for LSEs

The following European sites within 15km of Monmouthshire are susceptible to atmospheric pollution (the sites that are screened in for Appropriate Assessment following discussion in the text are marked in **bold**):

- **Usk Bat Sites SAC**
- **Cwm Clydach Woodlands SAC**
- **Wye Valley Woodlands SAC**
- **Severn Estuary SAC**
- **Severn Estuary SPA / Ramsar**
- **River Wye SAC**
- River Usk SAC
- Avon Gorge Woodlands SAC
- Wye Valley and Forest of Dean Bat Sites SAC
- Aberbargoed Grasslands SAC
- Sugar Loaf Woodlands SAC
- Llangorse Lake SAC
- Coed y Cerrig SAC

The Usk Bat Sites SAC is primarily designated for its populations of lesser horseshoe bats *Rhinolophus hipposideros*. This species' main habitat is mixed broadleaved and yew woodland. According to APIS the habitat is sensitive to nitrogen deposition with a critical load set at 10 – 20 kg N/ha/yr. However, several Annex I habitats, such as degraded raised bogs and blanket bogs are also highly sensitive to excessive nitrogen input. Although these are not a primary reason for the designation of this site, they must be considered in the HRA process. For both types of bog habitats, the empirical critical load for annual nitrogen deposition has been set at 5 – 10 kg N/ha/yr. Meeting these critical load limits is particularly important because the 3 year average between 2013 and 2015 indicates that the maximum nitrogen deposition to bog habitats (20.6 kg N/ha/yr) was over twice the upper critical limit for these habitats (10 kg N/ha/yr). A preliminary assessment of the road infrastructure around the Usk Bat Sites SAC indicates that it lies directly adjacent to the A465, which is likely to be a main route for commuter traffic, particularly between Monmouthshire and Blaenau Gwent. The Department for Transport's road traffic statistics indicate that at site number 50535, a traffic point count directly adjacent to the SAC, the

⁶² <http://www.dft.gov.uk/ha/standards/dmr/vol11/section3/ha20707.pdf>; accessed 13/07/2018

annual average daily traffic (AADT) in 2018 comprised 18,274 cars, 4,280 light goods vehicles and 1,522 heavy goods vehicles. Given the proximity of the SAC to such major traffic infrastructure, the site is screened in for Appropriate Assessment.

The Cwm Clydach Woodlands is designated for its beech *Fagus* woodland habitats, which are generally considered to be susceptible to atmospheric nitrogen deposition. APIS reports a site relevant critical load for beech forests of 10 – 20 kg N/ha/yr. Exceedance impacts would potentially be changes in ground vegetation and mycorrhiza, nutrient shifts and concomitant changes in the soil fauna. The SAC is situated similarly to the Usk Bat Sites SAC, directly adjacent to the A465 and therefore requires further consideration in an Appropriate Assessment.

The Wye Valley Woodlands SAC comprises several qualifying woodland habitats. Its *Asperulo-Fagetum* woodland feature has a critical nitrogen load of 10-20 kg N/ha/yr. Its yew woodland feature is also sensitive to nitrogen deposition⁶³. Exceedance of the critical load in the *Taxus baccata* woods feature would result in changes in soil processes, nutrient imbalance and an altered composition of plant and mycorrhiza communities. North of Chepstow, component parcels of the Wye Valley Woodlands SAC lie immediately adjacent to the A466. At manual count point 30576, this road had an AADT of 3,188 cars, 549 light goods vehicles and 68 heavy goods vehicles. While this is significantly less busy than some other A roads, given the sensitivity of the site's qualifying features and their proximity to the A466, this site is screened in for Appropriate Assessment.

The Severn Estuary SAC is designated for several habitats, including estuaries and Atlantic salt meadows, both of which are integral to the SPA's / Ramsar's bird assemblages and have a critical nitrogen load of 20-30 kg N/ha/yr, as identified on APIS. The critical load applies for most of the saltmarsh, but it is noted that the lower level of 20 kg N/ha/yr should be used for the more densely vegetated upper marsh and areas subjected to direct run-off from adjacent catchments. Exceedance impacts of the critical load would be an increase in late successional species, increased productivity and an increase in dominance of graminoid species. Several waterfowl species require a presence and suitable abundance of saltmarsh food plants for survival, such as saltmarsh grasses, herbs and their seeds, including *Puccinella maritima*, *Salicornia* and *Agrostis*. The M4 motorway traverses the Severn Estuary SAC and manual count point 73955 indicates an AADT of 49,618 cars, 9,230 light goods vehicles and 8,029 heavy goods vehicles here⁶⁴. As such, an increase in the number of car journeys associated with the Monmouthshire RLDP has the potential to result in LSEs on the Severn Estuary SAC through atmospheric pollution. The site is therefore screened in for Appropriate Assessment.

While the qualifying features of the Severn Estuary SPA / Ramsar are not directly susceptible to atmospheric nitrogen deposition, the prey species and habitats that these waterbirds rely on might be affected by significant changes in the concentrations of pollutants. Most of the birds feed on invertebrates in the littoral sediment and this habitat has a critical nitrogen load of 20-30 kg N/ha/yr. This is not considered to be very high sensitivity, but a review of evidence in APIS highlights that the current maximum deposition rate (22.5 kg N/ha/yr) does exceed the minimum critical load. The littoral sediments also comprise the saltmarsh, which is one of the SAC's features that are sensitive to atmospheric pollution. It also needs to be considered that invertebrates, the birds' primary food source, are sensitive to acidification. However, acidification of the marine environment is primarily associated with shipping and air traffic, rather than car usage. In accordance with the Severn Estuary SAC, which is screened in for its sensitivity of many of the habitats that support the SPA / Ramsar bird assemblage, the Severn Estuary SPA / Ramsar is therefore screened in for Appropriate Assessment.

The River Wye SAC is a riverine system of plain to montane levels, which supports a range of fish, such as several lamprey species, migratory salmonids and otters. As for the River Usk SAC, the survival of these species is dependent on the integrity of the river. The freshwater habitat within the river is regarded as being primarily phosphate limited (not nitrogen limited), however, the SAC is also designated for its transition mires and quaking bogs. APIS identifies that this feature is sensitive to atmospheric nitrogen deposition with a critical nitrogen load of 10-15 kg N/ha/yr. Exceedance impacts for this feature are listed as an increase in sedges and vascular plants, and negative effects on bryophytes. Unsurprisingly given its length, the River Wye SAC partially runs directly alongside several

⁶³ APIS provides a coniferous woodland range of 5-15 kgN/ha/yr. However, this range is derived from research into northern pine and spruce forests and the lowest part of the load range (5 kgN/ha/yr) is driven by the lichen and bryophyte interest of those forests which are quite different from lichen poor yew woodland present at this SAC. A minimum critical load of 10kgN/ha/yr is considered most appropriate for this SAC.

⁶⁴ <https://roadtraffic.dft.gov.uk/manualcountpoints/73955> [Accessed on the 25/10/2019]

busy roads, including the A466 to the north of Chepstow and the A40 in Monmouth. Transition mires and quaking bogs within 200m of these road links might be negatively impacted by increased traffic flow associated with the Monmouthshire RLDP. To identify the geographic locations of these habitat elements and ensure that atmospheric pollution is not an issue for the River Wye SAC, the site is screened in for Appropriate Assessment.

The River Usk SAC is a riverine system of plain to montane levels, which supports a range of fish, such as several lamprey species, migratory salmon and otters. The survival of these species is tightly linked to the maintenance of the integrity of the river. Freshwater habitats are typically regarded as being primarily phosphate limited, with lesser regard being given to nitrogen input. The River Usk Management Catchment Plan summarises a variety of measures implemented to preserve the integrity of the SAC⁶⁵ and explicitly refers to reducing the deposition of nitrogen deriving from atmospheric pollution. However, 'Delivering the Nutrient Management Plan' on the Wye-Usk Foundation website indicates the focus on nutrient control in these catchments remains phosphate, which does not come from the atmosphere. Moreover, there are no atmospheric nitrogen critical loads available to use in assessments for riverine European sites. As such, the River Usk SAC is screened out from Appropriate Assessment regarding atmospheric pollution.

The *Tilio-Acerion* forest of slopes, screes and ravines in the Avon Gorge Woodlands SAC is identified as being sensitive to atmospheric pollution in APIS with a critical nitrogen load of 15-20 kg N/ha/yr. An increase of the nitrogen concentration beyond this limit is likely to lead to changes in ground vegetation. Importantly, the current maximum nitrogen deposition stands at 30.7 kg N/ha/yr and therefore considerably exceeds the critical load. While the SAC lies adjacent to the A4, which is a fairly busy road, there is no obvious connection to commuter routes arising from Monmouthshire. Bristol, the most likely work destination for Monmouthshire residents in proximity to the SAC, can be more easily reached via alternative routes. As such, the Avon Gorge Woodlands SAC is screened out from Appropriate Assessment.

The qualifying features of the Wye Valley and Forest of Dean Bat Sites SAC, namely the lesser and greater horseshoe bat, are not directly sensitive to atmospheric nitrogen deposition. The species' broad habitat is broadleaved, mixed and yew woodland, which has an empirical critical nitrogen load of 10-20 kg N/ha/yr. However, exceeding the critical load primarily would lead to relatively nuanced changes in the habitat, such as changes in soil processes, nutrient levels and ground vegetation. Any atmospheric pollution impact would not be expected to result in a material effect on the viability of the bat population and neither species is identified as sensitive to nitrogen deposition in APIS. The bats predominantly rely on trees with sufficient cracks and fissures that have a high potential as roosting or hibernation sites, and it is unlikely that atmospheric pollution would affect this potential. While woodland is a critical foraging habitat for horseshoe bats, any subtle changes in botanical composition brought about by an increase in nitrogen deposition are unlikely to affect the overall foraging value of the SAC woodlands for these species. It is therefore concluded that the Monmouthshire RLDP will not result in LSEs on the Wye Valley and Forest of Dean Bat Sites SAC regarding the impact pathway atmospheric pollution. The site is screened out from Appropriate Assessment.

The Aberbargoed Grasslands SAC are designated for their *Molinia* meadows on calcareous, peaty or clayey-silt laden soils, which identified on APIS as being sensitive to atmospheric nitrogen deposition. Here, a critical load of 15 – 25 kg N/ha/yr for these meadows is listed. However, the Core Management Plan published by the Countryside Council for Wales does not identify atmospheric pollution as a key management measure for the SAC. The closest significant road within 200m of the SAC is the A4049. However, the AADT at the closest manual count point only amounts to 5,913. A closer investigation of data available on APIS highlights that, while the total nitrogen deposition to the site is very high, the NO_x concentrations are relatively low (12.41 ug/m³). This indicates that the majority of the nitrogen input is likely to come from agricultural sources. Therefore, the site is screened out from Appropriate Assessment.

The Sugar Loaf Woodlands SAC is designated for its old sessile oak woods, which have an empirical critical load of 10 – 15 kg N/ha/yr as outlined on APIS. Exceedance of this threshold would result in a decrease in mycorrhiza, loss of epiphytic lichens and bryophytes, and more general changes to the ground vegetation. However, the site is located further than 200m away from the nearest major roads.

⁶⁵ Page 12 of the document at <https://naturalresources.wales/media/3214/usk-management-catchment.pdf>. [Accessed on the 22/08/2019]

For example, it lies approx. 885m from the A40 and 1.1km from the A465. As such this SAC can be screened out and will not require Appropriate Assessment.

APIS highlights that the Llangorse Lake SAC is vulnerable to atmospheric nitrogen deposition, although critical loads for comparable habitats have not previously been established⁶⁶. While it is well known that meso- and eutrophic systems are often phosphate limited, nitrogen may be a co-limiting factor. However, despite the site's general sensitivity to atmospheric pollution, there is no major road within 200m of the SAC. The closest road that would provide a significant commuting corridor is the A40, which is located 1.9km to the south-west of Llangorse Lake SAC. This is beyond the screening distance for atmospheric pollution and the SAC is therefore screened out from Appropriate Assessment.

The Coed y Cerrig SAC is designated for its alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*, which are sensitive to some atmospheric pollutants. APIS highlights that the SAC is not sensitive to total atmospheric nitrogen deposition or nitrogen oxides. However, due to the presence of lichens and bryophytes, the site is sensitive to ammonia deposition at a critical level of 1 ug NH₃/m³. While a significant portion of ammonia is likely to derive from agricultural sources, some of it could derive from traffic sources. However, the closest major road (the A465) lies approx. 2.8km to the east of the SAC and therefore lies well beyond the screening distance for atmospheric pollution. The Coed y Cerrig SAC is therefore screened out from Appropriate Assessment.

The following policies of the Replacement Local Development Plan have been screened in for Appropriate Assessment because they allocate residential or employment growth, likely leading to increased atmospheric pollution and therefore LSEs on several European sites, sensitive to atmospheric pollutants:

- Strategic Policy S1: Strategic Sustainable and Resilient Growth (Provision for 8,366 net new dwellings and 7,215 net new jobs)
- Strategic Policy S2: Spatial Distribution of Development (Identifies the settlement hierarchy and quantum of residential development therein for Monmouthshire)
- Strategic Policy S6: Delivery of Homes (Requirement for 7,605 new homes with provision made for 8,366 new dwellings with the inclusion of a 10% flexibility allowance)
- Strategic Policy S7: Affordable Homes (The affordable housing target is set at 2,450 affordable homes)
- Strategic Policy S8: Strategic Development Sites (To be specified in the Deposit RLDP. Strategic Growth Areas are identified in Abergavenny, Monmouth, Severnside and Chepstow)
- Strategic Policy S13: Employment Sites Provision (Provision is made for a minimum of 43ha of employment land throughout Monmouthshire)

Background to Recreational Pressure

There is growing concern about the cumulative impacts of recreation on key nature conservation sites in the UK, as most sites must fulfill conservation objectives while also providing recreational opportunity. HRAs of Local Plans tend to focus on recreational pressure arising from a net increase in residents⁶⁷. Generally, recreational use of a European site has the potential to:

- Cause disturbance to wildlife species, particularly overwintering waterfowl and wader species
- Cause damage through direct trampling damage, erosion and habitat fragmentation;
- Cause eutrophication through recreation, such as through dog fouling; and

⁶⁶ <http://www.apis.ac.uk/src/select-a-feature?site=UK0012985&SiteType=SAC&submit=Next> [Accessed on 22/10/2019]

⁶⁷ The RTP1 report 'Planning for an Ageing Population' (2004) which states that 'From being a marginalised group in society, the elderly are now a force to be reckoned with and increasingly seen as a market to be wooed by the leisure and tourist industries. There are more of them and generally they have more time and more money.' It also states that 'Participation in most physical activities shows a significant decline after the age of 50. The exceptions to this are walking, golf, bowls and sailing, where participation rates hold up well into the 70s'.

- Prevent appropriate management or exacerbate existing management difficulties;

The sensitivity of European sites to different types of recreational pressure varies. Studies across a range of species have shown that the effects from recreation can be complex. It also should be emphasised that recreational use is not necessarily damaging. For example, in heathlands a certain level of physical disturbance (that is not continuous in nature) is considered beneficial, as this contributes to the maintenance of the overall habitat diversity and the maintenance of bare ground, the habitat feature that may harbour some of the rarest heathland species⁶⁸. However, in practice, a benign level of disturbance is not quantifiable and is likely to be confined to within narrow limits. Once the optimum recreational pressure is exceeded, negative impacts of recreation are to be expected.

Some of the most prominent examples of recreational pressure relevant to the European sites within or close to Monmouthshire, namely disturbance to sensitive species of birds, trampling damage, erosion and nutrient enrichment, are discussed below.

Disturbance of overwintering waterfowl and waders (September – March)

Human activity can affect birds either directly (e.g. by causing them to flee) or indirectly (e.g. by damaging their habitat or reducing their fitness in less obvious ways e.g. stress). The most obvious direct effect is that of immediate mortality such as death by shooting, but human activity can also lead to much more subtle behavioural (e.g. alterations in feeding behaviour, avoidance of certain areas and use of sub optimal areas etc.) and physiological changes (e.g. an increase in heart rate). While these are less noticeable, they might result in major population-level changes by altering the balance between immigration/birth and emigration/death⁶⁹.

Concern regarding the effects of disturbance on birds stems from the fact that they are expending energy unnecessarily and the time they spend responding to disturbance is time that is not spent feeding⁷⁰. Disturbance therefore risks increasing energetic expenditure of birds while reducing their energetic intake, which can adversely affect the 'condition' and ultimately survival of the birds. Additionally, displacement of birds from one feeding site to others can increase the pressure on the resources available within the remaining sites, as they then must sustain a greater number of birds⁷¹. Moreover, the more time a breeding bird spends disturbed from its nest, the more its eggs are likely to cool and the more vulnerable they, or any nestlings, are to predators. Multiple research reports have provided compelling links between changes in housing and access levels and impacts on different bird species in European protected sites^{72 73}.

Evidence in the literature suggests that the magnitude of disturbance clearly differs between different types of recreational activities. For example, dog walking leads to a significantly higher reduction in bird diversity and abundance than hiking⁷⁴. Scientific evidence also suggests that key disturbance parameters, such as areas of influence and flush distance, are significantly greater for dog walkers than hikers⁷⁵. A UK meta-analysis suggests that important spatial (e.g. the area of a site potentially influenced) and temporal (e.g. how often or long an activity is carried out) parameters differ between recreational activities, suggesting that activity type is a factor that should be taken into account by HRAs⁷⁶.

There is also likely to be a temporal element to disturbance, creating different disturbance patterns in summer and winter. It can be generally assumed that there are fewer recreational users in winter and that disturbance at a population level may be reduced, because birds are not breeding. However, recreational disturbance in winter may still have negative impacts, because birds face seasonal food

⁶⁸ Key R. 2000. Bare ground and the conservation of invertebrates. *British Wildlife* 11: 183-192.

⁶⁹ Riley, J. 2003. Review of Recreational Disturbance Research on Selected Wildlife in Scotland. Scottish Natural Heritage.

⁷⁰ Riddington, R. *et al.* 1996. The impact of disturbance on the behaviour and energy budgets of Brent geese. *Bird Study* 43:269-279

⁷¹ Gill, J.A., Sutherland, W.J. & Norris, K. 1998. The consequences of human disturbance for estuarine birds. *RSPB Conservation Review* 12: 67-72

⁷² Liley D, Clarke R.T., Mallord J.W., Bullock J.M. 2006a. The effect of urban development and human disturbance on the distribution and abundance of nightjars on the Thames Basin and Dorset Heath. *Natural England / Footprint Ecology*.

⁷³ Liley D., Clarke R.T., Underhill-Day J., Tyldesley D.T. 2006b. Evidence to support the appropriate Assessment of development plans and projects in south-east Dorset. *Footprint Ecology / Dorset County Council*.

⁷⁴ Banks P.B., Bryant J.Y. 2007. Four-legged friend or foe? Dog walking displaces native birds from natural areas. *Biology Letters* 3: 14pp.

⁷⁵ Miller S.G., Knight R.L., Miller C.K. 2001. Wildlife responses to pedestrians and dogs. 29: 124-132.

⁷⁶ Weitowitz D., Panter C., Hoskin R., Liley D. The spatio-temporal footprint of key recreation activities in European protected sites. Manuscript in preparation.

shortages and are likely to be susceptible to any nutritional loss. Therefore, the abandonment of suitable feeding areas due to disturbance can have serious consequences for their ability to find suitable alternative feeding sites.

Scientific evidence of disturbance to waterfowl and waders is now widely available. For example, Tuite et al⁷⁷ used a large (379 sites), long-term (10-year) dataset (September – March species counts) to correlate seasonal changes in wildfowl abundance with the presence of various recreational activities. They determined that the shoveler was one of the most sensitive species to recreational activities, such as sailing/windsurfing and rowing. Studies on recreation in the Solent have established that human leisure activities cause direct disturbance to wintering waterfowl populations^{78 79}.

A recent study on recreational disturbance on the Humber⁸⁰ assesses different types of noise disturbance on waterfowl referring to studies relating to aircraft (see Drewitt 1999⁸¹), traffic (Reijnen, Foppen, & Veenbaas 1997)⁸², dogs (Lord, Waas, & Innes 1997⁸³; Banks & Bryant 2007⁸⁴) and machinery (Delaney et al. 1999; Tempel & Gutierrez 2003). These studies identified that there is still relatively little work on the effects of different types of water-based craft and the impacts from jet skis, kite surfers, windsurfers etc. (see Kirby et al. 2004⁸⁵ for a review). Some types of disturbance are clearly likely to invoke different responses. In very general terms, both distance from the source of disturbance and the scale of the disturbance (noise level, group size) will both influence the response (Delaney et al. 1999⁸⁶; Beale & Monaghan 2005⁸⁷). On UK estuaries and coastal sites, a review of WeBS data showed that, among the volunteer WeBS surveyors, driving of motor vehicles and shooting were the two activities most perceived to cause disturbance (Robinson & Pollitt 2002)⁸⁸.

A study in the Solent monitored bird disturbance across 20 different locations between December 2009 and February 2010⁸⁹. This involved recording all recreational activities and relating these to behavioural responses of birds in pre-defined focal areas of intertidal habitat. The study recorded a total of 2,507 potential disturbance events, generating 4,064 species-specific behaviours. Roughly 20% of recorded events resulted in disturbance of waterfowl, including behaviours such as becoming alert, walking / swimming away, short flights (< 50m) or major flights. Generally, the likelihood of disturbance decreased with increasing distance to the disturbance stimulus (i.e. the recreational activity being undertaken). Importantly, the study also illustrated that recreational activities in the intertidal zone have the highest disturbance potential (41% of recorded events resulted in disturbance), followed by water-based activities (25%) and shore-based activities (12%).

The specific distance at which a species takes flight when disturbed is known as the 'tolerance distance' (also called the 'escape distance') and greatly differs between species. The tolerance distances of the study carried out for the Bird Aware project are summarised in Table 2. It is reasonable to assume from this evidence that disturbance is unlikely to be relevant at distances of beyond 200m. The data show that the sensitivity to disturbance differs between species, but that the intra-specific variation in response to disturbance is equally important. It was also examined how disturbance to different recreational activities varies between species, but for most species the number of recorded events was

⁷⁷ Tuite, C.H., Hanson, P.R. & Owen, M. 1984. Some ecological factors affecting winter wildfowl distribution on inland waters in England and Wales and the influence of water-based recreation. *Journal of Applied Ecology* 21: 41-62

⁷⁸ Footprint Ecology. 2010. Recreational Disturbance to Birds on the Humber Estuary

⁷⁹ Footprint Ecology, Jonathan Cox Associates & Bournemouth University. 2010. Solent disturbance and mitigation project – various reports.

⁸⁰ Helen Fearnley Durwyn Liley and Katie Cruickshanks (2012) Results of Recreational Visitor Survey across the Humber Estuary produced by Footprint Ecology

⁸¹ Drewitt, A. (1999) Disturbance effects of aircraft on birds. English Nature, Peterborough.

⁸² Reijnen, R., Foppen, R. & Veenbaas, G. (1997) Disturbance by traffic of breeding birds: evaluation of the effect and considerations in planning and managing road corridors. *Biodiversity and Conservation*, 6, 567-581.

⁸³ Lord, A., Waas, J.R. & Innes, J. (1997) Effects of human activity on the behaviour of northern New Zealand dotterel *Charadrius obscurus aquilonius* chicks. *Biological Conservation*, 82,15-20.

⁸⁴ Banks, P.B. & Bryant, J.V. (2007) Four-legged friend of foe? Dog-walking displaces native birds from natural areas. *Biology Letters*, 3, 611-613.

⁸⁵ Kirby, J.S., Clee, C. & Seager, V. (1993) Impact and extent of recreational disturbance to wader roosts on the Dee estuary: some preliminary results. *Wader Study Group Bulletin*, 68, 53-58.

⁸⁶ Delaney, D.K., Grubb, T.G., Beier, P., Pater, L.L.M. & Reiser, H. (1999) Effects of Helicopter Noise on Mexican Spotted Owls. *The Journal of Wildlife Management*, 63, 60-76.

⁸⁷ Beale, C.M. & Monaghan, P. (2005) Modeling the Effects of Limiting the Number of Visitors on Failure Rates of Seabird Nests. *Conservation Biology*, 19, 2015-2019.

⁸⁸ Robinson, J.A. & Pollitt, M.S. (2002) Sources and extent of human disturbance to waterbirds in the UK: an analysis of Wetland Bird Survey data, 1995/96 to 1998/99: Less than 32% of counters record disturbance at their site, with differences in causes between coastal and inland sites. *Bird Study*, 49, 205.

⁸⁹ Liley D., Stillman R. & Fearnley H. 2011. The Solent Disturbance and Mitigation Project Phase 2: Results of Bird Disturbance Fieldwork 2009/10. Report by Footprint Ecology for the Solent Forum.

not enough for comparison (except for brent goose, oystercatcher and redshank). The results suggest that species might respond to recreational activities differently. For example, brent geese responded to dog walkers much further away than oystercatcher and redshank. It is noted that while these data have been collected in relation to the Solent, similar tolerance distances might apply to species in the Severn Estuary SPA / Ramsar.

Table 2: Tolerance distances in metres of 16 species of waterfowl to various forms of recreational disturbance, as found in recent disturbance fieldwork⁹⁰. The distances are provided both as a median and a range.

| Species | Disturbance Distance (metres from stimulus) | | Activity | | | |
|---------------------|---|----------|----------|-------------|---------|---------|
| | Median | Range | Cycling | Dog walking | Jogging | Walking |
| Brent goose | 51.5 | 5 - 178 | 100 | 95 | 30 | 50 |
| Oystercatcher | 46 | 10 - 200 | 150 | 45 | | 50 |
| Redshank | 44.5 | 75 - 150 | 125 | 50 | 40 | 58 |
| Curlew | 75 | 25 - 200 | | | | |
| Turnstone | 50 | 5 - 100 | | | | |
| Coot | 12 | 10 - 20 | | | | |
| Mute swan | 12 | 8 - 50 | | | | |
| Grey plover | 75 | 30 - 125 | | | | |
| Little egret | 75 | 30 - 200 | | | | |
| Wigeon | 75.5 | 20 - 125 | | | | |
| Dunlin | 75 | 25 - 300 | | | | |
| Shelduck | 77.5 | 50 - 140 | | | | |
| Great-crested grebe | 100 | 50 - 100 | | | | |
| Lapwing | 75 | 18 - 125 | | | | |
| Teal | 60 | 35 - 200 | | | | |
| Mallard | 25 | 10 - 50 | | | | |

Trampling damage, erosion and nutrient enrichment

Most terrestrial habitats, especially grassland, heathland and woodland, can be affected by trampling and other mechanical damage, which in turn causes soil compaction and erosion. Some of the following studies have investigated the negative impacts of trampling, associated with different recreational activities:

- Wilson & Seney⁹¹ examined the degree of track erosion caused by hikers, motorcycles, horses and cyclists from 108 plots along tracks in the Gallatin National Forest, Montana. Although the results proved difficult to interpret, it was concluded that horses and hikers disturbed more sediment on wet tracks, and therefore caused more erosion, than motorcycles and bicycles.
- Cole et al⁹² conducted experimental off-track trampling in 18 closed forest, dwarf scrub and meadow & grassland communities (each tramped between 0 – 500 times) over five mountain regions in the US. Vegetation cover was assessed two weeks and one year after trampling, and an inverse relationship with trampling intensity was discovered, although this relationship was weaker after one year than two weeks indicating some

⁹⁰ Ibid.

⁹¹ Wilson, J.P. & J.P. Seney. 1994. Erosional impact of hikers, horses, motorcycles and off road bicycles on mountain trails in Montana. Mountain Research and Development 14:77-88

⁹² Cole, D.N. 1995a. Experimental trampling of vegetation. I. Relationship between trampling intensity and vegetation response. Journal of Applied Ecology 32: 203-214

Cole, D.N. 1995b. Experimental trampling of vegetation. II. Predictors of resistance and resilience. Journal of Applied Ecology 32: 215-224

recovery of the vegetation. Differences in plant morphological characteristics were found to explain more variation in response between different vegetation types than soil and topographic factors. Low-growing, mat-forming grasses regained their cover best after two weeks and were considered most resistant to trampling, while tall forbs (non-woody vascular plants other than grasses, sedges, rushes and ferns) were considered least resistant. The cover of hemicryptophytes and geophytes (plants with buds below the soil surface) was heavily reduced after two weeks, but had recovered well after one year and as such these were considered most resilient to trampling. Chamaephytes (plants with buds above the soil surface) were least resilient to trampling. It was concluded that these would be the least tolerant of a regular cycle of disturbance.

- Cole⁹³ conducted a follow-up study (in 4 vegetation types) in which shoe type (trainers or walking boots) and trampler weight were varied. Although immediate damage was greater with walking boots, there was no significant difference after one year. Heavier trampers caused a greater reduction in vegetation height than lighter trampers, but there was no difference in the effect on cover.
- Cole & Spilldie⁹⁴ experimentally compared the effects of off-track trampling by hiker and horse (at two intensities – 25 and 150 passes) in two woodland vegetation types (one with an erect forb understorey and one with a low shrub understorey). Horse trampling was found to cause the largest reduction in vegetation cover. The forb-dominated vegetation suffered greatest disturbance but recovered rapidly. Generally, it was shown that higher trampling intensities caused more disturbance.
- In heathland sites, trampling damage can also affect the value of a site to wildlife. For example, heavy use of sandy tracks loosens and continuously disturbs sand particles, reducing the habitat's suitability for invertebrates⁹⁵. Species that burrow into flat surfaces such as the centres of paths, are likely to be particularly vulnerable, as the loose sediment can no longer maintain their burrow. In some instances, nature conservation bodies and local authorities resort to hardening paths to prevent further erosion. However, this is concomitant with the loss of habitat used by wildlife, such as sand lizards and burrowing invertebrates.

Some of the European sites relevant to the Monmouthshire RLDP are likely to be affected by more specialized recreational activities, which are carried out less frequently than more popular activities (e.g. walking, dog walking, exercising). These niche activities might include canoeing, fishing and caving. However, due to their disproportionate impact these activities nevertheless require consideration. For example, canoeists might affect wildlife and their habitats throughout long stretches of rivers, including disturbance to gravel bars, the macrophyte community and species that live along the rivers, such as otter. Recreational fishing, not a mainstream recreational activity, is known to have contributed to the global fish stock crisis. It is estimated that recreational fishing around the world contributes approx. 12% to the global annual fish harvest⁹⁶. Furthermore, a global meta-analysis showed that fishing, both recreational and commercial, affects not only the population abundance of the target species but also leads to knock-on effects in the wider food web.⁹⁷

A major concern for nutrient-poor terrestrial habitats (e.g. heathlands, bogs and fens) is nutrient enrichment associated through dog fouling, which has been addressed in various reviews (e.g.⁹⁸). It is estimated that dogs will defecate within 10 minutes of starting a walk and therefore most nutrient enrichment arising from dog faeces will occur within 400m of a site entrance. In contrast, dogs will urinate at frequent intervals during a walk, resulting in a more spread out distribution of urine. For example, in Burnham Beeches National Nature Reserve it is estimated that 30,000 litres of urine and

⁹³ Cole, D.N. 1995c. Recreational trampling experiments: effects of trampler weight and shoe type. Research Note INT-RN-425. U.S. Forest Service, Intermountain Research Station, Utah.

⁹⁴ Cole, D.N., Spilldie, D.R. 1998. Hiker, horse and llama trampling effects on native vegetation in Montana, USA. *Journal of Environmental Management* 53: 61-71

⁹⁵ Taylor K., Anderson P., Liley D. & Underhill-Day J.C. 2006. Promoting positive access management to sites of nature conservation value: A guide to good practice. English Nature / Countryside Agency, Peterborough and Cheltenham.

⁹⁶ Cooke S.J. & Cowx I.G. 2004. The role of recreational fishing in global fish crises. *BioScience* 54: 857-859.

⁹⁷ Blaber S.J.M., Cyrus D.P., Albaret J.-J., Ching C.V., Day J.W., Elliott M., Fonseca M.S., Hoss D.E., Orensanz J., Potter I.C., Silvert W. 2000. Effects of fishing on the structure and functioning of estuarine and nearshore ecosystems. *ICES Journal of Marine Science* 57: 590-602.

⁹⁸ Taylor K., Anderson P., Taylor R.P., Longden K. & Fisher P. 2005. Dogs, access and nature conservation. English Nature Research Report, Peterborough.

60 tonnes of dog faeces are deposited annually⁹⁹. While there is little information on the chemical constituents of dog faeces, nitrogen is one of the main components¹⁰⁰. Nutrient levels are the major determinant of plant community composition and the effect of dog defecation in sensitive habitats (e.g. heathland) is comparable to a high-level application of fertiliser, potentially resulting in the shift to plant communities that are more typical for improved grasslands.

Screening for LSEs

The following European sites within 15km of Monmouthshire are susceptible to recreational pressure (the sites that are screened in for Appropriate Assessment following discussion in the text are marked in **bold**):

- **Severn Estuary SPA / Ramsar**
- **Severn Estuary SAC**
- **Usk Bat Sites SAC**
- **River Wye SAC**
- **River Usk SAC**
- **Sugar Loaf Woodlands SAC**
- Avon Gorge Woodlands SAC
- Wye Valley and Forest of Dean Bat Sites SAC
- Wye Valley Woodlands SAC
- Cwm Clydach Woodlands SAC
- Aberbargoed Grasslands SAC
- Coed y Cerrig SAC

The qualifying waterfowl and wader assemblage in the Severn Estuary SPA / Ramsar is highly sensitive to recreational disturbance through activities on land (e.g. dog walking), in the intertidal zone and on the water (e.g. different forms of watersports). Disturbance of birds in feeding and roosting areas is likely to result in the displacement of birds and, potentially, in the decline of the SPA's / Ramsar's qualifying population. As highlighted in the site's Core Management Plan, human disturbance might result in reduced food intake and / or increased energy expenditure by the birds, with the potential for reducing the long-term viability of the population. LSEs of the Monmouthshire RLDP on the Severn Estuary SPA / Ramsar therefore cannot be excluded and the site is screened in for Appropriate Assessment.

The Severn Estuary SAC is designated for several habitats, which provide the basal support for qualifying species of the SPA / Ramsar. As such, the impact pathways of these European sites should not be viewed in isolation. Several habitats are especially sensitive to trampling damage and abrasion associated with recreational activities, such as the Atlantic salt meadows. Saltmarsh is highly vulnerable to terrestrial and water-based activities, such as through increased erosion rates associated with tyres of off-road vehicles and the wash resulting from boating / shipping. Similarly, sandflat and mudflat habitat is highly susceptible to both land- and water-based activities, such as boating, anchoring, bait digging and trampling. Overall, the Monmouthshire RLDP may result in LSEs on the Severn Estuary SAC regarding recreational pressure and the site is therefore screened in for Appropriate Assessment.

The lesser horseshoe bat population in the Usk Bat Sites SAC are likely to be highly susceptible to recreational disturbance. As identified in the Core Management Plan for the site, internal disturbance to the maternity roost and the hibernation sites is likely to be a major stressor for the bats. However, the

⁹⁹ Barnard A. 2003. Getting the facts – Dog walking and visitor number surveys at Burnham Beeches and their implications for the management process. Countryside Recreation 11:16-19.

¹⁰⁰ Taylor K., Anderson P., Liley D. & Underhill-Day J.C. 2006. Promoting positive access management to sites of nature conservation value: A guide to good practice. English Nature / Countryside Agency, Peterborough and Cheltenham.

habitat features that the bats are associated with are classified as 'Caves not open to the public'. This means that human disturbance to bats is kept to a minimum by restricting public access to their roost sites. However, while some caves (e.g. Agen Allwedd) are gated to prevent public access, this is not the case for all caves.

The Usk Bat Sites SAC also supports other habitats that are sensitive to recreational impacts, including its calcareous slopes with chasmophytic vegetation and its dry heathland elements. For example, rock climbing is an identified recreational activity causing disturbance to the plants and substrate of slopes. Heavy trampling damage might lead to erosion and bare ground, damaging the heathland habitats. While both caving and climbing are relatively rare recreational activities (in comparison to e.g. dog walking), the impact of individuals engaging in these activities might be disproportionately high. As a precautionary measure, the Usk Bat Sites SAC is therefore screened in for Appropriate Assessment.

The River Usk SAC is primarily designated for its anadromous fish species, including Atlantic salmon *Salmo salar*, twaite shad *Alosa fallax* and allis shad *Alosa alosa*. Generally, it is the adults travelling up the river to the spawning grounds, which are susceptible to the impacts of fishing. The Core Management Plan for the SAC¹⁰¹ identifies that both recreational and commercial fishing are threatening shad populations. These species are fished in large numbers and recreational fishing has been identified as one of the main reasons for their population declines. Relating to Atlantic salmon a seasonal catch restriction is already imposed by Natural Resources Wales, which require that all salmon caught before the 16th of June is released back to the water to protect fish stocks¹⁰². However, given that exploitation of shad is currently unregulated, the River Usk SAC is screened in for Appropriate Assessment.

The River Wye SAC is designated for its water course of plain to montane reaches, its salmonid species, white-clawed crayfish and otter. Principally, all its fish species are potentially sensitive to fisheries exploitation. Natural England's Site Conservation Objectives Supplementary Advice Note highlights that any rod fishing should be undertaken sustainably without adversely affecting the ability of fish species for natural regeneration¹⁰³. Like the River Usk SAC, shad in the River Wye SAC are potentially fished in great numbers with uncertain effects on the SAC's population. Exploitation of shad is currently unregulated, but management controls are being considered by the review of freshwater fisheries legislation to identify sustainable levels of angling. Furthermore, Natural England's Site Improvement Plan for the English parts of the SAC also highlights recreational disturbance as a threat to the site, particularly the disturbance of otters by dog walkers and the disturbance of gravel bars and beds, which form important spawning grounds for the SAC's fish species, by canoeists¹⁰⁴. Given the current evidence relating to recreational pressure in the SAC, LSEs cannot be excluded, and the site is screened in for Appropriate Assessment.

The Sugar Loaf Woodlands SAC, particularly its veteran trees within the old sessile oak woods with the *Ilex* and *Blechnum* habitat component, is potentially sensitive to recreation. The SAC lies under 1km from the Strategic Growth Area of Abergavenny, indicating that it is likely to be within walking distance for new local residents. While Natural Resources Wales' Core Management Plan does not refer to low recreational pressure as a potential management requirement for the site¹⁰⁵, it is considered that the extension of Abergavenny may lead to recreational pressure effects in-combination with growth in the Brecon Beacons National Park Local Development Plan (LDP). Therefore, LSEs of the Monmouthshire RLDP on the Sugar Loaf Woodlands SAC cannot be excluded and the site is screened in for Appropriate Assessment.

The Avon Gorge Woodlands SAC, designated for its *Tilio-Acerion* forests of slopes, screes and ravines, and semi-natural dry grasslands, is highly sensitive to recreational impacts, particularly from illegal mountain biking access to the steep sides of the gorge. Natural England's Site Improvement Plan highlights that the site suffers major pressures from public access and that there is a need for close monitoring and visitor engagement to ensure that current visitation rates are sustainable¹⁰⁶. However, the SAC lies at a distance of approx. 9.5km from the boundary of Monmouthshire, and several

¹⁰¹ https://naturalresources.wales/media/673384/River_Usk%20SAC%20core%20plan.pdf [Accessed on the 22/08/2019]

¹⁰² <https://naturalresources.wales/days-out/things-to-do/fishing/?lang=en> [Accessed on the 22/08/2019]

¹⁰³ <http://publications.naturalengland.org.uk/publication/6096799802589184> [Accessed on the 28/10/2019]

¹⁰⁴ p17 of the Site Improvement Plan; <http://publications.naturalengland.org.uk/publication/5178575871279104> [Accessed on the 28/10/2019]

¹⁰⁵ https://naturalresources.wales/media/674063/Sugar_Loaf_Woodlands_core_management_plan_Mar_2008%20A_.pdf [Accessed on the 07/11/2019]

¹⁰⁶ <http://publications.naturalengland.org.uk/publication/5021516609617920> [Accessed on the 28/10/2019]

kilometres further from the nearest settlement within Monmouthshire. Core Visitor Catchments (CVC's) are based on the distances that people are willing to travel to visit recreational destinations. This approach originates from the Thames Basin Heath Delivery Framework, which identified a precautionary CVC of 7km around the Thames Basin Heaths SPA. While no such visitor data is specifically available for the Avon Gorge Woodlands SAC, Monmouthshire is located beyond a precautionary 7km core visitor catchment from the SAC. In addition, the River Severn will act as a barrier and, in practice, it is unlikely that many Monmouthshire residents will use the M4 to cross the river to drive up the Avon Gorge. Therefore, it is concluded that there will be no LSEs of the Monmouthshire RLDP on the SAC and the site is screened out from Appropriate Assessment.

The lesser and greater horseshoe bat populations in the Wye Valley and Forest of Dean Bat Sites SAC are very vulnerable to recreational disturbance, especially during hibernation when human presence might cause the bats to wake up and burn valuable fat reserves. Natural England's Supplementary Conservation Objectives Advice Note highlights that hibernation sites, where possible, should be secured against unauthorised access using grilles. The upkeep and repair of grilles is being delivered by Natural England and Natural Resources Wales. Caving in the wider area of the SAC falls under the remit of the Royal Forest of Dean Caving Club (RFDCG), which provides background on the geology and ecology of selected caves¹⁰⁷. A permit system is operated for cavers by the Forest of Dean Cave Conservation and Access Group. Furthermore, detailed access guidelines for both caves and mines in the Forest of Dean area have been released by members of the access group. In contrast to the Usk Bat Sites SAC, which is located in the Brecon Beacons National Park, the Wye Valley and Forest of Dean Bat Sites SAC is not considered to have a similarly strong recreational draw and it is therefore unlikely that the relatively small individual component sites of the SAC receive a high number of recreational visits. Given this and that access is tightly regulated by grilles and the RFDCG, it is concluded that there will be no LSEs of the Monmouthshire RLDP on the SAC regarding recreational pressure. The site is therefore screened out from Appropriate Assessment.

The Wye Valley Woodlands SAC is designated for several woodland habitats, including *Asperulo-Fagetum* beech forest, *Tilio-Acerion* forest of slopes, screes and ravines and *Taxus baccata* woods. These habitats are not generally considered to be highly sensitive to recreational pressure due to the difficult topography, but the segments of ancient forest within the SAC are potentially more vulnerable. It is well known that the condition in the soil surrounding mature trees affects their roots, mycorrhizal fungi, nutrient uptake and growth rate. Recreational activities might lead to compacted soil with less space for air and water, both essential for plant growth, and could negatively impact trees in the SAC. However, walking routes in the general area of the Wye Valley Woodlands SAC appear to be well publicised, waymarked and used by the public (e.g. near Beacon View, Monmouth¹⁰⁸). The woodland walks maintained by Natural Resources Wales (or by Natural England within SAC components in England) would have considered ecological interest features (e.g. ancient trees) and their use by the public is not considered to negatively impact the qualifying habitats of the SAC. A review of the contours on Ordnance Survey Maps within ViewRanger indicates that most of the SAC's woodland components are very steep¹⁰⁹ and that visitors are therefore likely to stick to the paths provided, which would further protect the site's interest features. The lesser horseshoe bats, Annex II qualifying species of the SAC, are highly sensitive to recreation, but access to the component sites of the SAC that act as maternity roosts or hibernacula is regulated by grills. Overall, LSEs of the Monmouthshire RLDP on the Wye Valley Woodlands SAC are unlikely, and the site is screened out from Appropriate Assessment.

The Cwm Clydach Woodlands SAC is not considered to be particularly sensitive to recreational pressure. The ground vegetation beneath the beech woodland canopy is relatively sparse and the negative impacts of trampling are therefore likely to be limited. However, other disturbance effects have been identified, particularly fly-tipping of domestic and recreational waste along roadsides leading through the SAC. However, the barriers that have been installed, have been successful in reducing the incidence of fly-tipping. Provided that these barriers are maintained, it is considered that the Monmouthshire RLDP will not result in LSEs on the Cwm Clydach Woodlands SAC. The site therefore can be screened out and requires no further consideration in an Appropriate Assessment.

The Aberbargoed Grasslands SAC, designated for its *Molinia* meadows, are not considered vulnerable to recreational pressure due to their robust tussock structure. Said structure also makes such

¹⁰⁷ <http://www.zen159313.zen.co.uk/rfdcc/caves.htm> [Accessed on the 28/10/2019]

¹⁰⁸ <https://naturalresources.wales/days-out/places-to-visit/south-east-wales/beacon-view/?lang=en> [Accessed on the 28/10/2019]

¹⁰⁹ <https://my.viewranger.com/user/routes/add> [Accessed on the 07/11/2019]

grasslands difficult to walk through such that they are not generally popular for recreation. However, in the past anti-social behaviours such as off-roading and burning have occurred on the grasslands. However, in 2005 Caerphilly Council were successful in obtaining Heritage Lottery funding to establish a conservation officer role for the site. In combination with a programme for education and establishing a newsletter for ongoing conservation activities within the site, this has improved the anti-social behaviours. Furthermore, given the distance of the Aberbargoed Grasslands SAC to Monmouthshire, it is considered that the Replacement Local Development Plan will not result in LSEs on the SAC.

The Coed y Cerrig SAC comprises alluvial forests in a valley bottom and is likely to be fairly popular for recreation. For example, the Coed-y-Cerrig National Nature Reserve is advertised as a place to visit on the Brecon Beacons National Park website¹¹⁰. The Core Management Plan for the SAC highlights that recreational access has the potential to result in significant trampling damage to the site. However, the SAC has a circular boardwalk in place. Due to the ground being so wet, most visitors stick to the boardwalks provided. Given this, the Coed y Cerrig SAC is screened out from Appropriate Assessment.

The following policies of the Replacement Local Development Plan have been screened in for Appropriate Assessment because they allocate residential dwellings or encourage tourism, likely leading to increased recreational pressure and therefore LSEs on several European sites:

- Strategic Policy S1: Strategic Sustainable and Resilient Growth (Provision for 8,366 net new dwellings and 7,215 net new jobs)
- Strategic Policy S2: Spatial Distribution of Development (Identifies the settlement hierarchy and quantum of residential development therein for Monmouthshire)
- Strategic Policy S6: Delivery of Homes (Requirement for 7,605 new homes with provision made for 8,366 new dwellings with the inclusion of a 10% flexibility allowance)
- Strategic Policy S7: Affordable Homes (The affordable housing target is set at 2,450 affordable homes)
- Strategic Policy S8: Strategic Development Sites (To be specified in the Deposit RLDP. Strategic Growth Areas are identified in Abergavenny, Monmouth, Severnside and Chepstow)
- Strategic Policy S10: Sustainable Transport (Supports active travel modes, such as walking and cycling routes, which may facilitate access to sensitive European sites)
- Strategic Policy S15: Visitor Economy (Promotes tourism opportunities that may result in a temporary increase of the local populace)

Background to Loss of Functionally Linked Land

While most European sites have been geographically defined to encompass the key features that are necessary for coherence of their structure and function, and the support of their qualifying features, this is not always the case. A diverse array of qualifying species including birds, bats and amphibians are not confined to the boundary of designated sites.

For example, the highly mobile nature of both wildfowl and heathland birds implies that areas of habitat of crucial importance to the maintenance of their populations are outside the physical limits of European sites. Despite not being designated, this area is still integral to the maintenance of the structure and function of the interest feature on the designated site and, therefore, land use plans that may affect such areas should be subject to further assessment. Examples of other mobile qualifying species are great-crested newts and bats. The latter animal group is known to travel considerable distances from their roosts to feeding sites. For example, in a 2001 study, female adult Bechstein's bats regularly undertook commuting distances of up to 1km¹¹¹. However, it is known that bat home ranges can be between 1-1.5km, with some individuals ranging up to 2.5km distance. Both spring migrations or regular foraging trips might take these species beyond the designated site boundary.

¹¹⁰ <http://www.breconbeacons.org/coed-y-cerrig> [Accessed on 22/10/2019]

¹¹¹ Kerth G., Wagner M. & Koenig B. 2001. Roosting together, foraging apart: Information transfer about food is unlikely to explain sociality in female Bechstein's bats (*Myotis bechsteinii*). Behavioral Ecology and Sociobiology 50: 283-291.

There is now an abundance of authoritative examples of HRA cases on plans affecting bird populations, where the potential importance of functionally linked land is recognised¹¹². For example, bird surveys in relation to a previous HRA established that approximately 25% of the golden plover population in the Somerset Levels and Moors SPA were affected while on functionally linked land, and this required the inclusion of mitigation measures in the relevant plan policy wording. Another important case study originates from the Mersey Estuary SPA / Ramsar, where adjacently located functionally linked land had a peak survey count of 108% of the 5 year mean peak population of golden plover. Similar to the above example, this led to considerable amendments in the planning proposal to ensure that the site integrity was not adversely affected.

Generally, the identification of an area as functionally linked land is now a relatively straightforward process. However, the importance of non-designated land parcels may not be apparent and require the analysis of existing data sources to be firmly established. In some instances, data may not be available at all, requiring further survey work.

Screening for LSEs

The following European sites within 15km of Monmouthshire are susceptible to the loss of functionally linked land because they are designated for mobile qualifying species (the sites that are screened in for Appropriate Assessment following discussion in the text are marked in **bold**):

- **Usk Bat Sites SAC**
- **Wye Valley and Forest of Dean Bat Sites SAC**
- **Severn Estuary SPA / Ramsar**
- Aberbargoed Grasslands SAC

The lesser horseshoe bats in the Usk Bat Sites SAC are not only dependent on their roosts and foraging habitat in the SAC, but potentially also on habitat that lies outside the designated site boundary. Feeding areas and commuting routes (flightlines) outside the designation may therefore be integral to sustaining the bat population. The area of greatest bat activity surrounding a roost is defined as the Core Sustenance Zone (CSZ)¹¹³, however this is not available for all sites and / or bat species. Generally, lesser horseshoe bats forage between 2 and 3km from their roost but they have been observed to range up to 4km in their nightly foraging trips¹¹⁴. The Bat Conservation Trust identifies a weighted average CSZ of 2km for lesser horseshoe bats. It is therefore recognised that linear features (required to navigate) and permanent pasture / unimproved grassland (favoured feeding areas) and woodlands within this distance outside the SAC boundary, and in many cases further afield, need to be maintained. Given that the Usk Bat Sites SAC is partially located within Monmouthshire and lies close to several settlements such as Gilwern, residential and employment site allocations might lead to LSEs on this SAC through the loss of supporting habitat. The site is therefore screened in for Appropriate Assessment.

The Wye Valley and Forest of Dean Bat Sites SAC lies partly within Monmouthshire and is designated for both its lesser and greater horseshoe bat populations. Relating to its lesser horseshoe bat population a CSZ of 2km therefore applies as for the Usk Bat Sites SAC above. Radio-tracking research on greater horseshoe bats has shown that they make longer foraging trips foraging from their roost sites than lesser horseshoe bats, up to 9-10km from their roost^{115 116}. This bat species uses commuting corridors along linear landscape features and forages in permanent pasture and woodland. The Bat Conservation Trust identifies a weighted average CSZ of 3km for greater horseshoe bats. Any linear features (required for navigation) and permanent pasture / unimproved grassland (favoured feeding areas) within this distance outside of the SAC's boundary, and in many cases further afield, need to be maintained. The

¹¹² Chapman C & Tyldesley D. 2016. Functional linkage: How areas that are functionally linked to European sites have been considered when they may be affected by plans and projects – A review of authoritative decisions. Natural England Commissioned Reports 207: 73pp.

¹¹³ https://cdn.bats.org.uk/pdf/Resources/Core_Sustenance_Zones_Explained_04.02.16.pdf?mtime=20190219173135 [Accessed on the 28/10/2019]

¹¹⁴ Schofield H.W. 2008. The Lesser Horseshoe Bat Conservation Handbook.

¹¹⁵ Billington G. 2008. Radio-tracking Study of Greater Horseshoe Bats at Dean Hall, Littledean, Cinderford. Natural England Commissioned Report NERR012..

¹¹⁶ Billington G. 2009. Radio Tracking Study of Greater Horseshoe Bats at Dean Hall, Littledean, Cinderford. Natural England Commissioned Report. NECR021.

Wye Valley and Forest of Dean Bat Sites SAC is partly located within Monmouthshire and the allocation of residential and employment sites in the Monmouthshire RLDP might therefore lead to LSEs on this SAC through the loss of supporting habitat. The site is therefore screened in for Appropriate Assessment.

The Severn Estuary SPA / Ramsar, designated for several species of waterfowl and its overall waterbird assemblage, supports several bird species that might regularly move beyond the designated site boundary. Above all, functionally linked land is relevant to Bewick's swans, which graze on a range of soft meadow grasses beyond the SPA's / Ramsar's site boundary, including wet meadows comprising *Agrostis stolonifera* and *Alopecurus geniculatus*. The qualifying waterfowl assemblage also includes European white-fronted geese, which commute up to 10km to their daytime foraging sites, which might include functionally linked farmland and wetland. It is considered that the functional integrity of the Severn Estuary SPA / Ramsar partly depends on land beyond its site boundary. LSEs of the Monmouthshire RLDP on the SPA / Ramsar cannot be excluded and the site is screened in for Appropriate Assessment.

The marsh fritillary butterfly population in the Aberbargoed Grasslands SAC is a species that is known to require relatively large areas of suitable habitat for a population to remain functional. It is generally considered that 50ha of suitable habitat will suffice to maintain a sustainable population¹¹⁷. The SAC itself is 39.6ha in size and not all of it comprises the butterfly's preferred habitat of wet grassland and devil's-bit scabious, the caterpillars only foodplant. As such it is likely that the butterfly population from the Aberbargoed Grasslands SAC will also depend on using habitat patches outside the European site that contain significant areas of devils bit scabious. However, given that the boundary of Monmouthshire is approx. 12.5km away, it is considered unlikely that the Plan's implementation would result in the loss of functionally linked land for the marsh fritillary butterfly. The site is screened out from Appropriate Assessment.

The following policies of the Replacement Local Development Plan have been screened in for Appropriate Assessment because they allocate residential or employment growth, potentially leading to the loss of functionally linked land and LSEs on the above identified European sites:

- Strategic Policy S1: Strategic Sustainable and Resilient Growth (Provision for 8,366 net new dwellings and 7,215 net new jobs)
- Strategic Policy S2: Spatial Distribution of Development (Identifies the settlement hierarchy and quantum of residential development therein for Monmouthshire)
- Strategic Policy S6: Delivery of Homes (Requirement for 7,605 new homes with provision made for 8,366 new dwellings with the inclusion of a 10% flexibility allowance)
- Strategic Policy S7: Affordable Homes (The affordable housing target is set at 2,450 affordable homes)
- Strategic Policy S8: Strategic Development Sites (To be specified in the Deposit RLDP. Strategic Growth Areas are identified in Abergavenny, Monmouth, Severnside and Chepstow)
- Strategic Policy S10: Sustainable Transport (Supports sustainable transport networks that may require lighting schemes, which could interfere with functionally linked habitat usage by bats)
- Strategic Policy S13: Employment Sites Provision (Provision is made for a minimum of 43ha of employment land throughout Monmouthshire)
- Strategic Policy S15: Visitor Economy (Promotes tourism opportunities that may result in a temporary increase of the local populace)

Background to Water Quality

The quality of the water that feeds European sites is an important determinant of the nature of their habitats and the species they support. Poor water quality can have a range of environmental impacts:

¹¹⁷ Butterfly Conservation, Dorset. 2009. Available at: <https://butterfly-conservation.org/sites/default/files/ni-marsh-frit-leaflet-july-2010.pdf> [Accessed on the 23/08/2019]

- At high levels, toxic chemicals and metals can result in immediate death of aquatic life, and can have detrimental effects even at lower levels, including increased vulnerability to disease and changes in wildlife behaviour.
- Eutrophication, the enrichment of plant nutrients in water, increases plant growth and consequently results in oxygen depletion. Algal blooms, which commonly result from eutrophication, increase turbidity and decrease light penetration. The decomposition of organic wastes that often accompanies eutrophication deoxygenates water further, augmenting the oxygen depleting effects of eutrophication. In the marine environment, nitrogen is the limiting plant nutrient and so eutrophication is associated with discharges containing available nitrogen.
- Some pesticides, industrial chemicals, and components of sewage effluent are suspected to interfere with the functioning of the endocrine system, possibly having negative effects on the reproduction and development of aquatic life.

The most significant issue in relation to the Monmouthshire RLDP is the discharge of treated sewage effluent into surface watercourses, which is likely to increase the nutrient concentration, most importantly phosphate levels, in European sites that are hydrologically linked to these watercourses. The RLDP assessed in this HRA provides for development in the Dwr Cymru Welsh Water catchment, responsible for the public water supply and wastewater treatment for large parts of Wales.

Screening for LSEs

The following European sites within 15km of Monmouthshire are sensitive to changes in water quality:

- **River Usk SAC**
- **River Wye SAC**
- **Severn Estuary SAC**
- Severn Estuary SPA / Ramsar
- Llangorse Lake SAC

The River Usk SAC is a riverine freshwater system of plain to montane levels with *Ranunculus fluitantis* and *Callitriche-Batrachion* vegetation. While this is a non-primary feature of the SAC it is essential in supporting the primary Annex II species, such as the qualifying fish and the otter. The Core Management Plan¹¹⁸ published by Natural Resources Wales (NRW) highlights the water quality in the system as a primary determinant of its ecological status, which is currently classified as unfavourable. While the main water quality impact in this catchment originates from agriculture, pollutants from sewage effluent, particularly increases in phosphorus concentrations, have the potential to increase the abundance of filamentous algae and to decrease the aquatic flowering plants. Eutrophication can lead to reduced dissolved oxygen concentrations, which in turn reduces the viability of fish populations. Following recent evidence on negative impacts of phosphate in Welsh rivers¹¹⁹, NRW have adopted tighter water quality targets. 88% of waterbodies in the R. Usk catchment are failing the tightened water quality objectives. Overall, the River Usk SAC is screened in for Appropriate Assessment.

Given the similar qualifying features to the River Usk SAC, the River Wye SAC is also sensitive to aquatic pollutants. Natural England's Site Conservation Objectives Supplementary Advice Note highlights that elevated nutrient levels in the SAC, especially the concentration of phosphorus, are likely to lead to eutrophication. This might change plant growth and community composition of the 'water courses of plain to montane levels' qualifying feature, as well as having knock-on effects (e.g. loss of substrate for spawning and early life stages, reduced dissolved oxygen (DO) concentrations, increased turbidity) on fish species, such as Atlantic salmon and shad, which generally require high DO and clear water. The Monmouthshire RLDP makes a provision for 8,366 new dwellings and 7,215 new jobs (43ha of employment space), which will increase the production of sewage effluent and therefore input of phosphorus into the River Wye SAC. There is also the potential for industrial pollutants to be affecting the SAC, including pollutants such as zinc, cadmium and copper. According to NRW, 67% of

¹¹⁸ https://naturalresources.wales/media/673384/River_Usk%20SAC%20core%20plan.pdf [Accessed on the 23/08/2019]

¹¹⁹ Available online at: <https://www.monmouthshire.gov.uk/planning/water-quality/> [Accessed on the 11/06/2021]

waterbodies in the R. Wye catchment are currently failing to meet the new water quality targets. Overall, LSEs of the Monmouthshire RLDP on the River Wye SAC cannot be excluded, and the site is screened in for Appropriate Assessment.

The Severn SAC is designated for several habitats (e.g. estuaries, mud- and sandflats, Atlantic salt meadows) and species (lampreys, twaite shad) that are highly sensitive to changes in water quality. The document jointly published by Natural England and Natural Resources Wales highlights physico-chemical parameters, such as oxygen, nutrients and turbidity in the water column as a primary attribute for protecting the integrity of the SAC. Significant changes to any of these parameters could trigger an increase in phytoplankton or macroalgal biomass, leading to changes in the distribution (including recruitment and spawning processes) of the qualifying fish species. Changes to water quality, such as reduced dissolved oxygen concentrations, are also known to act as barriers to migration for river lamprey, brook lamprey and twaite shad. Overall, LSEs of the Monmouthshire RLDP on the Severn Estuary SAC cannot be excluded, and the site is therefore screened in for Appropriate Assessment.

The Severn Estuary SPA / Ramsar, designated for individual waterbirds as well as its composite waterfowl assemblage, is considered to be sensitive to water quality issues. The Severn River Basin Management Plan states that only 17% of the estuarine water bodies currently achieve good ecological status, with the remainder being at moderate status. On page 13, Natural England's Site Improvement Plan specifically highlights water pollution as a threat to the SPA / Ramsar¹²⁰. This high nutrient loading may lead to an increase in benthic macroalgae, which have been identified in several locations in the Severn Estuary SPA / Ramsar, which is likely to have negative knock-on impacts on resident invertebrate communities. In turn, eutrophication effects could cascade up the food chain affecting the qualifying bird species. For example, increased nutrient input might change the sward composition of the saltmarsh, affect the Bewick's swans' ability to forage and ultimately impact the availability of adequate feeding habitat within the SPA / Ramsar. Ultimately, it is to be noted that any negative impacts of nutrient loading on the qualifying features in the SPA / Ramsar will occur as indirect effects on the birds' preferred foraging habitat and prey species. The Appropriate Assessment section of this report will therefore focus on discussing the Severn Estuary SAC, as this provides the essential supporting habitats for the SPA's / Ramsar's waterfowl species. Therefore, while LSEs of the Monmouthshire RLDP on the Severn Estuary SPA / Ramsar cannot be excluded, the site is screened out from Appropriate Assessment.

The Llangorse Lake SAC is a natural eutrophic lake, and its plants and animals are highly sensitive to changes in water quality. Furthermore, given that the Afon Llynfi is its only water outlet, any pollutants also remain within the lake for long periods. A significant portion of the current water pollutants derive from nearby agricultural practices and septic tanks. However, the lake is located in a lowland catchment and receives its hydrological input from a very small geographic area. Monmouthshire lies approx. 11.4km to the south-east of the Llangorse Lake SAC and is therefore considered to be beyond its hydrological catchment. Furthermore, the SAC is upstream of any watercourses that would be expected to receive wastewater or industrial run-off from development in Monmouthshire. As such it is considered that there is no hydrological connectivity between the RLDP area and the SAC. The Llangorse Lake SAC is screened out from Appropriate Assessment.

The following policies of the Replacement Local Development Plan have been screened in for Appropriate Assessment because they allocate residential or employment growth, which might lead to LSEs on designated freshwater and marine sites through increased sewage effluent and the release of toxic pollutants:

- Strategic Policy S1: Strategic Sustainable and Resilient Growth (Provision for 8,366 net new dwellings and 7,215 net new jobs)
- Strategic Policy S2: Spatial Distribution of Development (Identifies the settlement hierarchy and quantum of residential development therein for Monmouthshire)
- Strategic Policy S6: Delivery of Homes (Requirement for 7,605 new homes with provision made for 8,366 new dwellings with the inclusion of a 10% flexibility allowance)

¹²⁰ <http://publications.naturalengland.org.uk/publication/4590676519944192> [Accessed on the 28/10/2019]

- Strategic Policy S7: Affordable Homes (The affordable housing target is set at 2,450 affordable homes)
- Strategic Policy S8: Strategic Development Sites (To be specified in the Deposit RLDP. Strategic Growth Areas are identified in Abergavenny, Monmouth, Severnside and Chepstow)
- Strategic Policy S13: Employment Sites Provision (Provision is made for a minimum of 43ha of employment land throughout Monmouthshire)
- Strategic Policy S15: Visitor Economy (Promotes tourism opportunities that may result in a temporary increase of the local populace)

Background to Water Quantity, Level and Flow

In addition to water quality, both the water level and flow (and its natural diurnal and annual variation) are important determinants of the ecological status of European sites. Hydrological processes are critical in influencing habitat characteristics, including current velocity, water depth, wetted area, dissolved oxygen levels and water temperature. In turn these habitat features determine the short- and long-term viability of plant and animal species, as well as overall ecosystem composition.

A highly cited review paper summarised the ecological effects of reduced flow in rivers¹²¹. Droughts (ranging in their magnitude from flow reduction to a complete loss of surface water) have both direct and indirect effects on stream communities. For example, a marked direct effect is the loss of water and habitat for aquatic organisms. Indirect effects include a deterioration in water quality, changes to the food resources and alterations in interspecific interactions. An increased stability of baseflow and a reduction in the natural flow variability of rivers has been linked to the excessive growth of macrophytes and a reduction in fish populations¹²².

The variability in hydrological discharge does not only have ecosystem-level effects, but also affects specific functional groups and species more directly. Anadromous fish, the qualifying features of several of Monmouthshire's European sites, are especially sensitive to water fluctuations and flow variability. This is primarily because their life stages critically depend on specific flow levels. For example, a recent modelling study demonstrated that low-flow conditions in summer, a critical time when adult anadromous fish must reach their upstream spawning grounds, significantly reduces production in salmonids¹²³.

Screening for LSEs

The following European sites within 15km of Monmouthshire are sensitive to changes in their water quantity, level and flow (the sites that are screened in for Appropriate Assessment following discussion in the text are marked in **bold**):

- **River Usk SAC**
- **River Wye SAC**
- **Severn Estuary SAC**
- Severn Estuary SPA / Ramsar
- Aberbargoed Grasslands SAC
- Llangorse Lake SAC
- Coed y Cerrig SAC

The integrity of the River Usk SAC is dependent on both the volume and the stability of water flow. The Conservation Objectives for the SAC state that the quantity of water, including the natural flow variability,

¹²¹Lake P.S. 2003. Ecological effects of perturbation by drought in flowing waters. *Freshwater Biology* 48: 1161-1172.

¹²²Bunn S.E. & Arthington A.H. 2002. Basic principles and ecological consequences of altered flow regimes for aquatic biodiversity. *Environmental Management* 30: 492-507.

¹²³Ohlberger J., Buehrens T.W., Brenkman S.J., Crain P., Quinn T.P. & Hilborn R. 2018. Effects of past and projected river discharge variability on freshwater production in an anadromous fish. *Freshwater Biology* 63: 331-340.

is to be maintained or restored to maintain the site's qualifying features in the future¹²⁴. Hydrological processes, most importantly river flow level and variability, are critical in determining various habitat properties, such as current velocity, water depth and dissolved oxygen levels. Furthermore, the water depth and flow velocity influence the ability of adult anadromous fish of reaching their upstream spawning grounds. Species of shad are particularly sensitive to variations in flow levels. An ideal flow regime is to encourage high flows in March-May to stimulate upstream migration and maximise the upstream penetration of adult fish. In June-September low flows should be encouraged to ensure that juveniles are not washed into saline water prematurely. The development outlined in the Monmouthshire RLDP will require the abstraction of water for households and industry, and therefore could result in LSEs on the River Usk SAC. This site is therefore screened in for Appropriate Assessment.

The River Wye SAC is designated for the same anadromous fish species as the River Usk SAC. As for the Usk, the natural flow regime is therefore also critical to all its qualifying fish species, particularly the shad. Since development allocated in the Monmouthshire RLDP could also be supplied with water abstracted from the River Wye SAC, LSEs cannot be excluded and the site is screened in for Appropriate Assessment.

Being hydrologically connected with, and therefore also being dependent on, both the River Usk SAC and the River Wye SAC, the Severn Estuary SAC is highly vulnerable to changes in water flow rates for several reasons. Firstly, changes in the water flow rate are likely to lead to increases in sediment erosion or accretion respectively, to which the seagrass in the estuary is highly sensitive. Furthermore, the SAC's biotopes are also considered to be sensitive to changes in salinity, such as a long-term increase in salinity. Water abstraction for the public water supply in Monmouthshire from the main rivers supplying the Severn Estuary SAC, might lead to decreased freshwater input and could, ultimately, increase salinity levels in the estuary. As such, LSEs of the Monmouthshire RLDP cannot be excluded, and the site is screened in for Appropriate Assessment.

The Severn Estuary SPA / Ramsar, which harbours several species of qualifying waterfowl and waders, is considered to have an indirect sensitivity to changes in the hydrological regime. It is unlikely that changes in the water flow rate would affect any of the qualifying species (e.g. Bewick's swans) directly, because there is no linking impact pathway. However, an altered hydrological regime would likely affect their supporting habitats, including the Atlantic salt meadows, and the mud- and sandflats. For example, this could occur through changes in the species composition of the saltmarsh and a subsequent impact on the suitability of the saltmarsh for the birds or changes to the pattern of habitat use. However, since this impact pathway is already screened in for the Severn Estuary SAC, which addresses impacts on the birds' supporting habitats, the Severn Estuary SPA / Ramsar is screened out from Appropriate Assessment regarding the impact pathway water quantity, level and flow.

The Aberbargoed Grasslands SAC is an area comprising 48% of humid grassland with impeded drainage. This grassland and its characteristic plant community is sustained by both groundwater and surface water flow, depending on the variable water table. While the hydrological regime is not explicitly mentioned in the site's Core Management Plan, the integrity of the site is clearly partly dependent on the continued supply of sufficient water. However, due to the site's relatively long distance of 12.7km to Monmouthshire and the fact that it only requires a limited amount of water, which will be associated with superficial deposits with poor drainage rather than underlying aquifers, it is considered unlikely that the Monmouthshire RLDP will result in LSEs on the SAC through changes in the water level. The site is therefore screened out from Appropriate Assessment.

The Core Management Plan for the Llangorse Lake SAC highlights that the site is sensitive to the hydrological input into the lake, which should follow a natural seasonal cycle. The lake only has a mean depth of 2-3m (with a maximum depth of 7.5m), which will be further reduced through the gradual infilling of the lake with sediment from its banks. Any changes to the water supply of the SAC, especially a reduction in inflow, is therefore likely to threaten the integrity of the site. However, Welsh Water produced a final Water Resource Management Plan in 2019. This identifies that there will be no adverse effects on Llangorse Lake SAC from public water supply up to 2050. The Core Management Plan highlights that no new structures that will reduce inflow should be established in the vicinity of the Llangorse Lake SAC. However, as discussed in the previous section, the SAC lies approx. 11.4km to the north-west of Monmouthshire, which is considered to be beyond its hydrological catchment. There is no realistic way in which the abstraction of water for new development in Monmouthshire would

¹²⁴ Ibid.

change the water quantity, level or flow in the SAC. The site is screened out from Appropriate Assessment.

The Coed Y Cerrig SAC comprises alluvial forest in a valley bottom, which is dependent on a constant supply of water to maintain its waterlogged conditions. A significant alteration in the water quantity supplied might cause a drying out of the site and might potentially affect the qualifying feature of the SAC. The Coed y Cerrig SAC is only approx. 294m from the River Usk and is therefore likely to be hydrologically connected with this river. Drinking water for the western part of Monmouthshire might be extracted from the River Usk, however an abstraction effect is likely to affect the river a relatively long distance downstream from the Coed y Cerrig SAC. Welsh Water produced a final Water Resource Management Plan in 2019. This identifies that there will be no adverse effects on this SAC from public water supply up to 2050. It is therefore concluded that there is no linking hydrological impact pathway between Monmouthshire and the SAC. The site is screened out from Appropriate Assessment.

The following policies of the Replacement Local Development Plan have been screened in for Appropriate Assessment because they allocate residential or employment growth, leading to increased water abstraction from local water resources and potentially LSEs on European sites through changes to the water quantity, level and flow:

- Strategic Policy S1: Strategic Sustainable and Resilient Growth (Provision for 8,366 net new dwellings and 7,215 net new jobs)
- Strategic Policy S2: Spatial Distribution of Development (Identifies the settlement hierarchy and quantum of residential development therein for Monmouthshire)
- Strategic Policy S6: Delivery of Homes (Requirement for 7,605 new homes with provision made for 8,366 new dwellings with the inclusion of a 10% flexibility allowance)
- Strategic Policy S7: Affordable Homes (The affordable housing target is set at 2,450 affordable homes)
- Strategic Policy S8: Strategic Development Sites (To be specified in the Deposit RLDP. Strategic Growth Areas are identified in Abergavenny, Monmouth, Severnside and Chepstow)
- Strategic Policy S13: Employment Sites Provision (Provision is made for a minimum of 43ha of employment land throughout Monmouthshire)
- Strategic Policy S15: Visitor Economy (Promotes tourism opportunities that may result in a temporary increase of the local populace)

Local Development Plans to be considered 'in-combination'

It is obligatory to not only assess LSEs of a proposed plan alone, but also to investigate whether there might be 'in-combination' effects with plans proposing development in other authorities surrounding a European protected site. In practice, such an 'in-combination' assessment is of greatest relevance when the plan would otherwise be screened out because its individual contribution is inconsequential. For the purposes of this HRA, we have identified several other authorities within 15km from Monmouthshire that have developed their own Local Development Plans (LDPs) or Local Plans, outlining residential and / or employment growth within their own boundary. These include Powys, Torfaen, Newport, Blaenau Gwent, Herefordshire, Forest of Dean, South Gloucestershire, Bristol, Brecon Beacons National Park, Merthyr Tydfil and Caerphilly. Table 3 summarises the residential and / or employment growth allocated within the respective LDPs for these authorities. It is to be noted that several LDPs are nearing the end of their plan period and the authorities of Torfaen, Blaenau Gwent, South Gloucestershire and Bristol are currently working on Replacement Local Development Plans or updates to their Local Plans. However, Table 3 summarises the currently adopted, and therefore legally effective, Plans.

Table 3: Number of residential dwellings and employment space that are to be delivered in authorities within 15km of Monmouthshire, according to their adopted Local Development Plans and Local Plans.

| Local Authority | Total housing provided | Total employment space provided |
|--|-----------------------------------|---|
| Powys (Adopted April 2018) | 4,600 (2011-2026) ¹²⁵ | 45ha |
| Torfaen (Adopted December 2013) | 4,700 (2006-2021) ¹²⁶ | 75.3ha |
| Newport (Adopted January 2015) | 11,623 (2011-2026) ¹²⁷ | 172ha |
| Blaenau Gwent (Preferred Strategy) | 2,115 (2018-2033) ¹²⁸ | 46ha |
| Herefordshire (Adopted October 2015) | 16,500 (2011-2031) ¹²⁹ | 148ha |
| Forest of Dean (Adopted February 2012) | 5,162 (2011-2026) ¹³⁰ | Not specified |
| South Gloucestershire (Adopted December 2013) | 28,355 (2006-2027) ¹³¹ | 1,267ha (safeguarded) |
| Bristol (Adopted June 2011) | 8,000 (2006-2026) ¹³² | 16ha |
| Brecon Beacons National Park (Adopted December 2013) | 1,990 (2007-2022) ¹³³ | 1.5ha |
| Merthyr Tydfil (Adopted January 2020) | 2,821 (2016-2031) ¹³⁴ | 30,65ha |
| Caerphilly (Adopted November 2010) | 10,269 (2006-2021) ¹³⁵ | 101.9ha |
| Total | 96,135 | 1903,35 (incl. safeguarded land) |

Other plans and projects to be considered ‘in-combination’

Other ongoing projects within Monmouthshire County Council, its surrounding authorities and Wales must also be considered, as these might have in-combination effects with the proposed Monmouthshire RLDP. For example, a project to enhance the scope for tourism throughout Wales might lead to higher recreational pressure in the wider area and some of the SACs potentially affected by the RLDP, thereby acting in-combination. The following further projects (in addition to the Plans of adjoining authorities outlined in the previous section) are considered in this HRA:

- **Cardiff Capital Region City Deal:** This deal aims to develop and promote South East Wales as a great place to live and work, investing £1.2 billion to increase the economic potential across ten local authorities, including Blaenau Gwent, Caerphilly, Monmouthshire and Torfaen

¹²⁵ <https://en.powys.gov.uk/article/4898/Adopted-LDP-2018> [Accessed on the 29/08/2019]

¹²⁶ <https://www.torfaen.gov.uk/en/Related-Documents/Forward-Planning/Adopted-Torfaen-LDP-Written-Statement.pdf> [Accessed on the 29/08/2019]

¹²⁷ <http://www.newport.gov.uk/documents/Planning-Documents/LDP-2011-2026/LDP-Adopted-Plan-January-2015.pdf> [Accessed on the 05/11/2019]

¹²⁸ The Local Development Plan is currently under review, and is at the Preferred Strategy stage. <https://www.blaenau-gwent.gov.uk/en/resident/planning/local-development-plan/local-development-plan-2018-2033/local-development-plan-ldp-first-review/> [Accessed on the 05/11/2019]

¹²⁹ https://www.herefordshire.gov.uk/download/downloads/id/1788/core_strategy_sections_combined.pdf [Accessed on the 05/11/2019]

¹³⁰ <https://www.fdean.gov.uk/media/2487/cs-adopted-version-february-2012.pdf> [Accessed on the 05/11/2019]

¹³¹ This is the 2006-2027 Core Strategy, however a revised Core Strategy is currently in preparation. <https://www.southglos.gov.uk/documents/cleanversionforinterimpublishion2.pdf> [Accessed on the 05/11/2019]

¹³² This is the current Development Framework Core Strategy, which is in the process of being revised. [https://www.bristol.gov.uk/documents/20182/34540/Core%20Strategy%20WEB%20PDF%20\(low%20res%20with%20links\)_0.pdf/f350d129-d39c-4d48-9451-1f84713a0ed8](https://www.bristol.gov.uk/documents/20182/34540/Core%20Strategy%20WEB%20PDF%20(low%20res%20with%20links)_0.pdf/f350d129-d39c-4d48-9451-1f84713a0ed8) [Accessed on the 05/11/2019]

¹³³ <https://www.beacons-npa.gov.uk/wp-content/uploads/Brecon-Written-Statement.pdf> [Accessed on the 04/02/2020]. This is the current Local Development Plan for the authority, but a review (Local Development Plan 2) is currently ongoing.

¹³⁴ <https://www.merthyr.gov.uk/media/5642/replacement-ldp-written-statement-final-composite-version-140120.pdf> [Accessed on the 04/02/2020]

¹³⁵ <https://www.caerphilly.gov.uk/CaerphillyDocs/LDP/written-statement.aspx> [Accessed on the 04/02/2020]. A Replacement Local Development Plan up to 2031 was withdrawn in October 2016.

- **Prosperity for All: A Low Carbon Wales (2019):** From an HRA perspective this is a positive plan, setting the target for Wales to transition to a low carbon nation. A target is to cut the emission of greenhouse gases by at least 80% by 2050.
- **Monmouthshire Corporate Business Plan (2017-2022):** This plan sets out the vision and priorities for Monmouthshire, detailing what can be expected from the Council and what is being asked by the county's citizens. The key priority in the plan is to support sustainable economic development and to maximise the potential of the natural environment to serve the well-being of future generations.
- **Monmouthshire 2040 Our Economic Growth and Ambition Statement:** This statement sets out the Council's aspiration to raise Monmouthshire's profile as a dynamic place to do business, to invest and live in. It stipulates that Monmouthshire's economy needs to grow to create sustainable and resilient communities.
- **Monmouthshire Well-being Plan (2017-2023):** The plan outlines the objectives for improving well-being within the authority, a key requirement of the Well-being and Future Generations Act (2015). A key component of the Plan from an HRA perspective is the protection of the natural environment and adaptation to the impact of climate change.
- **Monmouthshire Local Transport Plan (2015):** The Monmouthshire Local Transport Plan identifies the key transport issues that are relevant to the County and proposes a 5-year plan to deliver an accessible, integrated and sustainable transport system for South-East Wales. This includes the provision of better walking and cycling infrastructure, bus networks and 20mph limit zones.
- **Monmouthshire Climate Emergency Declaration (May 2019):** In 2019 the Council declared a climate emergency and committed to limiting the increase in global temperatures to 1.5C. This includes a move towards net zero carbon emissions by 2030, development of a strategy and associated actions plans to deliver this target, and a continued review of the Corporate Plan, Well-being Plan and the Local Development Plan.

5. Discussion of Strategic Growth Areas in Monmouthshire

The following chapter discusses the identified impact pathways in relation to the four Strategic Growth Areas proposed in the Monmouthshire RLDP. Due to there being four strategic settlements, each with at least three scenarios of growth, the discussion is presented in tabulated format (Table 4). Most importantly, for all Strategic Growth Areas (and each of the growth options within), LSEs cannot be excluded, and they are therefore screened in for Appropriate Assessment. The Appropriate Assessment in relation to the Strategic Growth Areas and the Strategic Policies is undertaken in Chapter 6.

Table 4: Screening Discussion of the Plan's Strategic Growth Options

HRA screening assessment of the potential strategic growth areas detailed within the Preferred Strategy for Monmouthshire, providing a broad discussion of the likely implications of growth in the strategic settlements and the growth area options proposed for these settlements. Where a growth area has been coloured **green** in the 'Screening Outcome' column, this indicates that it would be screened out from Appropriate Assessment regarding all impact pathways. Where a growth area has been coloured **orange** in the 'Screening Outcome' column, this indicates that LSEs of the growth option cannot be excluded and that it would be screened in for Appropriate Assessment.

| Strategic Settlement | Growth General Discussion on Relevant Impact Pathways Related to the Settlements | Growth Area Option (Screening Outcome is colour-coded) |
|----------------------|---|---|
| Abergavenny | Regarding recreational pressure , growth in Abergavenny is likely to be less impactful than growth in Monmouth or Chepstow. This is because the sites that are most sensitive to recreational pressure (notably the Severn Estuary SPA / Ramsar and Severn Estuary SAC) are located over 30km away. Given that the likelihood of visiting a recreation site is inversely related with its distance to home, residents in Abergavenny would be less likely to visit these European sites. However, Abergavenny is very close to Sugar Loaf Woods SAC which could be susceptible to recreational damage. | Option A – Land north of Abergavenny Land at Chapel Farm Fields (9.6ha) Land off old Hereford Road (8.3ha) Land at Penlanlas Farm (6.08ha) |
| | All three strategic growth areas in Abergavenny are on greenfield sites and therefore, in principle, could act as functionally linked land . However, all approximate areas are beyond the screening distances for bats from the Usk Bat Sites SAC and birds from the Severn Estuary SPA / Ramsar. Due to their distance to the relevant sites, all growth areas would be screened out regarding functionally linked land. It is to be noted that while the Strategic growth Areas provide for the core of the development in the | Option B – Land to the east of the A465 Abergavenny Urban Extension (65ha) |

Monmouthshire Preferred Strategy, further individual site allocations outside these areas are likely to come forward in the Deposit Plan and would have to be individually assessed.

Furthermore, while development in all growth areas is unlikely to be relevant for the River Wye SAC, all three areas are expected to be served by Wastewater Treatment Works (WwTWs) that discharge effluent into the River Usk SAC, which ultimately drains into the Severn Estuary SPA / Ramsar and SAC. For **water quality and water quantity, level and flow**, all growth options would be screened in for Appropriate Assessment. Option A might have a slightly reduced risk of affecting the River Usk SAC through surface / road water run-off, as the growth area lies further away from the river than areas identified in Options B and C.

Growth in all three growth areas is likely to increase commuter traffic from and to Abergavenny and could therefore have potential **atmospheric pollution** effects. Such an increase in traffic would be especially relevant for journeys into Blaenau Gwent along the A465 and the adjacent Cwm Clydach Woodlands SAC and the Usk Bat Sites SAC.

Option C – Land between the B4246 and Heads of the Valleys Road

Land at Evesham Nurseries, Llanfoist (8.3ha)

Residential growth in Chepstow, irrespective of its exact location, is likely to result in LSEs on the Severn Estuary SPA / Ramsar, and the Severn Estuary SAC, as a result of **recreational pressure**. Particularly the Severn Estuary is only a few hundred metres away from Chepstow and its qualifying bird species are highly sensitive to recreational disturbance. Due to its proximity to the SPA / Ramsar, new Chepstow residents would be expected to regularly access the Severn Estuary. The Avon Gorge Woodlands SAC, while very popular for recreation, lies over 15km from Chepstow and therefore outside a typical core visitor catchment for woodland sites.

All strategic growth areas in Chepstow are greenfield sites and, depending on their distance to the Wye Valley and Forest of Dean Bat Sites SAC, could be **functionally linked land** to the SAC's lesser and greater horseshoe bat population. Furthermore, the proposed allocations are sufficiently large (i.e. >2ha) to potentially act as significant off-site supporting habitat for bird species from the SPA / Ramsar, especially Bewick's swan and, to a lesser extent, white-fronted goose. Therefore, all growth areas would be screened in for Appropriate Assessment and, if within relevant screening distances, site-specific surveys for bats or wintering birds would be recommended for the Deposit Plan.

Option D – Land north of the Bayfield Estate

Bayfield (10.07ha)

Option E – Land between the Bayfield Estate and A48

Land at St. Lawrence Lane (20.4ha)

Land west of A466 & Mounton Road (12.8ha)

Option F – Land between the A48 and M48

Land at Wyelands (100ha)

Chepstow

Due to the long distance to the River Usk SAC, development in Chepstow is considered unlikely to result in LSEs on the **water quality and water quantity, level and flow** in the site. However, all three growth areas are likely to be served by WwTWs that discharge effluent into the River Wye SAC and, ultimately into the Severn Estuary SPA / Ramsar and SAC. Given the very short distance to the Severn Estuary, there would be little scope for the attenuation of aquatic pollutants that derive from development in Chepstow. Development under Option D is closest to the River Wye SAC and might have the highest potential for LSEs of surface runoff deriving from new development.

Growth in all three growth areas is likely to increase commuter traffic from and to Chepstow and could therefore have potential **atmospheric pollution** effects. An increase in traffic journeys in this part of Monmouthshire is likely to be most relevant for journeys northwards along the A466 past the Wye Valley Woodlands SAC, along the M48 which traverses the Severn Estuary SAC and the Severn Estuary SPA / Ramsar. As such, all three growth areas would be screened in for Appropriate Assessment regarding atmospheric pollution.

As in Abergavenny, due to the relatively long travel distance (more than 15km), residential growth in Monmouth is likely to have less of an impact on European sites that are most susceptible to **recreational pressure**, particularly the Severn Estuary SPA / Ramsar and the Severn Estuary SAC.

All proposed strategic growth areas in Monmouth are greenfield sites and, depending on their distance to the Wye Valley and Forest of Dean Bat Sites SAC, could act as **functionally linked land** for the SAC's lesser and greater horseshoe bat populations because they lie within the relevant commuting distances for the lesser and greater horseshoe bat populations. While the proposed allocations are sufficiently large (i.e. >2ha) to be potentially suitable as significant off-site supporting habitat for bird species from the Severn Estuary SPA / Ramsar, they are located over 15km away and are therefore unlikely to be core supporting habitat for any of the SPA's / Ramsar's qualifying features. Regardless, due to their potential use by SAC bats, all growth areas would be screened in for Appropriate Assessment and, if within relevant screening distances, site-specific surveys for bats would be recommended for the Deposit Plan.

Monmouth

All growth areas proposed in Monmouth would allocate development that would result in LSEs on the **water quality and water quantity, level and flow** in the River Wye

Option G – Land West of Monmouth

Croft Y Bwla Farm (49.9ha)

Land adjacent to Croft Y Bwla (13ha)

Land at Drewen Farm (11.52ha)

Land north of Wonastow Road (9.12ha)

Option H – Land Central Monmouth

Land Known as Vauxhall Fields (8.58ha)

Land at Drybridge Farm (22.5ha)

Option I – Land North-East of Monmouth

Land North-East of Monmouth and North of Dixon Road (42ha)

SAC. This is because they are likely to be served by WwTWs that discharge effluent into the River Wye SAC and, ultimately into the Severn Estuary SPA / Ramsar and SAC. Due to the long 'by-river' distance between Monmouth and the European sites in the Severn Estuary, there is a likely potential for the attenuation of nitrogen along the flow path, but the growth areas' potential impact on the Severn Estuary would nevertheless be subjected to an Appropriate Assessment. Compared to Options H and I, Option G (Greenfield land West of Monmouth) is expected to have the lowest potential for direct surface runoff negatively affecting the River Wye SAC, because it lies furthest from the SAC.

Growth in the three proposed areas is likely to increase commuter traffic from and to Monmouth and could therefore have potential **atmospheric pollution** effects. An increase in the number of car trips would be expected along the A40 towards Herefordshire (adjacent to the Wye Valley Woodlands SAC) and eastwards along the A40 and A465 past Abergavenny (potentially affecting the Usk Bat Sites SAC and the Cwm Clydach Woodlands SAC). As such, all three growth areas would be screened in for Appropriate Assessment regarding atmospheric pollution.

The area named as Severnside is located immediately adjacent to the Severn Estuary SPA / Ramsar and the Severn Estuary SAC and is therefore likely to result in LSEs regarding **recreational pressure**. Particularly, Option L (land West of Caldicot / East of Rogiet) is less than 1km in straight travel distance from the Wales Coast Path, which is likely to be a priority destination for new residents.

All strategic growth areas in Severnside are greenfield sites that could act as **functionally linked land**. However, they lie beyond the screening distance for bats originating from the Wye Valley and Forest of Dean Bat Sites SAC. Severnside is located adjacent to the Severn Estuary SPA / Ramsar and the proposed greenfield allocations are sufficiently large (i.e. >2km) to be potentially suitable as off-site supporting habitat for bird species from the SPA / Ramsar, especially Bewick's swans and, to a lesser extent, white-fronted geese. All growth areas proposed in Severnside would be screened in for Appropriate Assessment and, depending on their likely suitability for SPA / Ramsar features, site-specific wintering bird surveys would be recommended for the Deposit Plan.

Option J – Land North-East of Caldicot

The Showground (36.06ha)

Land at Bradbury Farm (29.1ha)

Land to the east of Church Road (10.09ha)

Option K – Land North-West of Caldicot

Dewstow Road (37ha)

Option L – Land West of Caldicot / East of Rogiet

Land East of Rogiet (35ha)

Land to the West of Caldicot and East of Rogiet (34.6ha)

Severnside

All growth areas proposed in Severnside would allocate development that is likely to result in LSEs on the **water quality and water quantity, level and flow** in the River Wye SAC, and the Severn Estuary SAC and Severn Estuary SPA / Ramsar. This is because these growth areas are much closer to the River Wye than the River Usk and therefore likely to be served by WWTWs that discharge effluent into the River Wye SAC. Given the short flow distance to the Severn Estuary, any impacts on the water quality and resources in the River Wye are also likely to affect the estuary. Options L and M due to their relatively short distances, have the highest potential for surface runoff directly flowing into the Severn Estuary SPA / Ramsar / SAC.

Growth in any part of Severnside is likely to increase commuter traffic and could therefore have potential **atmospheric pollution** effects. The car journeys most relevant to European sites would be more trips on the M4 traversing the Severn Estuary SPA / Ramsar and the Severn Estuary SAC, and journeys on the M48-A466 link, which would lead commuters along the Wye Valley Woodlands SAC. As such, all growth areas in Severnside would be screened in for Appropriate Assessment regarding atmospheric pollution.

Option M – Land East of Caerwent

Caerwent A (8.8ha)

6. Appropriate Assessment

Atmospheric Pollution

We have identified the following policies in the Monmouthshire RLDP that provide for new development within the authority, which need to be considered further in relation to the atmospheric pollution impact pathway:

- Strategic Policy S1: Strategic Sustainable and Resilient Growth (Provision for 8,366 net new dwellings and 7,215 net new jobs)
- Strategic Policy S2: Spatial Distribution of Development (Identifies the settlement hierarchy and quantum of residential development therein for Monmouthshire)
- Strategic Policy S6: Delivery of Homes (Requirement for 7,605 new homes with provision made for 8,366 new dwellings with the inclusion of a 10% flexibility allowance)
- Strategic Policy S7: Affordable Homes (The affordable housing target is set at 2,450 affordable homes)
- Strategic Policy S8: Strategic Development Sites (To be specified in the Deposit RLDP. Strategic Growth Areas are identified in Abergavenny, Monmouth, Severnside and Chepstow)
- Strategic Policy S13: Employment Sites Provision (Provision is made for a minimum of 43ha of employment land throughout Monmouthshire)

It is to be noted that the Monmouthshire RLDP Preferred Strategy aims for the provision of a level of employment growth that is commensurate with the proposed residential growth. One of its key aims is to minimise commuting by car through offering employment locally and promoting public transport schemes. Notwithstanding, a considerable proportion of new residents are likely to commute to employment sites within or out of Monmouthshire. Therefore, due consideration to this impact pathway must be given.

Usk Bat Sites SAC

The Usk Bat Sites SAC harbours several habitat types that are highly sensitive to atmospheric pollution (particularly nitrogen deposition) due to their nutrient-poor conditions, including bogs, dry heathland, Alpine / sub-alpine grassland and broad-leaved deciduous woodland. Increased nutrient inputs have been observed to result in changes of the community structure, such as an increased dominance of grasses¹³⁶ and reduced abundance in bryophyte and lichens¹³⁷. The following section will investigate the current evidence base available for the Usk Bat Sites SAC and provide AECOM's recommendations for the Deposit Plan stage of the Replacement Local Development Plan.

Commuter traffic

Generally, the impact of air pollution from traffic is only relevant within 200m of roads as the contribution of roads to pollution has declined to background concentrations by this distance. Due the early stage of the Plan, there are currently no individual site allocations available and it is not possible to judge the implications of the spatial distribution of development for the atmospheric pollution level. However, given the level of planned residential development within the Monmouthshire RLDP (making provision for an additional 8,366 new dwellings between 2018 and 2033) and the number of dwellings to be delivered by the surrounding authorities over this timescale, the RLDP might have significant air quality impacts alone and 'in-combination' with other Plans. This is because the residential and employment development may be associated with an increase of the local population and thus the amount of motorised travel within the authority.

¹³⁶ Bobbink R., Roelofs J.G.M. 1995. Nitrogen critical loads for natural and semi-natural ecosystems: The empirical approach. *Water, Air and Soil Pollution* 85: 2413-2418.

¹³⁷ Pescott O.L., Simkin J.M., August T.A. Randle Z., Dore A.J., Botham M.S. 2015. Air pollution and its effects on lichens, bryophytes, and lichen-feeding Lepidoptera: Review and evidence from biological records. *Biological Journal of the Linnean Society* 115: 611-635.

According to Journey to Work data from the 2011 census¹³⁸, a total of 14,889 residents of Monmouthshire commute out of the authority in a car or van on a daily basis. The most common destination for journeys to work arising from Monmouthshire is Newport with 3,491 daily outflows, accounting for 23.4% of all outward commuter traffic. Blaenau Gwent is only 8th on the list of the most frequent commuter destinations (680 journeys, 4.6%) The authority also has a daily inflow of 11,065 commuters, 1,880 (17%) of which originate from Blaenau Gwent. The A465, a major A road in terms of traffic volume, provides for the fastest, most direct connection to Monmouthshire, and is therefore likely to be taken by the majority of commuters. Given that the Plan provides for 7,215 net new jobs, this is likely to increase the number of commuters travelling into Monmouthshire along the A465. It is to be noted that because these data do not include commutes to work that both start and end in Monmouthshire, the actual proportion of regular traffic journeys that might affect the Usk Bat Sites SAC is likely to be lower than the figure provided above.

The A465 runs directly adjacent, and at times through, the Usk Bat Sites SAC for about 2km in the north-eastern part of Blaenau Gwent and the western section of Monmouthshire. Given the current business and strategic positioning of this stretch of the A465, there is the clear potential for the increased car traffic arising from the Monmouthshire RLDP to result in adverse effects on the site integrity of the Usk Bat Sites SAC through increased nitrogen deposition to roadside areas of heathland.

In-Combination Air Quality Modelling for the Deposit Plan

Assessing the impacts of an increase in vehicular traffic on atmospheric pollution is an exercise that requires detailed air quality modelling, calculating the deposition rates of the three main traffic-related atmospheric pollutants, namely ammonia (NO₃), oxides of nitrogen (NO_x) and total nitrogen deposition. The deposition of these pollutants to sensitive habitats within 200m of major roads will determine adverse effects, if any, on European sites. This is an in-combination exercise that considers the residential and employment development in adjoining authorities, satisfying the Natural Resources Wales requirement that any Plan must be assessed in the context of growth outlined in other Plans. The surrounding authorities that are developing their own Local Development Plans with potential in-combination implications for atmospheric pollution in the Usk Bat Sites SAC are Powys, Blaenau Gwent, Torfaen, Caerphilly, Merthyr Tydfil and Rhondda Cynon Taf. The contribution of this growth to Average Annual Daily Traffic (AADT), the average vehicle speeds and Heavy Duty Vehicle (HDV) traffic volume is incorporated into the traffic modelling exercise.

Air quality modelling is only required if there are sensitive habitats within 200m of the A465. For example, heath and scrub only make up 32.2% of the SAC and therefore there might not be any heathland habitat in the 200m band adjacent to the A465. However, a preliminary investigation of online images indicates that there are sensitive habitats in the Usk Bat Sites SAC within the 200m screening distance of the A465. It appears that there are both heathland elements and calcareous rocky slopes with chasmophytic vegetation around Ogof Craig a Ffynnon and Main Road, within 200m of the A465. It is therefore recommended that at least one air quality transect is modelled running north into the SAC along this road link. Due to the length of the A465 that runs adjacent to the Usk Bat Sites SAC, it might be advisable to model a second transect intercepting sensitive habitat along this road.

Cwm Clydach Woodlands SAC

The Cwm Clydach Woodlands SAC is primarily designated for its *Asperulo-Fagetum* beech forest, which is identified as sensitive to atmospheric pollution on APIS. The critical load for the site is 10 – 20 kg N/ha/yr, which is currently exceeded considerably (average total nitrogen deposition between the years 2013 and 2015 was 30.5 kg N/ha/yr). A total nitrogen critical load of 10 – 20 kg N/ha/yr is also established for the site's Atlantic acidophilous beech forest with *Ilex* and *Taxus* in the shrublayer. As such, an increase in the traffic volume due to the implementation of the Blaenau Gwent Local Development Plan has the potential to result in adverse effects on the site integrity of the Cwm Clydach Woodlands SAC. The following section will investigate the current evidence base available for this SAC and provide AECOM's recommendations for the Deposit Plan stage of the Replacement Local Development Plan.

¹³⁸ Available at <https://www.nomisweb.co.uk/census/2011/wu03uk> [accessed 12/04/2019]

Commuter traffic

Like the Usk Bat Sites SAC, the Cwm Clydach Woodlands SAC runs alongside the A465 for approx. 2km, lying to the south of this major commuting route. Due to its similar geographic setting to the Usk Bat Sites SAC, the commuter traffic pattern for the woodlands will be the same. 4.6% of the additional commuter outflow and 17% of the additional commuter inflow arising from the Monmouthshire RLDP is likely to lead directly past the Cwm Clydach Woodlands SAC. Since the closest stretch of the A465 is within 200m of the SAC, this additional motorised travel has the potential for negative impacts on sensitive habitats within the site.

In-Combination Air Quality Modelling for the Deposit Plan

Given that there currently is no air quality modelling available for the site, it is not possible to exclude adverse effects on the integrity of the Cwm Clydach Woodlands SAC. An air quality modelling exercise accounting for the in-combination growth in Monmouthshire and its adjoining authorities will be required to determine whether atmospheric pollution over the Plan period is likely to have a negative impact on the site's integrity. However, as highlighted in the context of the Usk Bat Sites SAC above, such modelling will only be necessary if sensitive habitat elements of the SAC occur within 200m of the A465. Overall, 88.9% of the SAC comprise broad-leaved deciduous woodland and a review of online mapping shows that the designated woodland elements straddle the A465 almost along the entire length of the SAC. It is therefore recommended that at least one air quality transect running south into the SAC is modelled along this road link. Due to the length of the A465 that runs along the Cwm Clydach Woodlands SAC, it might be advisable to model a second transect intercepting sensitive habitat along this road.

Wye Valley Woodlands SAC

Commuter traffic

The Wye Valley Woodlands SAC lies along the A466 and the River Wye, running on a north-south axis between Monmouth and Chepstow, which are two of the largest settlements in Monmouthshire. The Preferred Strategy for Monmouthshire identifies these two settlements as primary growth areas and there is therefore the potential for increased commuter traffic between the two towns along the A466, which provides one of the fastest routes between the north and the south of the authority. The A466 lies within 200m of the Wye Valley Woodlands SAC in various stretches, and atmospheric pollutants resulting from commuter journeys both starting and ending within Monmouthshire, could therefore affect the qualifying features within the site.

The provision of new employment in Monmouthshire is also likely to increase car travel between Monmouthshire and adjacent authorities. The increase in traffic most relevant to the Wye Valley Woodlands SAC would be commuter journeys to and from authorities to the north-east of Monmouth, particularly Herefordshire and the Forest of Dean. According to Journey to Work data from the 2011 census¹³⁹, a total of 14,889 residents of Monmouthshire commute out of the authority in a car or van on a daily basis. The Forest of Dean (924 journeys, 6.2%) and Herefordshire (748 journeys, 5%) are both among the most frequent destinations of commuters, both of which are likely to involve journeys along major roads (A40, A136) within 200m of the Wye Valley Woodlands SAC. Furthermore, both authorities also contribute significantly to the total inflow of commuter traffic into Monmouthshire (Forest of Dean: 1,403 journeys, 12.7%; Herefordshire: 618 journeys, 5.6%). Given that the RLDP provides for development both in Monmouth and Chepstow, it is considered a likely outcome that the traffic flow within 200m of the Wye Valley Woodlands SAC will significantly increase.

In-Combination Air Quality Modelling for the Deposit Plan

An Air Quality Impact Assessment (AQIA) will be required to model the deposition levels of relevant atmospheric pollutants and to ensure that the Monmouthshire RLDP will not result in adverse effects on the site integrity of the Wye Valley Woodlands SAC. As identified in the previous section, several geographic areas should be considered to evaluate the full extent of likely traffic impacts on the Wye

¹³⁹ Available at <https://www.nomisweb.co.uk/census/2011/wu03uk> [accessed 12/04/2019]

Valley Woodlands SAC. To assist with this exercise, MAGIC was used to map the distribution of priority woodland habitat within the SAC and identify where this lies within 200m of the identified roads¹⁴⁰.

To capture the likely effect of traffic increase on the A466 linking Chepstow with Monmouth, it is recommended to model a road transect near Colwell Grove, where the A466 lies approx. 179.7m from the SAC. Furthermore, to model the impacts of traffic flow between Monmouthshire and Herefordshire, it is advised to model a road transect on the A40 north-east of Monmouth, where it runs within approx. 126.9m of the Wye Valley Woodlands SAC. It is to be noted that this is not a definitive list of potential transects for air quality modelling. The SAC lies adjacent to major roads along its entire length from north to south Monmouthshire. Habitat mapping on MAGIC is only available for England and large sections of the SAC (and nearby stretches of road) lie within Wales. Therefore, habitat mapping for Wales will be consulted to inform the HRA of the Monmouthshire Deposit Plan.

River Wye SAC

Commuter traffic

The River Wye SAC's geographic location in relation to the anticipated changes in commuter traffic is similar to that for the Wye Valley Woodlands SAC (see the section on commuter traffic for that SAC). It runs within 200m of the A466 for long stretches between Chepstow and Monmouth, and adjacent to the A40 to the north-east of Monmouth. The Monmouthshire RLDP might therefore increase the traffic flow and nutrient deposition affecting the SAC in multiple locations.

In-Combination Air Quality Modelling for the Deposit Plan

The only qualifying feature within the River Wye SAC that has an established critical nitrogen load (and therefore allows a meaningful Appropriate Assessment of this impact pathway) are the transition mires and quaking bogs, which have a critical load of 10-15 kg N/ha/yr. Although this Annex I feature is not a primary reason for the selection of this site, due consideration must be given to it in the HRA process. Given that the River Wye SAC is primarily designated for its feature 'water course of plain to montane levels', it is likely that the mires and bogs only cover a small proportion of the SAC. Therefore, detailed mapping of this habitat feature is required to evaluate whether any of the bog / mire habitat elements are within 200m of the A466 or the A40. An investigation of the River Wye SAC's Core Management Plan indicates that the Colwyn Brook Marshes (North & South) SSSI is the only component site of the SAC that harbours the air quality-sensitive habitat feature quaking bogs and transition mires. This SSSI lies in the authority of Powys approx. 28km to the north-west of Monmouthshire. Additionally, the SSSI is located in a very remote area and it is considered extremely unlikely that any traffic arising from the Monmouthshire RLDP would pass within 200m of this SSSI component. It is therefore concluded that there is no requirement for air quality modelling regarding this SAC for the Deposit Plan and a conclusion of no adverse effects on site integrity, alone or in-combination with other plans and projects, can be drawn.

Severn Estuary SAC, SPA and Ramsar

Commuter traffic

The Severn Estuary SAC is located in the southern tip of Monmouthshire, within a short distance to Chepstow and Severnside, two areas that are defined as growth areas in the Preferred Strategy for Monmouthshire. The SAC is traversed by two motorways, the M4 and the M48, both of which are likely commuter routes between Monmouthshire and the adjacent authorities of Newport, South Gloucestershire and Bristol. Road traffic statistics for the motorways indicate that the M4 is by far the busier of the two motorways, as indicated by a 2018 AADT of 49,618 cars, 9,230 light goods vehicles and 8,029 heavy goods vehicles at manual count point 73955¹⁴¹. Given that both motorways have extremely high traffic flows, it is to be expected that further development in the south of Monmouthshire would increase the usage of these motorways further.

¹⁴⁰ <https://magic.defra.gov.uk/MagicMap.aspx> [Accessed on the 30/10/2019]

¹⁴¹ <https://roadtraffic.dft.gov.uk/manualcountpoints/73955> [Accessed on the 30/10/2019]

The Journey to Work data from the 2011 census¹⁴² indicates that Newport (3,491 journeys, 23.4%), South Gloucestershire (1,164 journeys, 7.8%) and Bristol (939, 6.3%) make up a significant proportion of the total daily commuter outflow (14,889 journeys) from Monmouthshire. Conversely, 14.2% (1,570 out of 11,065 trips) of the total commuting journeys to Monmouthshire originate from Newport. Commutes to the authorities of South Gloucestershire and Bristol in particular, are likely to involve use of either the M4 or the M48, both of which run through the heart of the SAC.

In-Combination Air Quality Modelling for the Deposit Plan

The Severn Estuary SAC comprises the two main habitats estuaries and Atlantic salt meadows, both of which have an established critical nitrogen load of 20-30 kg N/ha/yr. According to Natural England's Site Improvement Plan, nitrogen deposition already exceeds the habitats' critical load and any additional increase in atmospheric pollutants, for example from road traffic, therefore has the potential to result in adverse effects on the integrity of the SAC. Nitrogen deposition might have particularly strong impacts on the upper saltmarsh, in combination with nutrient runoff from the adjacent catchments, where it might lead to a shift in the species composition of the sward. In turn, this could change the habitat suitability and distribution of the Bewick's swan, which critically depends on the saltmarsh.

Habitat mapping data on MAGIC and the Natural Resources Wales (NRW) website was used to examine the distribution of the priority habitat coastal saltmarsh in the Severn Estuary SAC and its location in relation to the M4 and M48 motorways, the roads most likely to receive an increase in the traffic flow due to the Monmouthshire RLDP. According to NRW priority habitat mapping, coastal saltmarsh lies directly adjacent to the M4 at the western side of the Prince of Wales Bridge. It is recommended that one road transect is modelled here to assess any potential increase in nitrogen deposition to saltmarsh due to the emerging RLDP. Furthermore, there is saltmarsh directly adjacent to the M48 on the western side of the Severn Bridge, where the River Wye joins the Severn Estuary SAC. It is recommended that at least one road transect is modelled here for the Deposit Plan HRA. Results from these modelling exercises will help determine potential adverse effects on the SAC's site integrity.

Recreational Pressure

The following policies in the Monmouthshire RLDP have been identified to provide for new development within the authority, which need to be considered further in relation to the recreational pressure impact pathway:

- Strategic Policy S1: Strategic Sustainable and Resilient Growth (Provision for 8,366 net new dwellings and 7,215 net new jobs)
- Strategic Policy S2: Spatial Distribution of Development (Identifies the settlement hierarchy and quantum of residential development therein for Monmouthshire)
- Strategic Policy S6: Delivery of Homes (Requirement for 7,605 new homes with provision made for 8,366 new dwellings with the inclusion of a 10% flexibility allowance)
- Strategic Policy S7: Affordable Homes (The affordable housing target is set at 2,450 affordable homes)
- Strategic Policy S8: Strategic Development Sites (To be specified in the Deposit RLDP. Strategic Growth Areas are identified in Abergavenny, Monmouth, Severnside and Chepstow)
- Strategic Policy S10: Sustainable Transport (Supports active travel modes, such as walking and cycling routes, which may facilitate access to sensitive European sites)
- Strategic Policy S15: Visitor Economy (Promotes tourism opportunities that may result in a temporary increase of the local populace)

¹⁴² Available at <https://www.nomisweb.co.uk/census/2011/wu03uk> [accessed 12/04/2019]

Severn Estuary SPA / Ramsar

Existing Evidence Base

The Severn Estuary SPA / Ramsar is a destination with a unique funnel shape, meaning that it runs diagonally through several authorities, including Forest of Dean, Stroud and Monmouthshire. The site is likely to have a unique recreational draw on residents in these adjacent authorities and, given that the likelihood of visits decreases with distance from a destination, residents are likely to visit the stretches of the Severn Estuary SAC with suitable access points that are closest to home. To date, no visitor data on access points within Monmouthshire is available. However, Footprint Ecology undertook a visitor survey in Lydney (Forest of Dean) in 2017 to inform a recreation strategy for that part of the estuary¹⁴³. A visitor survey was also undertaken by EPR in 2016 for the part of the SPA / Ramsar within Stroud District¹⁴⁴. These surveys were undertaken to establish a baseline of visitor pressure in the relevant parts of the SAC to these Councils, and to assess the potential impacts of residential growth in the respective authorities, similar to the development proposed in the Monmouthshire RLDP. The results of these surveys are not directly relevant to Monmouthshire, illustrated by the fact that the surveys did not capture visitors from Monmouthshire (likely due to the presence of stretches of the SAC much closer to home). Nevertheless, some of the patterns of visitor use highlighted in these surveys are likely to be similar in Monmouthshire (for example, the proportion of dog walkers), and are therefore discussed in the following. Furthermore, the implications for visitor management discussed in Footprint Ecology's recreation strategy provide useful context to the Monmouthshire RLDP.

Recreational boating

Water-based activities are likely to be particularly disturbing to overwintering birds because they may bring visitors closer to sensitive areas, such as roosts or foraging sites. Furthermore, the infrastructure associated with boating activities (e.g. moorings) is known to be particularly damaging to benthic habitats, leading to erosion, abrasion and sediment displacement (although the latter is more relevant to the Severn Estuary SAC). The Association of Severn Estuary Relevant Authorities (ASERA) published a study of boating in the Severn Estuary Marine Site (EMS, which covers the SAC designation) in 2016. It summarises the key environmental impacts of boating, gives an overview of current boat usage trends and suggests steps for managing water-based activities. The study highlights that boating is a popular activity across the estuary, with focal areas around Cardiff, Newport and Portishead. There are two boat clubs (Chepstow Boat Club, Chepstow & District Yacht Club) near Chepstow, which are most relevant to the SGAs of Chepstow and Severnside. These have a relatively small number of moorings (13-49) compared to a boat club in Cardiff (500-1,600). Furthermore, the overall level of boating activity in the Chepstow area is classified as low.

To minimise the negative impacts of water-based activities, education management tools are in place in the estuary. The RYA's approach relies on the phenomenon that education can be more effective than regulation. It runs courses that provide resources and practical advice on a range of environmental topics, which are completed by more than 155,000 people per year. The Green Blue, a partnership between the RYA and British Marine, has published a series of guides and factsheets with the aim to raise awareness among the industry and recreationists. For example, Fact Sheet 1 discusses the effects of boating and watersports on wildlife, with the aim to generate awareness of overwintering birds. As part of the UK Marine SACs Project, good practice guidelines were developed for recreation activities in European Marine Sites to promote site-specific management schemes.

Lydney visitor survey

The Lydney visitor survey covered the four main access points to the part of the Severn Estuary SPA / Ramsar closest to Lydney, the proposed location of new development. Across all survey points the total number of people entering the wider area was 153, giving an hourly rate of 9.6 people entering the estuary. There was one dog for every three people entering, which is important as the most significant

¹⁴³ Liley D., Panter C. & Hoskin R. 2017. Lydney Severn Estuary Visitor Survey and Recreation Strategy. Unpublished report by Footprint Ecology for the Forest of Dean District Council. 55pp. Available at: <https://www.footprint-ecology.co.uk/reports/Liley%20et%20al%202017%20Lydney%20Severn%20Estuary%20Visitor%20Survey%20and%20Recreation%20Strategy.pdf> [Accessed on the 31/10/2019]

¹⁴⁴ Southgate J. & Colebourn K. 2016. Severn Estuary (Stroud District) Visitor Survey Report. Report for Stroud District Council. Ecological Planning & Research, Winchester. 68pp. Available at: https://www.stroud.gov.uk/media/2902/severnsestuaryvs_report_15581c_final_060616.pdf [Accessed on the 31/10/2019]

disturbance typically results from dog walkers. Of the 83 interviewees, 36 visitors (43%) undertook dog walking and 14 visitors (17%) were walking. Boating was undertaken by 5 interviewees (6%). While visit duration was similarly short (mostly between 30 minutes and 1 hour) for all activities (except boating), dog walking was the recreational activity that involved the highest proportion of frequent visits, with a total of 41% of dog walkers visiting daily or most days (180+ visits per year). Most importantly, the visit patterns in the Severn Estuary SAC, particularly those of dog walkers, walker and joggers, highlight that visitors tend to live very close to the SAC. For example, dog walkers travel a median distance of 2.3km, mostly on foot, to their access points, highlighting the potential significance of new nearby residential development. Overall, the Lydney survey highlights that the Severn Estuary SPA / Ramsar is subjected to regular disturbance by particular user groups, especially dog walkers, which generally have the biggest disturbance effect on SPA / Ramsar features.

Footprint Ecology places the visitor data in the context of bird distribution data within the wider area around Lydney, derived from Mills & Smart (2017)¹⁴⁵. Importantly, Mills & Smart also considered land that might be functionally linked to the SPA (e.g. New Grounds, Lydney to Aylburton) and that therefore may be integral in supporting the SPA's / Ramsar's qualifying species. Generally, the surveyed area is important for roosting / feeding curlew, shelduck and lapwing in winter, and whimbrel on passage (April-May, July-September). It was also determined that for mallard, lapwing, curlew and whimbrel the counts are exceeding 1% of the designated SPA / Ramsar populations, meaning that the area fulfils the criteria of functionally linked land. A proportion of the visitor use in Lydney occurs in areas that are important to SPA / Ramsar features, and Footprint Ecology therefore provided recommendations for the management and mitigation of recreational pressure in Lydney.

Stroud visitor survey

EPR's Stroud visitor survey focussed on the upper section of the Severn Estuary SPA / Ramsar, closer to where the River Severn transitions into the Severn Estuary. It surveyed nine access points to the estuary, which were either parking locations or public rights of way providing direct access on to the estuary. Overall, 461 people accessed the area over two days at all access points, resulting in an access rate of 30.7 people per hour. 185 dogs were recorded across all access points over the two-day survey period, resulting in an average of 12.3 dogs per hour. 51.6% of the groups interviewed had at least one dog with them, which is slightly less than observed at other marine sites such as the Solent (53%) and North Kent (65%). The average (mean) distance travelled by visitors to reach their access point was 14.5km. Visitors arriving on foot, i.e. the local residents, had travelled an average of 5.4km. Most importantly, the study also provides a visitor catchment for the Severn Estuary SPA / Ramsar, which uses the standard 75th percentile of distances travelled by visitors to define a core recreational catchment. Interestingly, and in contrast to Lydney where visitors tend to travel very short distances to the site, the parts of the SPA / Ramsar covered in the Stroud survey has an indicative recreational catchment of 17.7km (when considering all visitors) and 7.7km (when considering only Stroud residents). The main reason for this disproportionately large catchment is most likely due to the low housing density within this part of Stroud District, which is significantly lower than in other geographic areas, such as the Solent. As a result, one needs to go further away from the site before capturing 75% of visitors.

One of the key messages to be taken from these two surveys is that the recreational pattern in the Severn Estuary SPA / Ramsar is highly variable between different locations. It is therefore important to attain a site-specific evidence base to evaluate the current recreation patterns and to inform any recommendations on the management of this recreation.

Mitigation through an Interim Impact Avoidance Strategy

The Stroud visitor survey concluded that housing and tourism development to be delivered within and outside the district is likely to increase visitor pressure in the Severn Estuary SPA / Ramsar, potentially leading to adverse effects on the overwintering birds. The scope and content of a broad Interim Impact Avoidance Strategy was therefore provided in relation to development in Stroud. The key elements of this strategy were:

¹⁴⁵ Mills B. & Smart M. 2017. Lydney New Grounds. Desk Based Review of Bird Assemblages in Relation to the Severn Estuary Special Protection Area. Unpublished report for Forest of Dean District Council.

- Delivery of Suitable Alternative Greenspace (SANG) spatially close to the proposed housing sites; although it was noted that it was difficult to replicate a site that mirrors the SPA / Ramsar;
- On-site Strategic Access Management and Monitoring (SAMM) measures around the key themes of education and awareness, zoning and bylaws, signage, wardening and parking provision;
- Collaboration with integral stakeholders (e.g. Natural Resources Wales, Parish Councils, private landowners) to achieve a sustainable, long-term outcome; and
- Future monitoring of visitor use levels and numbers of overwintering birds to assess changes in recreational pressure and whether access management is effective.

While this Interim Impact Avoidance Strategy was created using the evidence base for Stroud, similar mitigation measures could be developed for Monmouthshire, if required. Visitor surveys in other European sites (e.g. Solent, North Kent, Exe Estuary, Thames Basin Heaths, Dorset Heaths) have resulted in similar strategies. The typical set of tools for mitigating visitor pressure usually involves the provision of SANG and SAMM, which both need to be tailored to the site-specific context. An alternative solution could be a cross-authority collaboration, whereby Monmouthshire County Council would become a signatory to the existing Interim Impact Avoidance Strategy that was developed for Stroud District and which could be geographically expanded to cover Monmouthshire.

Access points in southern Monmouthshire

The Monmouthshire RLDP makes provision for 8,366 new dwellings within the Plan's period, which is likely to increase the recreational demand on natural spaces in the authority. Due to its high habitat value, the Severn Estuary SPA / Ramsar represents one of the most likely destinations for existing and future Monmouthshire residents. Specifically, the RLDP proposes both Severnside (approx. distance of 885m to the estuary) and Chepstow (approx. distance of 1km to the estuary) as Strategic Growth Areas with significant new residential growth. Both areas are within the typical median distances that visitors are prepared to walk for recreational visits. A recent research paper has shown that the amount of residential housing is highly positively correlated with visitor pressure, particularly in estuarine destinations¹⁴⁶. Given that the Monmouthshire RLDP proposes new housing, it is to be expected that this will lead to an increase in the visitor numbers to the Severn Estuary SPA / Ramsar. However, in the first instance it needs to be established whether there are suitable access points along this stretch of the estuary, which would enable new residents to access the site and potentially disturb the SPA's / Ramsar's bird interest features. In the following section, both Strategic Growth Areas will be investigated in turn.

The area named as Severnside in the Monmouthshire RLDP is adjacent to a stretch of the Severn Estuary SPA / Ramsar that is between the Severn Bridge (M48) and the Prince of Wales Bridge (M4). Review of satellite imagery shows that this stretch of the SPA / Ramsar is not easily accessed, as it is severed from some of the main residential areas by the Gloucester to Newport train line and several drains / ditches. However, several access points to the SPA / Ramsar exist. One location is the Black Rock Picnic Site car park to the north-east of Sudbrook, which provides direct access on to the estuary. Furthermore, most of Caldicot lies within easy walking distance of the Wales Coast Path to the south of the settlement. Monmouthshire County Council undertakes visitor counts in the estuary (e.g. through the use of pressure pads, micro slabs and body heat detectors)¹⁴⁷. An assessment of the 2019 visitor counts highlighted that the Black Rock car park and the Caldicot section of the Wales Coast Path are the busiest sections of the estuary, further confirming that these are appropriate locations to be surveyed. Review of the ViewRanger website shows that these sections of the coastline have published visitor routes and are actively used for recreation.

The proposed residential growth in Chepstow was also considered. The most likely access point to the SPA / Ramsar to the west of the confluence with the River Severn for Chepstow residents is to the south of St. Pierre, where a public footpath runs parallel to a ditch that traverses the train line and then joins the Wales Coast Path. However, this access route lies relatively far from Chepstow and the 2019 visitor

¹⁴⁶ Weitowitz D.C., Panter C, Hoskin R. & Liley D. 2019. The effect of urban development on visitor numbers to nearby protected nature conservation sites. doi: 10.1093/jue/juz019. Journal of Urban Ecology: 1-12.

¹⁴⁷ Linetop Ltd. (2019). Monmouthshire Wales Coastal Path – Visitor Monitoring Report April 2019 – September 2019. 7pp.

counts for the St. Pierre access path were comparatively low¹⁴⁸. Therefore, it was concluded that it is most appropriate to concentrate on the access points identified near Caldicot.

In-Combination Assessment and Recommendations for work to inform the Deposit Plan

This Appropriate Assessment showed that the Severn Estuary SPA / Ramsar is a recreational hotspot for residents of authorities that lie a similar distance from the SPA / Ramsar as Monmouthshire, including the Forest of Dean and Stroud. As such it is expected that the situation will be similar in Monmouthshire, where significant additional housing is to be allocated within 1km of the SPA / Ramsar. Furthermore, the existing density of housing within 2-3km from the estuary, the median distance that residents usually walk, is higher than in some of the more rural parts of Forest of Dean or Stroud. As such, it might be expected that existing visitor levels are already relatively high, and that additional housing could lead to an unsustainable pressure on the SPA / Ramsar bird features without a mitigation strategy. Furthermore, there are several access points to the estuary, which bring recreational visitors within close proximity to sensitive habitat features, such as the Atlantic saltmarsh and potential land parcels acting as functionally linked land. **It is concluded that there is insufficient data for the parts of the Severn Estuary in Monmouthshire. Therefore, the following work is recommended to inform Appropriate Assessment of recreational pressure in the Deposit Plan HRA:**

- **Visitor survey at the two access points identified above (Black Rock Picnic Site car park, Wales Coast Path south of Caldicot) to provide in-combination visitor data that is relevant to Monmouthshire**
- **Contact Natural Resources Wales for any available mapping of functionally linked land parcels in the wider area around Severnside and Chepstow to analyse visitor data in the context of the SPA's / Ramsar's sensitive features**
- **If appropriate, develop an appropriate policy framework that either makes reference to the existing Stroud Interim Impact Avoidance Strategy or that sets out its own mitigation strategy (i.e. SANG and SAMM) in relation to the Severn Estuary SPA / Ramsar, using the strategy for Stroud and Forest of Dean as a model.**

In response to this recommendation, the authorities of Monmouthshire and Torfaen (another authority also progressing its RLDP) have jointly commissioned a visitor survey at four access locations (including the two survey points identified above) along the estuary, to provide in-combination visitor data for the European site. The survey work was commenced in February and March 2020 but had to be paused due to the COVID-19 outbreak. It will be completed in the next overwintering period of SPA / Ramsar birds in February / March 2022. A full set of survey data will allow an identification of the site's core recreational catchment and help establish the contribution of both Monmouthshire and Torfaen to the overall recreational footprint in the SPA / Ramsar. Results from the visitor counts and interviews will be revisited as part of the 'in-combination' Appropriate Assessment of the Deposit Plan HRA. Furthermore, a land-based recreation report and a coastal access, recreational angling and bait-digging study are currently being undertaken. These will also be discussed in the Deposit Plan HRA.

Severn Estuary SAC

As identified in the screening section for LSEs, the Monmouthshire RLDP might also result in negative impacts on sensitive habitat features of the Severn Estuary SAC, including the estuary feature, the subtidal sandbanks, the sand- and mudflats, and the Atlantic salt meadows. In contrast to the SPA / Ramsar features which would mostly be subject to direct disturbance, the SAC features are likely to be affected by trampling, erosion, pollution and abrasion associated with boating activities. The estuaries feature of the SAC is defined as highly vulnerable to physical disturbance and abrasion, which could result from anchoring, power boats, jet skis, bait digging, littering and walking on sensitive habitat features. In the intertidal sand- and mudflats, boating, anchoring, trampling and the use of off-road vehicles are most likely to cause physical disturbance, such as the compaction of substratum. For example, trampling and the use of vehicles results in the collapse of burrows of clam species, heart urchin and razor shell. Due to the longevity of these species, these habitats have long recovery rates of up to five years following disturbance events. Physical disturbance and abrasion are also key issues

¹⁴⁸ Ibid.

for saltmarsh communities, where they can cause damage to individual plants and change the ecological structure of the sward. Furthermore, wash arising from boating increases saltmarsh erosion.

Existing Evidence Base

Some useful context for the likely effects of recreational activities on the Severn Estuary SAC can be drawn from the Lydney visitor survey undertaken in the Forest of Dean. Of the 83 people interviewed in the study, only 5 visitors (6%) were undertaking boating activities. This indicates that water-based activities are, compared to other recreational activities, niche activities only undertaken by a small proportion of the local population. However, this needs to be set into the context of the temporal patterns of the activity. Interviewees that were boating stated that they were undertaking the activity for long durations (80% stayed over one hour, 40% stayed longer than four hours) and were visiting relatively frequently (60% were boating one to three times per week, amounting to a maximum of 180 visits per year). Therefore, while activities directly damaging the SAC features are relatively infrequent, it is likely that the area of SAC they potentially affect is disproportionately large. Furthermore, the Lydney visitor survey highlighted that the Severn Estuary SAC is likely to have a large catchment area with regards to water-based activities such as boating. Boating was one of the activities for which visitors travelled furthest to the SAC, with a median distance of 5.3km and a maximum distance of 165.4km. These data highlight that due regard must be given to activities that potentially affect the Severn Estuary SAC, even if they are undertaken by relatively few visitors. Further evidence on the importance of the Severn Estuary SAC for watersports is summarised in the ASERA study (see earlier section on the Severn Estuary SPA / Ramsar).

The main boating related access point relevant to this stretch of the Severn Estuary SAC lies approx. 5km to the east of the Severnside Strategic Growth Area and approx. 1.8km to the Chepstow Strategic Growth Area. Review of satellite imagery highlights that this inlet comprises two jetties where multiple boats are anchored. The jetties are reachable on foot or by car, respectively. While there are relatively few official access points directly on to the estuary, the SAC south of Caldicot and Rogiet also has continuous stretches of mudflats and saltmarsh. Any activities carried out in the intertidal zone, such as walking, dog walking and bait digging, therefore have the potential to physically disturb the SAC habitats, potentially leading to adverse effects.

In-Combination Assessment and Recommendations for the Deposit Plan

It is generally considered that adverse effects on the site integrity of the Severn Estuary SAC could be avoided within the remit of an Interim Impact Avoidance Strategy. While this would be primarily designed to mitigate recreational pressure on the SPA / Ramsar features, any suite of measures could be extended to include the SAC features. For example, information boards for the general public could be enhanced to provide background information on the negative impacts of boating or bait-digging, thereby helping to raise awareness. Furthermore, detailed information about the distribution of the most important SAC habitats could be provided to encourage that boating visitors avoid such areas. A Code of Conduct for boaters could be published online, via leaflets and on information boards. There are also several policy mechanisms through which the Severn Estuary SAC could be protected, for example by introducing the following wording into a policy addressing the protection of European sites in Monmouthshire: ***'Any development proposals that would increase visitor access to sensitive habitat features in the Severn Estuary SAC, SPA and Ramsar site, especially on to saltmarsh and mudflat habitat, will not be supported unless it can be demonstrated that no adverse effect on the integrity of the SAC will occur.'*** For the Deposit Plan stage of the Monmouthshire RLDP it is therefore recommended to establish an evidence base regarding activities that might impact the SAC. This could be achieved through the visitor survey that is already recommended with regards to the Severn Estuary SPA / Ramsar features. Furthermore, mitigation measures tailored to the SAC could be incorporated into a mitigation strategy, as this is likely to be required in respect of the SPA's / Ramsar's bird species.

Usk Bat Sites SAC

Primarily, the Usk Bat Sites SAC is designated for its lesser horseshoe bat population of European significance. Both the maternity roost and the numerous hibernation sites (e.g. in Agen Allwedd Cave and Clydach Gorge Cave) are highly sensitive to recreational disturbance due to potential changes to a variety of habitat conditions, such as ventilation, temperature, light level and noise level.

Given the high sensitivity of this bat species to disturbance, the most important caves have been gated for conservation reasons, including Agen Allwedd, Craig a Ffynnon and Daren Cilau. Access to these caves requires prior application for a permit to the Mynydd Llangatwg cave Management Advisory Committee¹⁴⁹. However, numerous other roost and hibernation sites are not gated and as such potentially sensitive to higher visitor footfall. However, the BBNP website identifies caving as a potentially dangerous activity that requires prior consent of a local caving club and the assistance of a qualified expedition leader¹⁵⁰. Furthermore, the Caves of South Wales website outlines the Cave Conservation Code, which aims at minimising impacts on cave biota as well as geological formations¹⁵¹.

In the BBNP visitor survey, Brecon Canal was identified by 154 interviewees (9%) as one of the destinations during their visit. The Brecon Canal was the closest destination to the Usk Bat Sites SAC (1.7km) given by interviewees, which may also involve a visit to the SAC. Assuming the same proportion of Monmouthshire visitors than that obtained for the whole visitor survey dataset (i.e. 8%), this would imply that the area of NP in proximity to the Bat Sites SAC is visited by roughly 12 visitors travelling from Monmouthshire per every two days (the survey effort in the BBNP). It should also be highlighted that caving was not among the most popular recreational activities mentioned by interviewees and as such is likely to be carried out by very few people. Given its specialised nature, it cannot be assumed that this activity is directly linked to a general increase in the local population, in the same way as dog-walking.

Given the relatively small number of Monmouthshire residents that visit the approximate area around the SAC, the existing access controls (e.g. locked gates) of the most important roost and hibernation caves and the wider regulation of caving activities, it is considered that the implementation of the Monmouthshire RLDP would not result in adverse effects on the integrity of the caves in the Usk Bat Sites SAC, both alone and in-combination.

The residential growth outlined in the Monmouthshire RLDP might also result in additional recreational pressure on various sensitive habitat elements of the Usk Bat Sites SAC. Notably, European dry heath elements are likely to be negatively impacted by off-trail trampling damage. Undoubtedly, any potential negative effects of recreation related to the physical modification of habitats, are likely to be linked to the amount of visitor footfall and the maintenance of the available path network. The Usk Bat Sites SAC lies within easy walking distance (c.1km) of only a small number of dwellings in Monmouthshire. Car-based visitors will of course visit sites further afield but scrutiny of the small number of public roads that provide access into the SAC's component sites indicates that they are generally narrow, and parking is very limited, which will inherently control the number of casual visitors. The site will therefore not be a destination for mass recreational visits arising from Monmouthshire.

Consulting the results of the BBNP visitor survey, most visitors find that the NP is well managed (92% agree) and that information about the NP is easy to find before a visit (81% agree). This is important because it demonstrates the general access conditions in the NP and how easy it is for people to plan their visits, which crucially includes the planning of hiking or exercising routes. Furthermore, 'conditions of upland paths' (rated highly by 52%), 'conditions of lowland paths' (49%) and 'signage' (36%) were all features that were rated highly by interviewees. These results appear to indicate that the path network in the NP is well managed / maintained. This is important because having a variety of well-maintained paths to choose from, encourages visitors to stay on paths and reduces off-path trampling damage.

The potential adverse effects of recreational climbing in the SAC are appropriately addressed in the Core Management Plan of the site. This highlights that climbing in the management units 1 and 2 of the Mynydd Llangatwg SSSI, a component of the Usk Bat Sites SAC, requires the issue of a permit. Therefore, the number of climbers affecting the sensitive rocky slopes can be relatively easily controlled. Like caving, rock climbing is a niche activity undertaken by relatively few people (compared to mainstream activities such as walking and dog walking). This is reflected in the BBNP visitor questionnaire, where rock climbing was not among the reported recreational activities. The overall increase in the number of climbers as a result of the Monmouthshire RLDP is therefore expected to be limited and is adequately addressed through the permit system that already operates in the SAC.

¹⁴⁹ <http://mlcmac.org/llangatwg.htm> [Accessed on the 27/08/2019]

¹⁵⁰ <http://www.breconbeacons.org/caves> [Accessed on the 27/08/2019]

¹⁵¹ <http://www.oqof.org.uk/> [Accessed on the 27/08/2019]

In-Combination Assessment

Authorities adjacent to Monmouthshire, including Powys and Blaenau Gwent (both authorities that encompass components of the Usk Bat Sites SAC), would have also had to undertake HRA of their proposed Plans prior to adoption. For example, the Powys Deposit Plan HRA Screening Report concludes that there is no linking impact pathway between development in the Plan and the SAC, and the site therefore can be screened out. Furthermore, the HRA of the previous Blaenau Gwent LDP did not conclude adverse impacts on the Usk Bat Sites SAC regarding recreational pressure. Given the relatively small additional number of visitors likely arising from the Monmouthshire RLDP, it is considered that the implementation of the Monmouthshire RLDP would not result in adverse effects on the integrity of habitats in the Usk Bat Sites SAC, in-combination with development Plans in surrounding authorities.

River Usk SAC & River Wye SAC

Due to the similarity in qualifying features and the likely impacts of recreation, the Appropriate Assessment of the River Usk SAC and the River Wye SAC is combined in this section. Both SACs are freshwater systems that are designated for their plain to montane water courses, several anadromous fish species and otter.

The source of the River Usk SAC lies in upland Wales and it then flows in a south-easterly direction, entering Monmouthshire to the west of Abergavenny. The SAC then runs south through the authority before entering the Severn Estuary. The River Wye SAC also rises in the Welsh mountains (at Plynlimon), from where it runs in an easterly direction, before turning in a southerly direction, straddling the English-Welsh border and entering the Severn Estuary near Chepstow.

As highlighted in the LSEs screening section, the Core Management Plans for both sites highlight that recreational pressure is a potential threat to the interest features of the site. For example, both twaite and allis shad are under pressure from recreational anglers, which sometimes take large numbers of these species. Rod fishing is also a potential concern for some of the other qualifying fish species, such as Atlantic salmon. There are several other mechanisms by which SAC features might be impacted, including disturbance of otters by dog walkers, the cutting of water crowfoot beds for boat navigation and effects on the riverine system by canoeists (e.g. disturbance of gravel beds that are used for spawning by the qualifying fish). Given that the Monmouthshire RLDP allocates additional residential housing, there is a clear impact pathway potentially linking to both riverine SACs.

The Monmouthshire RLDP allocates new residential housing within several Strategic Growth Areas, not all of which will be equally relevant to the two SACs. For example, potential new residents in the Strategic Growth Areas of Monmouth or Chepstow, which are interested in visiting a river for recreation, are much more likely to visit the River Wye SAC, which is much closer to home. In relation to the River Usk SAC, the Strategic Growth Area of Abergavenny is most relevant, the outskirts of the town lying only approx. 100m from the SAC. Overall, this increase in the local population might lead to more people visiting local greenspaces, including the rivers Usk and Wye. Therefore, this HRA assesses suitable access points and paths at the two rivers, which might facilitate this increase in recreational pressure.

The Ordnance Survey Map on ViewRanger was consulted to investigate the path access network to the Usk around Abergavenny. The map indicates that there are public rights of way on both sides of the river leading from the Llanfoist bridge approx. 2.8 miles upstream to Glangrwyney. South of Abergavenny, there is no public right of way along the river for several kilometres until Llanellen. Notably, near Llanellen, the Usk Valley Walk (an advertised long-distance hiking route) tracks the river until Llantrisant in southern Monmouthshire. The Usk Valley Walk is an 80km long-distance hiking trail from Brecon to Caerleon (Newport), which is widely advertised online and social media platforms (e.g. ¹⁵²). Regarding canoeing, the primary river access point is the Brecon Promenade a long distance upstream from Abergavenny where recreationists can launch their own canoes or rent one. However, in practice canoes can be launched from various other points along the bank of the SAC.

Ordnance Survey Maps show that the River Wye SAC is similarly accessible to recreationists. There is a public right of way, the Wye Valley Walk, straddling both sides of the banks of the River Wye in the area of Monmouth. Upstream of central Monmouth, the path lies on the western side of the river with

¹⁵² https://www.ldwa.org.uk/ldp/members/show_path.php?path_name=Usk+Valley+Walk [Accessed on the 01/11/2019]

no footpath on its eastern side. At the Wye Bridge, the Wye Valley Walk traverses to the eastern side of the river, from where it follows the meandering river downstream all the way to Chepstow. Access to the River Wye SAC by Chepstow residents is likely to be less of an issue, because the SAC is less accessible near its confluence with the Severn Estuary. The available evidence indicates that canoeing is a highly popular activity on the River Wye. For example, a google search for 'canoeing the Wye Valley' brings up 279,000 results and five different companies that offer canoeing activities. In Monmouth there is a facility for canoe hiring just north of the Wye Bridge, which is accessible to new Monmouthshire residents that are interested in canoeing. As is the case for the River Usk SAC, while most canoeists might launch from the main canoeing hubs, canoes can be launched from many other locations on the banks of the Wye. Overall, given that both SACs are easily accessible to all forms of recreation, including hiking, canoeing and fishing, it is likely that the Monmouthshire RLDP would result in an increase in recreational pressure within the Usk and the Wye SACs. However, it is to be noted that several mechanisms are already in place, which buffer adverse recreational impacts in the SACs.

In both rivers canoeing access in specific stretches is regulated by the Wye and Usk Foundation¹⁵³. The rules set by this organisation stipulate that canoeing and kayaking can only be undertaken freely in winter, when the rivers are in spate flow. The Foundation gives clear instructions where paddling is permitted and has live webcams that show the rivers' water levels. Restricting boating activities to the winter ensures that damage to the qualifying species and habitat is minimised. For example, it is less likely that canoeists will disturb gravel bars in high water flows and paddling in winter also protects the spawning period, when the anadromous fish are most sensitive. The Brecon Beacons National Park website, which promotes canoeing in the River Usk SAC, advises all users to follow both the Countryside Code¹⁵⁴ and the Waterways Code¹⁵⁵. These Codes of Conduct are designed to raise public awareness to reduce the disturbance and the pollution of the countryside. The Forest of Dean and Wye Valley tourism website also promotes the Code of Conduct for canoeists¹⁵⁶, which includes avoiding damage to beds of waterweed and disturbance of nesting birds along the river banks. Regarding recreational fishing, catch and release is now promoted by Natural Resources Wales as an angling technique to aid the conservation of fish stocks. Furthermore, any Atlantic salmon that is caught before the 16th of June must be returned to the river¹⁵⁷. There are also rod fishing byelaws in place for Wales, detailing the open seasons for a range of fish species, which are designed to protect the integrity of the fish populations.

Canoeing and fishing are popular recreation activities in both rivers, particularly along the R. Wye given the right of navigation. While these activities can have very damaging effects, they are undertaken by a small percentage of the population. For example, only approx. 1.5% of the UK population engage in recreational fishing¹⁵⁸, which is exceedingly small compared to popular recreational activities such as dog walking. Therefore, of the new residents arising from the RLDP, only a small fraction would add to the number of canoeists and fishers along the two river corridors. Consequently, a direct link between the delivery of new housing in an area and a significant increase in the number of people that will engage in fishing or canoeing cannot be drawn. Furthermore, the qualifying species are considered to be at relatively low risk of negative impacts from a general increase in the surrounding population. While an increase in river recreation infrastructure (e.g. further boat moorings) may pose a threat to the *Ranunculus* vegetation, this is not an automatic consequence of the Monmouthshire RLDP.

Overall, given that only a very small portion of new residents are expected to undertake activities that would threaten the integrity of the riverine SAC and there are current regulatory measures of these activities in place, it is concluded that there will be no adverse effects of the Monmouthshire RLDP alone on the site integrity of the River Usk SAC and the River Wye SAC. However, there is currently a motion towards introducing new, more protective catch controls for some of the qualifying fish species in these SACs. For example, the River Usk SAC's Core Management Plan highlights that exploitation of shad is currently unregulated and that a cessation of fishing activity might become necessary near known spawning grounds. Controls on shad catches are currently being considered in the review of freshwater fisheries legislation. Furthermore, Natural Resources Wales is applying for more protective catch

¹⁵³ <https://www.wyeuskfoundation.org/> [Accessed on the 01/11/2019]

¹⁵⁴ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/701188/countryside-code.pdf [Accessed on the 01/11/2019]

¹⁵⁵ http://www.britishwaterways.co.uk/media/documents/publications/Waterways_Code_Leaflet.pdf [Accessed on the 01/11/2019]

¹⁵⁶ http://www.wyedeantourism.co.uk/canoe_conduct [Accessed on the 05/11/2019]

¹⁵⁷ <https://naturalresources.wales/days-out/things-to-do/fishing/?lang=en> [Accessed on the 01/11/2019]

¹⁵⁸ approximately 1 million fishing licences are sold annually in the UK, equating to approximately 1.5% of the UK population; even assuming that an equal number of people regularly fish without licences that still equates to only 3% of the population

controls on Atlantic salmon, which are being reviewed by the Welsh Government. The HRA of the Deposit Plan will give consideration to any changing legislation regarding recreational fishing.

In-Combination Assessment

Authorities adjacent to Monmouthshire, including the Brecon Beacons National Park, Cardiff (closest to the River Usk SAC), Forest of Dean, Hereford, South Gloucestershire and Bristol (all relevant regarding recreational pressure in the River Wye SAC), also undertook HRAs of their proposed Plans prior to adoption. For example, the HRA of the adopted Herefordshire Core Strategy concluded that there would be no adverse effects of the plan on the River Wye SAC in relation to recreational pressure. Given the relatively small additional number of residents undertaking canoeing and fishing that are likely to arise from the Monmouthshire RLDP, it is considered that the implementation of the plan is unlikely to result in adverse effects on the integrity of the riverine SACs in-combination.

Sugar Loaf Woodlands SAC

The Sugar Loaf Woodlands SAC is a composite site that encompasses three distinct areas, The Park, St Mary's Vale and The Deri. Approx. 70% of the site is covered by woodland with mature sessile oaks dominating the canopy layer. The underlying ground flora comprises native plants such as hazel, holly, common bent, wavy-hair grass, creeping soft-grass, wood sorrel, heath bedstraw and bracken. As highlighted in the background chapter, an increase in recreational pressure (particularly when people venture off-path) may lead to increased soil compaction around the sensitive root systems of ancient trees. Furthermore, trampling could lead to direct damage to tree roots and the surrounding ground flora. The emerging Monmouthshire RLDP allocates 8,366 new homes, of which at least some will be delivered in the Abergavenny SGA within potential walking distance of the SAC. Recreational pressure could especially arise in-combination with the adopted Brecon Beacons National Park (BBNP) LDP, which allocates 1,990 dwellings. The area covered by the BBNP LDP adjoins Monmouthshire and the provision of housing in Crickhowell would place new residents within easy travel distance of the SAC.

The area encompassing the Sugar Loaf Woodlands SAC is managed by the National Trust. The Sugar Loaf mountain is a very popular recreation destination. The community app outdooractive shows that 40 visitor routes (varying in length from 0.9 to 32.5 miles) have been mapped within and near the SAC woodland parcels. Furthermore, the National Trust (NT) website advertises the Sugar Loaf circuit walking trail, which starts in the town centre of Abergavenny, leads through SAC woodland, Sugar Loaf summit and back to Abergavenny. The NT describes the mountain as an '*iconic peak*', offering wildlife adventures and '*glorious panoramic views*' over the surrounding countryside.

Despite being a highly rated recreation area, the integrity of the Sugar Loaf Woodlands SAC is unlikely to be at significant risk from housing proposed in the Monmouthshire RLDP. Several well-established tracks cut through the three component parts of the SAC. These paths would avoid the most sensitive parts of the site (e.g. roots of mature trees) and are maintained in good condition by the NT. Given that a suitable path network is in place, there is little incentive for visitors to walk off-track. The steep terrain of the woodland also discourages off-track activities (which are most damaging to sensitive habitat features) and the creation of new desire lines. Overall, given that the steep gradient of the SAC restricts visitor activities to the main paths and the site is under appropriate management by the NT, it is concluded that the Monmouthshire RLDP will not lead to adverse effects on site integrity regarding recreational pressure in-combination. No policy recommendations are made in relation to this impact pathway.

In-Combination Assessment

Authorities adjacent to Monmouthshire, including the Brecon Beacons National Park (most relevant to the Sugar Loaf Woodlands SAC), Powys (most relevant to the River Usk SAC), Herefordshire and Forest of Dean (the latter two being most relevant to the River Wye SAC), have undertaken their own HRAs in relation to European sites, both alone and in-combination. For example, the Powys Deposit Plan HRA Screening Report concludes that there is no linking impact pathway between development in the Plan and the River Usk SAC, the site therefore being screened out from Appropriate Assessment. The HRA of the previous Blaenau Gwent LDP determined that there were no adverse impacts on the River Wye SAC regarding recreational pressure. It is therefore concluded that the implementation of

the Monmouthshire RLDP would not result in adverse effects on the integrity of these SACs, in combination with development Plans in surrounding authorities.

Loss of Functionally Linked Land

The following policies of the Monmouthshire RLDP have been screened in for Appropriate Assessment because they allocate residential or employment growth, potentially leading to the loss of functionally linked land and LSEs on several European sites with mobile species:

- Strategic Policy S1: Strategic Sustainable and Resilient Growth (Provision for 8,366 net new dwellings and 7,215 net new jobs)
- Strategic Policy S2: Spatial Distribution of Development (Identifies the settlement hierarchy and quantum of residential development therein for Monmouthshire)
- Strategic Policy S6: Delivery of Homes (Requirement for 7,605 new homes with provision made for 8,366 new dwellings with the inclusion of a 10% flexibility allowance)
- Strategic Policy S7: Affordable Homes (The affordable housing target is set at 2,450 affordable homes)
- Strategic Policy S8: Strategic Development Sites (To be specified in the Deposit RLDP. Strategic Growth Areas are identified in Abergavenny, Monmouth, Severnside and Chepstow)
- Strategic Policy S10: Sustainable Transport (Supports sustainable transport networks that may require lighting schemes, which could interfere with functionally linked habitat usage by bats)
- Strategic Policy S13: Employment Sites Provision (Allocates a minimum of 43ha of employment land throughout Monmouthshire)
- Strategic Policy S15: Visitor Economy (Promotes tourism opportunities that may result in a temporary increase of the local populace)

Usk Bat Sites SAC & Wye Valley and Forest of Dean Bat Sites SAC

Given that both SACs are designated for similar species and that the impact mechanisms relating to the Monmouthshire RLDP are the same, the Appropriate Assessment of the two sites is combined in the following. The concept of functionally linked land addresses that mobile qualifying species, such as the lesser horseshoe bat (qualifying species of both the Usk Bat Sites SAC and the Wye Valley and Forest of Dean SAC) and the greater horseshoe bat (qualifying species of the latter SAC only), are not only dependent on the designated European sites, but also on habitat features (e.g. commuting corridors, foraging sites) that are not part of the formal site designation. Such functionally linked land is considered to be important for maintaining the integrity of bat populations within SACs. Both SACs lie partly within Monmouthshire and the RLDP might therefore result in land parcels that are functionally linked to these European sites. The Usk Bat Sites SAC is located partly within the north-western section of Monmouthshire, and development within the Strategic Growth Area of Abergavenny is most likely to result in the loss of functionally linked land of this SAC. The Wye Valley and Forest of Dean Bat Sites SAC comprises several component parts in the eastern section of Monmouthshire, and therefore development allocations within the Strategic Growth Areas of Monmouth and Chepstow are most likely to affect land that is functionally important to SAC bats. Of further note is that the Usk Bat Sites SAC site boundary includes significant areas of bat supporting habitats, whereas the Wye Valley and Forest of Dean Bat Sites SAC boundary encompasses little such habitat. Given the latter site's proximity to urban settlements, the loss of greenfield sites may have a disproportionately higher impact on its horseshoe bat populations.

To assess the impact pathway loss of functionally linked land, an assessment of the behaviour and habitat requirements of bats is required in the first instance. Most bats are likely to use natural linear landscape features (e.g. hedges and treelines) to navigate and open areas of grassland for foraging. Therefore, it is generally the allocation of greenfield sites for development, which is expected to have the largest impact on lesser and greater horseshoe bat populations. Developing greenfield sites is likely to mean that such features are lost, resulting in the loss of functionally linked land parcels. Conversely, redeveloping existing brownfield sites is likely to be less damaging because these are generally

presumed to have a lower ecological value to the bats. However, it is to be noted that bats also use man-made habitat features to roost and / or navigate. Therefore, even the conversion of a brownfield site could mean that functionally linked land is lost. However, all current growth options in the Strategic Growth Areas (see Chapter 5) allocate greenfield sites, which are likely to be most suitable as functionally linked land. An appraisal of functional habitat linkage also requires a clear definition of this term, since all linear habitat features across Monmouthshire are potentially used by bats. For the purposes of this HRA, functionally linked land is defined as habitat outside the designated site boundary that is fundamental to the ability of the SAC to reach its Conservation Objectives. In other words, such land must lie sufficiently close to the SAC to be used by a significant proportion of SAC bats **and** comprise suitable habitat features.

The linear landscape features and grassland used by bats for navigating, commuting and foraging provide an adequate starting point for an assessment of functionally linked land. Review of online satellite imagery indicates that there are various areas with suitable bat off-site supporting habitat around the Strategic Growth Areas proposed in the Monmouthshire RLDP. The following provides a brief overview of some of these. For example, the area to the north of the A465 (Heads of the Valley Road) and the south of the settlement of Clydach, comprises open habitat with streams, treelines and semi-improved grassland; and this habitat might be used by lesser horseshoe bats stemming from the nearby Usk Bat Sites SAC. Furthermore, two component parcels of the Wye Valley and Forest of Dean Bat Sites SAC lie relatively close to the Strategic Growth Area of Monmouth. The Newton Court Stable Block, SSSI component of the SAC, is in an area of tree- and hedge-lined fields, adjacent to Mally Brook and the River Wye. Given that the designation here only covers the stables, it is certain that the bats will be using some of these habitat features, which are not part of the designation. Equally, the Wye Valley Lesser Horseshoe Bat Site (another SSSI component) also lies adjacent to fields with linear habitat features and the River Wye. The lesser horseshoe bats are likely to utilise some of these features for commuting and / or foraging.

Research has been conducted on the distance that horseshoe bats regularly travel from their roosts during the summer. The summer foraging band widths for lesser horseshoe bats are derived from radio tracking studies. Their average foraging trip from day-time roosts is roughly 2km, although the maximum distances travelled by adult females and nulliparous females equate to 4.1km and 4.5km respectively¹⁵⁹. Bontadina et al. (2002)¹⁶⁰ advised that conservation management for this species should concentrate within 2.5km of roosts, with particular focus on a 600m radius around identified roosts (where the bat colony forages 50% of the time). In other Local Planning Authorities (e.g. Wiltshire), using such radio-tracking data and considering the general habitat requirements of greater and lesser horseshoe bats has culminated in bat mitigation Supplementary Planning Documents (SPDs). For example, the Trowbridge Bat Mitigation Strategy SPD sets out bat sensitivity zones in which greenfield development is likely to result in the loss of functionally linked habitat. The Red Zone (high risk) comprises a 600m radius from SAC woodland and / or trees that are known to support bat maternity roosts. In this zone, any new urban development is unlikely to be permitted due to unacceptable habitat loss and light pollution. A wider Yellow Zone (medium risk) comprises the area in which habitat features are important to the integrity of the SAC bats and planning proposals must deliver adequate mitigation measures (e.g. reduced density of development and retention of linear habitat features). The Trowbridge SPD is an example of a detailed mitigation strategy that is based on bespoke data of bat populations in the Bath and Bradford on Avon Bats SAC. However, such detailed site-specific data is not available for many European sites designated for bats.

For example, relatively little data on critical flight lines and feeding grounds is available for bats from the Wye Valley & Forest of Dean Bat Sites SAC. The Strategy for the Conservation of Horseshoe Bats in the Wye Valley and Forest of Dean (to which Monmouthshire County Council is a signatory) is relatively broad and stipulates that further work (e.g. mapping of linear features and academic research) is needed to identify key flightlines. The strategy also specifies that all hedgerows should be assumed to be important as bat commuting routes in broader policy terms. The HRA of the Forest of Dean Site Allocations Plan also states that there is limited information regarding horseshoe bat foraging areas and fly-ways. It determined that horseshoe bats appear to generally forage within 2-4km from roosts, but some individuals regularly foraging up to a 10km distance. That HRA recommended a broad mitigation

¹⁵⁹ Knight T. (2006). *The use of landscape features and habitats by the lesser horseshoe bat (Rhinolophus hipposideros)*. PhD Thesis, University of Bristol.

¹⁶⁰ Bontadina F. (2002). Radio-tracking reveals that lesser horseshoe bats (*Rhinolophus hipposideros*) forage in woodlands. *Journal of Zoology* **258**: 281-290.

approach, ensuring that adverse effects are avoided at the planning application level (this is discussed further below).

Given the lack of specific data on the Usk Bat Sites SAC and the Wye Valley & Forest of Dean Bat Sites SAC is available, broader data on functionally linked habitat usage of bats needs to be considered. This is provided by the Bat Conservation Trust's Core Sustenance Zones (CSZs)¹⁶¹. This term refers to the area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the colony using the roost. The CSZs are calculated by averaging the mean-maximum foraging radii across all studies reporting this metric, weighted by the number of bats tracked in the study. The weighted average is then rounded to the nearest kilometre to reflect the level of precision in the bat tracking. According to the Trust, lesser horseshoe bats have a CSZ of 2km, while greater horseshoe bats have a CSZ of 3km. Confidence in this zone size is described in the guidance as good, because the calculation is based on a reasonable sample size from multiple colonies and studies. Any development sites within these buffers are therefore of particular concern regarding their suitability for and usage by the lesser and greater horseshoe bat.

A preliminary analysis of candidate sites considered in the Monmouthshire RLDP, indicates that none of the sites in the Abergavenny SGA lie within the 2km CSZ of the Usk Bat Sites SAC (see **Table 5** below). Although suitable habitat features for bats (e.g. treelines and hedgerows) are present within many site boundaries, these are not considered to be relevant to the qualifying lesser horseshoe bat population in the SAC. In contrast, four of the six candidate sites in the Monmouth SGA lie within 3km of the Wye Valley & Forest of Dean Bat Sites SAC. Greater horseshoe bats may rely on linear habitat features (e.g. treelines, hedgerows) to commute to off-site foraging habitats. Furthermore, some bats may also forage within candidate sites where tree clusters are present. However, since the Preferred Strategy RLDP does not include individual allocations, a definitive site-specific in-combination analysis will have to be undertaken as part of the Monmouthshire Deposit Plan. Notwithstanding this, the assessment highlights that bat surveys will be required for planning applications, particularly in sites coming forward in the Monmouth SGA (see policy recommendation below).

Table 5: Candidate sites considered in the Monmouthshire RLDP, listing the distance (km) to the Usk Bat Sites SAC and the Wye Valley & Forest of Dean Bat Sites SAC, the habitat type on site and the site size (ha).

| Site Ref | Site Name | Distance to relevant European Site | Habitat type | Site size (ha) |
|-------------|--------------------------------------|------------------------------------|---|----------------|
| Abergavenny | | Usk Bat Sites SAC | | |
| CS0093 | Land at Evesham Nurseries, Llanfoist | 3.8 | Grazing land, improved / semi-improved grassland; subordinate treelines and tree clusters | 8.3 |
| CS0094 | Land at Penlanlas Farm | 5.5 | Grazing land, improved / semi-improved grassland; some treelines | 6.1 |
| CS0125 | Abergavenny Urban Extension | 5.7 | Grazing land, improved / semi-improved grassland; arable land; treelines | 65 |

¹⁶¹ Research published by the Bat Conservation Trust. 2016. Core Sustenance Zones: Determining zone size. Available at: https://cdn.bats.org.uk/pdf/Resources/Core_Sustenance_Zones_Explained_04.02.16.pdf?mtime=20190219173135 [Accessed on the 04/11/2019]

| | | | | |
|--------|----------------------------|-----|---|-----|
| CS0128 | Land at Chapel Farm Fields | 5 | Grazing land, improved / semi-improved grassland; hedgerows | 9.6 |
| CS0192 | Land off Old Hereford Road | 5.6 | Arable land; surrounding treelines | 8.3 |

Monmouth

Wye Valley &
Forest of Dean
Bat Sites SAC

| | | | | |
|--------|---|-----|--|------|
| CS0051 | Croft Y Bwla Farm | 3.3 | Arable land enclosed by treelines | 49.9 |
| CS0078 | Land adjacent to Croft Y Bwla | 2.8 | Grazing land, improved / semi-improved grassland; scattered trees | 13 |
| CS0090 | Land north of Wonastow Road | 3.1 | Grazing land, improved / semi-improved grassland; hedgerows; scattered trees | 9.12 |
| CS0099 | Land at Drybridge Farm | 2 | Grazing land, improved / semi-improved grassland; hedgerows; scattered trees; some urban development | 22.5 |
| CS0160 | Land Known as Vauxhall Fields | 2.2 | Grazing land, improved / semi-improved grassland; hedgerows; treelines; scattered trees | 8.6 |
| CS0182 | Land North East of Monmouth and North of Dixon Road | 0.7 | Grazing land, improved / semi-improved grassland; some arable fields; scattered trees | 42 |

It is noted that some genetic interchange between the SAC populations and roosts located far beyond the CSZs is likely to occur. Although some degree of linkage is likely to exist with populations across Wales, the HRA process is concerned with identifying the core zone around bat SACs that is integral for sustaining the SAC colonies and thus for the sites to achieve their Conservation Objectives. The importance of functionally linked roosts is likely to reduce with distance because fewer bats would be expected to cover such large distances. Furthermore, given that the lesser horseshoe bat is a legally protected species, all habitat used by horseshoe bats (e.g. those lying outside the identified CSZs) will need to be preserved or mitigated. As such, swarming sites with some degree of functional linkage to the SACs will need to be protected even if an integral link with SAC bat populations cannot be established.

Therefore, it is recommended that the following text (or similar) is inserted into a suitable policy in the next iteration of the RLDP: ***'To meet the requirements of the Conservation of Habitats and Species Regulations (2017, as amended) regarding allocated greenfield sites that are likely to be functionally linked to the Usk Bat Sites SAC or the Wye Valley and Forest of Dean Bat Sites SAC, the applicant is required to provide evidence that the development will not result in adverse effects on site integrity. Sites with potential functional linkage may be identified using a range of established methods, including radio-tracking data for the two SACs, Core Sustenance Zones (CSZs) derived from other horseshoe bat populations in the UK and habitat assessments. On sites that are potentially linked to the SACs, a suite of bat surveys (e.g. bat activity surveys,***

roost emergence surveys) will need to be undertaken between April and September as a minimum. Where a land parcel is used by SAC bats, mitigation and avoidance measures might be required, and the planning application will likely need to be assessed through a project-level Habitats Regulations Assessment’.

Severn Estuary SPA / Ramsar

Generally, it is to be noted that the Severn Estuary SPA / Ramsar covers most of the habitat that is used by its qualifying bird species, including the wet coastal grazing marsh, improved grassland and open standing water. However, some of its more mobile waterfowl and wader species, most notably the Bewick's swan and the white-fronted goose, might be expected to move the longest distance beyond the site boundary. The Natural England Advice Note¹⁶² identifies that *‘some species will also use areas of land and coastal waters outside the boundaries of both the European Marine Site, SPA and Ramsar site. Relevant authorities need to have regard to such adjacent interests, as they might be affected by activities taking place within, or adjacent to the European Marine Site.’* Effectively, this statement highlights that regarding the Severn Estuary SPA / Ramsar, due consideration must be given to the loss of functionally linked land. The Strategic Growth Areas included in the Monmouthshire RLDP are likely to be relevant to this impact pathway. For example, the growth area of Monmouth lies over 21km from the Severn Estuary SPA / Ramsar and it is unlikely that any of the qualifying species would be travelling that far outside the site boundary. Abergavenny is even further away from the SPA / Ramsar and development within the area is unlikely to be relevant for birds from the European site. However, the Strategic Growth Areas of Severnside and Chepstow both lie within 1km of the estuary, which is well within the distance that SPA / Ramsar birds might be expected to travel, particularly the Bewick's swan.

Bewick's swans feed on several species of soft meadow grasses, including *Agrostis stolonifera* and *Alopecurus geniculatus* that are component species of wet meadows. Some of such habitat features might be located outside the European site. The distance travelled to foraging grounds beyond the boundary of the SPA / Ramsar is likely to depend on the time of year, resource conditions within the SPA / Ramsar and interspecific competition. Due to a combination of these factors, Bewick's swans partially forage in fields at relatively great distances from their roosting locations. A study in the Netherlands determined that Bewick's swans foraged in arable fields 7.1km away from their roosts¹⁶³.

A review of satellite imagery of the growth area of Severnside, shows an extensive network of drainage ditches to the north of the SPA / Ramsar, in proximity to the M4 motorway. Furthermore, there are arable fields between Rogiet and Caldicot, one of the growth options for Severnside, in which the Bewick's swans might be foraging for leftover grains. This presence of suitable habitat would seem to suggest that some of the fields might be land that is functionally linked to the SPA / Ramsar. The Strategic Growth Area of Chepstow also comprises a combination of wet grassland and arable fields, with the potential to act as supporting habitat to the SPA / Ramsar. However, given that the distance to the SPA / Ramsar is further, a potential for the M48 to act as a barrier and the more built-up nature of the wider area, its general suitability is considered to be slightly lower than the Severnside area. It is less likely that birds from the SPA's / Ramsar's intertidal zones would traverse the motorways and the River Wye to settle on fields around Chepstow. In other areas (e.g. Merseyside) SPA birds travel considerable distances inland to roost or feed, but that is most likely because the immediate coastal zone is heavily urbanised. Given that southern Monmouthshire is less built up, it is expected that the birds will fly the shortest possible distance to find suitable feeding grounds. However, in the absence of bird monitoring data for the arable fields in question, it remains a possibility that the birds are using greenfield sites in the Strategic Growth Area of Chepstow. Severn Estuary functionally linked land surveys have been commissioned and will be delivered by the end of March 2020¹⁶⁴. If available, the results will be taken into account for the Deposit Plan HRA.

Given that the RLDP does not make definitive allocations, the suitability of the candidate sites for supporting Bewick's swans was assessed in this instance. The key parameters that guide this assessment include distance to the Severn Estuary SPA / Ramsar (the likelihood of site use decreases with distance from a designated site), habitat type (Bewick's swans predominantly forage in agricultural

¹⁶² Published by Natural Resources Wales and Natural England. Available at: <https://naturalresources.wales/media/673887/severn-estuary-sac-spa-and-ramsar-reg-33-advice-from-ne-and-ccw-june-09.pdf> [Accessed on the 05/11/2019]

¹⁶³ Nolet B.A., Bevan R.M., Klaassen M., Langevoord O. & van der Heijden Y.G.J.T. 2002. Habitat switching by Bewick's swans: Maximisation of average long-term energy gain? *Journal of Animal Ecology* 71: 979-993.

¹⁶⁴ <http://bidstats.uk/tenders/2019/W37/710869319> [Accessed on the 07/11/2019]

stubble, but may also be found in wet grassland) and site size (it is generally assumed that sites should be at least 2ha in size to support a significant population of wintering waterfowl). Table 6 provides a summary of the 10 candidate sites considered in southern Monmouthshire, summarising these key parameters.

The data show that all candidate sites clearly lie within the maximum foraging distance of 10km, documented for Bewick's swans. Therefore, all sites were assessed in more detail regarding their habitat and size. This assessment highlighted that all sites comprise grassland (and potentially wet grassland) and / or arable fields, and are sufficiently large to potentially support 1% of the SPA's / Ramsar's Bewick's swan population. It is well known that the swans frequently switch feeding habitats in winter. As was relevant for the bat SACs, the Preferred Strategy RLDP does not make definitive site allocations, which currently pre-empts a conclusive site-specific in-combination analysis. This will have to be undertaken as part of the Monmouthshire Deposit Plan. However, given that the Chepstow and Severnside SGAs constitute suitable habitats close to the Severn Estuary SPA / Ramsar, bird surveys will be required to support planning applications and associated HRAs (see policy recommendation below).

Table 6: Candidate sites considered in the Monmouthshire RLDP, listing the distance (km) to the Severn Estuary SPA / Ramsar, the habitat type on site and the site area (ha).

| Site Ref | Site Name | Distance to relevant European Site | Habitat type | Site size (ha) |
|------------|----------------------------------|------------------------------------|---|----------------|
| Chepstow | | Severn Estuary SPA / Ramsar | | |
| CS0098 | Bayfield | 3.1 | Grazing land, improved / semi-improved grassland | 10.07 |
| CS0112 | Land at St Lawrence Lane | 2.4 | Grazing land, improved / semi-improved grassland; subordinate woodland | 20.4 |
| CS0152 | Land at Wyelands | 1.3 | Extensive tracts of grazing land, improved / semi-improved grassland; arable land; scattered treelines | 100 |
| CS0165 | Land west of A466 & Mounton Road | 2.4 | Grazing land, improved / semi-improved grassland; scattered treelines | 12.8 |
| Severnside | | | | |
| CS0065 | Land at Bradbury Farm | 1.5 | Grazing land, improved / semi-improved grassland, some areas of arable land | 29.1 |
| CS0087 | The Showground | 1.2 | Grazing land, improved / semi-improved grassland; roughly 60% of the site comprises existing brownfield development | 36.06 |
| CS0127 | Land to the east of Church Road | 1.6 | Grazing land, improved / semi-improved grassland; subordinate treelines and clusters of woodland | 10.09 |
| CS0129 | Dewstow Road | 1.8 | Grazing land, improved / semi-improved grassland; | 37 |

| | | | | | |
|--------|-----------------------|--|-----|--|-----|
| | | | | subordinate treelines and tree clusters | |
| CS0150 | Land East of 1 Rogiet | | | Arable fields and grazing land, improved / semi-improved grassland | 35 |
| CS0166 | Caerwent A | | 3.2 | Arable fields and grazing land, improved / semi-improved grassland | 8.8 |

It is recommended that the following text (or similar) is inserted into an appropriate policy of the Deposit Plan: ***'To meet the requirements of the Conservation of Habitats and Species Regulations (2017, as amended), the applicant should be required to provide evidence that the development will not result in adverse effects on the integrity of the Severn Estuary SPA / Ramsar regarding its qualifying bird species. To demonstrate this, a survey will be required to determine the habitats and current site use to verify if the land parcel is indeed suitable for supporting a significant population¹⁶⁵ of designated bird species. Where habitats are suitable, non-breeding bird surveys will be required to determine if the site and neighbouring land constitute a significant area of supporting habitat. Bird surveys will need to be undertaken during autumn, winter and spring. If habitat within the site or adjacent land are identified to support significant populations of designated bird species, avoidance measures and mitigation will be required, and the planning application will likely need to be assessed through a project specific Habitats Regulations Assessment to ensure that the development does not result in adverse effects on integrity.'***

Note: There is considerable precedent for deferring wintering bird surveys to the planning application stage, such as in the Solent (for Brent geese), Arun Valley (for Bewick's swans) and the Merseyside area (waterfowl and waders).

In-Combination Assessment

Development plans in other authorities adjoining European sites that are relevant to Monmouthshire allocate their own residential and employment sites. Therefore, in-combination effects may be present through the loss of multiple, potentially small, supporting sites across the wider geographic area. However, the consideration of cumulative effects is inherently built into the assessment of functionally linked habitat. The '1% of the SPA / Ramsar population' criterion (which defines functional linkage) is sufficiently low to capture supporting sites that are not highly significant individually, but are likely to be cumulatively. Therefore, a detailed in-combination section is not required for this impact pathway.

Water Quality

The Monmouthshire RLDP provides for new residential and employment development, which will increase the volume discharge of treated sewage effluent. The following policies require Appropriate Assessment in relation to the water quality impact pathway:

- Strategic Policy S1: Strategic Sustainable and Resilient Growth (Provision for 8,366 net new dwellings and 7,215 net new jobs)
- Strategic Policy S2: Spatial Distribution of Development (Identifies the settlement hierarchy and quantum of residential development therein for Monmouthshire)
- Strategic Policy S6: Delivery of Homes (Requirement for 7,605 new homes with provision made for 8,366 new dwellings with the inclusion of a 10% flexibility allowance)
- Strategic Policy S7: Affordable Homes (The affordable housing target is set at 2,450 affordable homes)

¹⁶⁵ A significant population is classified as a site that regularly used by 1% or more of the population of qualifying bird species

- Strategic Policy S8: Strategic Development Sites (To be specified in the Deposit RLDP. Strategic Growth Areas are identified in Abergavenny, Monmouth, Severnside and Chepstow)
- Strategic Policy S13: Employment Sites Provision (Allocates a minimum of 43ha of employment land throughout Monmouthshire)
- Strategic Policy S15: Visitor Economy (Promotes tourism opportunities that may result in a temporary increase of the local populace)

River Usk SAC & River Wye SAC

Due to the similar ecological nature and qualifying features of the River Usk SAC and the River Wye SAC, this section combines the Appropriate Assessment for both sites.

Both SACs are designated for a variety of features that are dependent on water quality. For example, the *Ranunculus fluitantis* and *Callitriche-Batrachion* vegetation elements are highly dependent on good water quality status. Under high nutrient conditions, the growth of algae and the risk of eutrophication increases. In turn the excessive growth of epiphytic algae is likely to suppress the flowering of aquatic plants. However, unfavourable water quality status will also affect the fish species that the sites are designated for. For example, both sea and brook lampreys require clear, well-oxygenated water for spawning, and eutrophication associated with domestic sewage effluent will reduce their spawning success. Atlantic salmon also need high water quality, particularly high dissolved oxygen levels, for survival. Maintaining the good chemical status within the rivers is therefore integral to protecting their integrity.

The River Usk rises on the northern slopes of the Black Mountain and flows 125km in a south-easterly direction through the towns of Brecon, Crickhowell, Abergavenny and Usk, before discharging into the Severn estuary at Newbridge. The SAC comprises a long narrow catchment, partly owed to the surrounding rugged terrain that receives inflow from various tributaries. The Environment Agency (EA) river catchment data explorer highlights that the north-western part of Monmouthshire (for example the area surrounding Abergavenny) lies in the River Usk catchment¹⁶⁶. The Monmouthshire RLDP identifies Abergavenny as one of its Strategic Growth Areas, which will result in the increased production of wastewater in this part of Monmouthshire. It is expected that new housing in the western part of Monmouthshire will be served by local Wastewater Treatment Works, such as the one just south of Abergavenny. Any WwTWs in this area of Monmouthshire will discharge treated sewage effluent directly into the River Usk SAC, or in tributaries feeding it. As such, there is a clear linking impact pathway between the new development in Abergavenny and the SAC.

The Lower Wye flows from Glasbury in Wales south through Herefordshire, Monmouthshire, Gloucestershire and then joins the Severn Estuary near Chepstow. The surrounding area is primarily rural with mixed agricultural land use, including livestock, arable and horticulture. As identified in the EA catchment explorer both Monmouth and Chepstow, Strategic Growth Areas identified in the Monmouthshire RLDP, lie within the operational catchment of the River Wye. Therefore, it is likely that sewage treated near these settlements will be discharged into the River Wye SAC. As for the River Usk SAC, there is therefore a clear linking impact pathway between Monmouth and Chepstow, and the River Wye SAC.

The Core Management Plans for both SACs indicate that the most significant source of water pollution is agriculture, including the input of fertiliser run-off, livestock manure, silage effluent and soil erosion from ploughed land. However, they also highlight that discharges from sewage treatment works, urban drainage systems and other urban sources are also significant sources of aquatic pollution and require consideration. To assess the likely impacts of sewage discharge on the SAC, it is important in establishing the rivers' current performance in relation to the Environment Agency's current water quality standards. For example, targets of 0.06 mg/l for phosphorus and 80% saturation for dissolved oxygen have been set for the River Usk SAC, to protect the integrity of the site. For the River Wye SAC, the site's Conservation Objectives Supplementary Advice Note states that dissolved oxygen should be at 85% saturation, the mean biological oxygen demand at 1.5 mg/l and the total ammonia 0.25 NH₃-N

¹⁶⁶ <https://environment.data.gov.uk/catchment-planning/ManagementCatchment/3107> [Accessed on the 28/08/2019]

mg/l¹⁶⁷. The Usk catchment management summary¹⁶⁸ highlights that out of 45 river water bodies, eight fail to achieve good chemical status due to pollution from sewage and waste water. A particular cause of concern is the Llwyd operational catchment, a sub-catchment of the Usk, where four of the five water bodies fail to reach their water quality target. In the River Wye SAC, the water industry (including wastewater) is cited as being responsible in 11 instances for water bodies in the Wye catchment not achieving good chemical status¹⁶⁹.

In Wales, the water quality of rivers is protected through the Review of Consents process agreed upon by the Environment Agency Wales. This sets out the volume of sewage effluent that can be discharged into local watercourses by WwTWs, including thresholds for the discharge of phosphate, nitrogen, dissolved oxygen, biological oxygen demand and ammonia. WwTWs have a permitted headroom, based on their ability to process additional sewage effluent whilst remaining within the consented volume of discharge and water chemistry thresholds. These discharge consents are developed in consideration of the SAC's qualifying feature and therefore remaining within the permitted headroom would mean that there will be no adverse effects on the site integrity of the River Usk SAC.

It is noted that the Monmouthshire RLDP already contains some broad policy wording that protects the water quality within the authority from adverse effects. Strategic **Policy S4 (Climate Change)** stipulates that new development should be '*Incorporating water efficiency measures and minimising adverse impacts on water resources and quality*'. Furthermore, Strategic **Policy S18 (Green Infrastructure, Landscape and Nature Conservation)** outlines that development proposals must '*maintain, protect and enhance the integrity and connectivity of Monmouthshire's green infrastructure, landscape and biodiversity assets through the following key functions: (ii) Habitat provision and connectivity by protecting, positively managing and enhancing biodiversity and geological interests, including designated and non-designated sites...*'. While these policies provide some basic protection to the River Usk SAC and the River Wye SAC, it is recommended that, given the high sensitivity of these SACs to water quality impacts, specific reference to these SACs is made in the policy. The following text could be added to the Deposit Plan: '***Any development proposals have to ensure that there will be no adverse effects on the site integrity of the two riverine SACs, the River Usk SAC and the River Wye SAC, regarding water quality generally and phosphorus input specifically. This is particularly important because these SACs are designated for habitats and wildlife species that are especially reliant on good water quality.***'

A definitive Appropriate Assessment of the water quality impact pathway for both SACs will be undertaken for the Deposit Plan, when the spatial distribution of the development will be available. Significant residential and employment development in Strategic Growth Areas within the hydrological catchments of both SACs will be coming forward and this will result in the input of net additional treated sewage effluent into both SAC sites. For the Deposit Plan, it is therefore recommended that further information regarding the WwTWs in Monmouthshire is requested from Welsh Water, including their locations, available consented headroom and discharge points, and any hydrological linkages to the riverine SACs. Alternatively, a joint Water Cycle Study (WCS) could be commissioned with the neighbouring authorities (e.g. Blaenau Gwent, Newport, Torfaen) to inform Appropriate Assessment of the Deposit Plan.

Such additional data would confirm the hydrological linkages between the SACs and relevant WwTWs and identify whether allocated growth can be accommodated within the currently consented headroom of these works. Overall, the locations, discharge points and capacities of Monmouthshire's WwTWs will be assessed in the Deposit Plan HRA and will evaluate whether water quality impacts of the proposed development can be adequately mitigated within the existing infrastructure framework.

One of the key concerns whether new development can be delivered without adverse effects on European sites with aquatic habitats, is whether the appropriate WwTW infrastructure is in place. Strategic Policy S6 (Infrastructure Provision) states that '*the infrastructure needed to service and deliver sustainable development must be in place or provided in phase with proposed development. Where existing infrastructure is inadequate to serve the development, new or improved infrastructure and facilities to remedy deficiencies must be provided.*' While this would include the sewage infrastructure,

¹⁶⁷ <http://publications.naturalengland.org.uk/publication/6096799802589184> [Accessed on the 04/11/2019]

¹⁶⁸ Published by Natural Resources Wales. Available at: <https://naturalresources.wales/media/3214/usk-management-catchment.pdf> [Accessed 01/11/2019]

¹⁶⁹ Published by the Environment Agency Wales. Available at: <https://environment.data.gov.uk/catchment-planning/OperationalCatchment/3549/Summary> [Accessed on the 04/11/2019]

this is currently not specifically mentioned. As a precautionary measure, it is recommended to insert the following text (or similar) into an appropriate policy of the Deposit Plan: ***'Regarding new residential and employment development it will be ensured that new growth can be accommodated within the existing wastewater treatment infrastructure network. Where allocated development exceeds the permitted headroom of any Wastewater Treatment Works (WwTW), the development will be delivered in phases to ensure that the consented discharge is not exceeded.'*** Given that a WCS is undertaken and the above recommended text is inserted into the next stage of the Monmouthshire RLDP, it is concluded that there would not be adverse effects on the site integrity of the River Usk SAC and the River Wye SAC regarding water quality.

Emerging Issue of Nutrient Neutrality

As discussed in the previous section, both the River Wye SAC and the River Usk SAC are sensitive to increased nutrient loading, predominantly phosphates contributed from treated sewage effluent. In comparison, agricultural runoff contributes relatively little phosphorus and this is managed through Defra's Catchment Sensitive Farming initiative. Due to the increasing phosphate concentrations in both riverine systems, both Natural Resources Wales and Natural England have recently advised that development plans should not result in a net increase of phosphorus concentrations in both SACs, a concept known as nutrient neutrality. This is to be ensured by calculating an overall phosphorus budget, encompassing all site allocations included in the RLDP. As this issue is still being investigated, a specific calculation methodology for the two SACs is not yet available. However, methodologies developed for other freshwater sites in the UK (e.g. Stodmarsh SPA / Ramsar / SAC) are transferable and can be applied to the River Wye and River Usk SAC, due to similar sensitivities.

AECOM undertook preliminary phosphorus calculations for the Strategic Growth Areas (SGAs) of Abergavenny and Monmouth. Potential residential or employment sites in these SGAs are likely to have nutrient neutrality implications because they are served by WwTWs discharging into the upper reaches of both SACs. The Chepstow and Severnside SGAs are served by Nash WwTW in Newport, which discharges into the Severn Estuary and therefore will not contribute phosphorus to the R. Wye and R. Usk. Calculating a phosphorus budget involves four key stages:

- Stage 1: Future phosphorus load in treated wastewater effluent
- Stage 2: Phosphorus loss due to conversion of existing land use (e.g. from grazing land to urban surfaces)
- Stage 3: Phosphorus leachate from future land uses (e.g. runoff from impermeable surfaces or infiltration from open greenspaces)
- Stage 4: Overall phosphorus budget for all site allocations (bringing all previous stages together)

The calculations undertaken for the RLDP, indicate that all potential sites would result in a phosphate surplus within the catchments of the two SACs. Therefore, mitigation or phosphate offsetting measures would need to be ensured before planning consent could be granted. While the predicted total phosphorus surplus of the RLDP as calculated at the moment appears high (4,579.6 kg / TP / yr⁻¹), it is to be noted that this is because all potential sites have been assessed, whereas only a portion of the assessed sites will actually be allocated in the Deposit RLDP and the actual phosphate concentrations contributed to the SACs will thus be much lower. Notwithstanding this, it is evident that avoidance or mitigation measures will need to be explored to allow development under the RLDP to come forward. A potential list of feasible and effective nutrient mitigation approaches will be delivered to support the Deposit Plan, which is likely to include some of the following interventions:

- Removing additional land from agricultural production (this would only form a small part of the mitigation package, due to relatively little phosphorus being contributed from agricultural practices (e.g. 0.27 kg / TP / yr⁻¹ from mixed-used land)
- Improving phosphate removal efficiency to a standard of 0.25 mg/l at WwTWs serving housing allocated in Abergavenny and Monmouth; this approach has significant potential as a mitigation measure, but will need to be secured through a formal agreement with the water company and is likely to cost in excess of £1 million

- Utilising constructed wetlands / reedbeds as tertiary treatment systems downstream of WWTWs; this approach has limitations in that phosphate removal efficiency of these systems is relatively low (approx. 2 mg/l), but they could form part of the mitigation package
- Creating offsite wetlands to offset the phosphorus that would enter the SACs from treated sewage effluent or agriculture elsewhere (i.e. not treating the actual effluent produced by the Monmouthshire RLDP); however this would require a large area of suitable land and take a long time (the time for the wetland to be designed and to mature) before actual phosphorus removal is provided.

AECOM considers that none of the above interventions would provide sufficient mitigation on their own to ensure phosphate neutrality of the RLDP. The mitigation package will likely encompass several measures and require collaboration of various stakeholders, including Monmouthshire County Council, Natural Resources Wales, Natural England, Welsh Water and other statutory bodies / regulators. It is recommended that the Council explores potential solutions alongside further steps towards developing its Deposit Plan. The site allocations will need to be confirmed to allow for mitigation solutions to be assessed and taken forward. AECOM recommends that a mitigation package covering the first 4 years of RLDP development should be identified, in line with the obligatory 4-yearly review process. Solutions to water quality issues will need to be catchment-based and require a trans-boundary effort by Local Planning Authorities. A complete Appropriate Assessment of the nutrient neutrality issue will be provided in the Deposit Plan HRA, including detailed calculations of the phosphate budget and offsetting / mitigation approaches. A policy requirement for ensuring that any additional phosphate input will not result in adverse effects on site integrity has been made in the previous section.

In-Combination Assessment

It is to be noted that the evidence used to set the thresholds for aquatic parameters (e.g. dissolved oxygen, nitrogen) is derived from an in-combination approach that aims at protecting the integrity of the riverine SACs. The Environment Agency's Review of Consents process sets wastewater discharge limits for WWTWs within Monmouthshire, while accounting for discharged effluent arising from development allocated within the Plans of adjacent authorities. The same also applies to the concept of nutrient neutrality, which emerges from the cumulative growth in all hydrologically linked authorities contributing phosphorus to the River Wye SAC and River Usk SAC. As such, the impact pathway water quality, including the phosphate neutrality issue, is by definition assessed in-combination with growth in other authorities. Furthermore, the HRAs of development plans of surrounding authorities (e.g. those of the Brecon Beacons National Park, Blaenau Gwent and Herefordshire) concluded there were no adverse impacts of their Plans on the river SACs (although it is noted that these assessments will require updating in line with the emerging nutrient neutral approach adopted for the SACs). It is therefore concluded that, provided adequate phosphate mitigation is identified and secured, there would be no adverse effects on the site integrity of the River Usk SAC and the River Wye SAC regarding water quality, in-combination with other Plans.

Severn Estuary SAC

The Severn Estuary SAC is designated for several habitats and species, which are potentially sensitive to a deterioration in water quality. The estuary and the subtidal sandbanks habitats are both considered sensitive to changes in nutrient loading in principle, however due to the high turbidity of water in the SAC, algal productivity is generally low except for very localised hotspots. However, the sand- and mudflats present in the SAC are highly vulnerable to increasing nutrient loading. One consequence of increased nutrient input is the growth of green seaweeds and reduced oxygenation on the mudflats. Importantly, at high nutrient enrichment levels, species diversity declines with a modal shift to fewer, but pollution tolerant species. The Atlantic salt meadows habitat component is also highly vulnerable to nutrient enrichment. Elevated concentrations of phosphorus and, particularly, nitrogen lead to the dominance of some seaweed species with an adverse effect on glasswort and the overall structure of the sward. All additional treated sewage effluent discharge arising from development allocated in the Monmouthshire RLDP is likely to enter the Severn Estuary SAC, either because it is directly discharged into the SAC or because it enters indirectly, via the Rivers Usk and Wye (see previous section on the Appropriate Assessment). The Strategic Growth Areas outlined in the Monmouthshire RLDP are likely to differ in their potential impacts on the water quality in the SAC, which will be discussed in the following.

The underlying mechanism through which water quality impacts of development may be ameliorated, is the process of pollutant attenuation. Importantly, catchment-scale modelling has shown that the total nitrogen and total phosphorus load within watercourses is generally attenuated within a few tens of kilometres¹⁷⁰. Another study demonstrated that 100% of the nitrogen and phosphorus loads was attenuated within a 5km section of a coastal watershed¹⁷¹. It is to be noted that pollutant attenuation is a complex process and dependent on various site-specific conditions, but these attenuation distances nevertheless serve as a useful starting point for an Appropriate Assessment of the impact pathway water quality.

The Monmouthshire RLDP identifies two Strategic Growth Areas in northern Monmouthshire (Abergavenny, Monmouth) and two in southern Monmouthshire (Sevenside, Chepstow). Assuming that the net new residential dwellings in Monmouth would be treated and discharged locally, the wastewater effluent would enter the River Wye approx. 32km flow distance to the north of the Severn Estuary SAC. Given the above cited distances for nutrient attenuation, it is assumed that phosphorus and nitrogen in wastewater discharge from Monmouth would effectively be inconsequential for the SAC. Similarly, development in Abergavenny is located far beyond 30km of flow distance to the north of the Severn Estuary SAC, rendering any water quality impacts immaterial for the estuary. In contrast, both the Sevenside and the Chepstow Strategic Growth Areas are located within 1km flow distance of the Severn Estuary SAC. Additional development in these areas therefore has the potential to result in significant nutrient enrichment in the SAC.

However, it is considered that any adverse effects on the Severn Estuary SAC regarding water quality are addressed through the Environment Agency's Review of Consents process (see previous Appropriate Assessment on the River Usk SAC and the River Wye SAC). Given that this process considers the qualifying features of European sites, it also ensures that the permitted headroom of WwTWs does not damage the integrity of the Severn Estuary SAC. The following text that was recommended in relation to water quality in the SAC rivers would also help address any potential water quality impacts in the estuary: ***Regarding new residential and employment development it will be ensured that new growth can be accommodated within the existing wastewater treatment infrastructure network. Where allocated development exceeds the permitted headroom of any Wastewater Treatment Works (WwTW), the development will be delivered in phases to ensure that the consented discharge is not exceeded.*** Given that the above text is inserted into the next stage of the Monmouthshire RLDP, it is concluded that there would be no adverse effects of the RLDP on the site integrity of the Severn Estuary SAC regarding the impact pathway water quality.

In-Combination Assessment

Numerous authorities border the Severn Estuary SAC, including Newport, Forest of Dean and South Gloucestershire. Development allocated within the Plans of these authorities therefore has the potential to affect the water quality in the Severn Estuary SAC in-combination. However, as a legal requirement, HRAs have been undertaken on all these Plans, assessing in-combination effects on European sites. The HRAs have concluded that there will be no in-combination effects on the water quality in the Severn Estuary SAC. For example, the HRA of the Newport LDP concluded that the proposed schemes would have no in-combination effects on the Severn Estuary SAC due to there being no local waterways connecting to the SAC. Given the evidence in the relevant HRAs, it is concluded that there would be no adverse effects of the Monmouthshire RLDP on the site integrity of the Severn Estuary SAC regarding the impact pathway water quality in-combination with other Plans.

Water Quantity, Level and Flow

The Monmouthshire RLDP provides for new residential and employment development, which will result in an increased water abstraction from groundwater or surface water bodies. This could lead to adverse effects on the integrity of European sites that depend on naturally fluctuating hydrological cycles. The following policies require Appropriate Assessment in relation to the water quantity, level and flow impact pathway:

¹⁷⁰ Bray E.N., Chen X. & Keller A.A. 2010. Instream attenuation of nitrogen and phosphorus in non-point source dominated streams: Hydrologic and biogeochemical controls. AGU Fall Meeting Abstracts.

¹⁷¹ Ensign S.H., McMillan S.K., Thompson S.P. & Piehler M.F. 2006. Nitrogen and phosphorus attenuation within the stream network of a coastal, agricultural watershed. Journal of Environmental Quality 35: 1237-1247.

- Strategic Policy S1: Strategic Sustainable and Resilient Growth (Provision for 8,366 net new dwellings and 7,215 net new jobs)
- Strategic Policy S2: Spatial Distribution of Development (Identifies the settlement hierarchy and quantum of residential development therein for Monmouthshire)
- Strategic Policy S6: Delivery of Homes (Requirement for 7,605 new homes with provision made for 8,366 new dwellings with the inclusion of a 10% flexibility allowance)
- Strategic Policy S7: Affordable Homes (The affordable housing target is set at 2,450 affordable homes)
- Strategic Policy S8: Strategic Development Sites (To be specified in the Deposit RLDP. Strategic Growth Areas are identified in Abergavenny, Monmouth, Severnside and Chepstow)
- Strategic Policy S13: Employment Sites Provision (Provision is made for a minimum of 43ha of employment land throughout Monmouthshire)
- Strategic Policy S15: Visitor Economy (Promotes tourism opportunities that may result in a temporary increase of the local populace)

River Usk SAC & River Wye SAC

Due to the similar ecological nature and qualifying features of the River Usk SAC and the River Wye SAC, this section combines the Appropriate Assessment for both sites.

As highlighted in the screening section for LSEs, both SACs depend on naturally fluctuating hydrological regimes with annual fluctuations in water volume and current velocity. While a certain degree of variability is desirable, the changes in water flow and level need to remain within natural limits and in accordance with the life cycle of the SAC's qualifying features. For example, Atlantic salmon require changing water depth depending on its life stage. During the spawning and incubation periods, the water depth should be 15 – 75 cm, suitable fry habitat should be below 20 cm in depth and parr habitat between 20 – 40 cm. Major water abstractions are also likely to reduce the maximum river flows in the migratory period and on a diurnal timescale, resulting in the exposure of lamprey nests and nurse areas above the water level. Furthermore, the flow conditions are highly important in enabling anadromous fish to reach their spawning grounds and ensuring that juveniles are not washed into marine water prematurely. Overall, the natural flow regime within the SACs maintains the characteristic biotope mosaic that is necessary to maintain the biological integrity of the site. The main target for the rivers is to maintain 90% of the naturalised daily mean flow throughout the year.

An investigation into water resources, level and flow requires, in the first instance, the consideration of the available water resources in area. The available resources then need to be set into the context of the current and future exploitation rates. Based on the Environment Agency's water stress classification system, the rivers are located within a wider area of low water stress¹⁷². Irrespective of this, water abstraction for domestic water supply is the most important pressure on the water volumes in both the Usk and the Wye catchments. For example, in the River Usk the public water supply accounts for 94% of the catchment's total annual abstraction¹⁷³. This abstraction accounts for a large proportion of the potable water supply across south-east Wales and is transported across the region through an intensive system of water transport infrastructure. This water abstraction system is augmented by six public water supply impoundment reservoirs within the catchment. At low flow conditions, potentially prohibitive of abstraction, these reservoirs discharge water into the 'low flow' Usk for abstraction further downstream.

In 2019, Welsh Water, the company responsible for the potable water supply in Wales, published its final Water Resources Management Plan (WRMP) for the period between 2010 and 2050¹⁷⁴. This

¹⁷² Environment Agency. 2013. Water stressed areas – Final classification. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/244333/water-stressed-classification-2013.pdf [Accessed on the 28/08/2019]

¹⁷³ Natural resources Wales. 2017. River Usk Abstraction Licensing Strategy. Available at: <https://naturalresources.wales/media/682209/river-usk-abstraction-licensing-strategy-july-2017.pdf> [Accessed on the 28/08/2019]

¹⁷⁴ Dwr Cymru Welsh Water. 2019. Final Water Resources Management Plan 2019. Available at: <https://www.dwrcymru.com/en/My-Water/Water-Resources/Final-Water-Resources-Management-Plan-2019.aspx> [Accessed on the 28/08/2019]

strategic report primarily exists to ensure that there is sufficient potable water to supply future housing growth in Wales (considering factors such as climate change) and that water abstraction is undertaken sustainably, particularly during dry periods when the impact of water abstraction is likely to be greatest. The water supply area of Dwr Cymru Welsh Water is divided into three regions (North Wales, South West Wales, South East Wales), which are further subdivided into Water Resource Zones (WRZs). Development allocated in the Monmouthshire RLDP would be spread between the South East Wales Conjunctive Use System (SEWCUS), the largest of the WRZs with approx. 40% of the total demand in Wales, and the Monmouth WRZ, which supplies the market town of Monmouth and the surrounding villages.

The potable water supply in the SEWCUS WRZ is abstracted from the downstream reaches of both the River Usk and the River Wye catchments, indicating that water supplying development in the Strategic Growth Areas of Chepstow and Abergavenny will be derived from a combination of the two SACs. However, the WRMP demonstrates that the supply demand balance for the zone is in surplus for its planning period between 2020 and 2050. The reported baseline deployable output is 422 MI/d, which is higher than the maximum demand (approx. 395 MI/d) modelled for any of the years covered by the WRMP.

The Monmouth WRZ primarily sources its potable water from the Mayhill abstraction from the River Wye at Monmouth. Furthermore, a small spring abstraction is at Ffynnon Gaer, which supplies an area south of Monmouth. The supply-demand balance projected for the zone indicates that the reported deployable output is approx. 4.1 MI/d throughout the planning period, which exceeds the maximum demand of approx. 3.6 MI/d in 2020/21. As such, the water resources that are available exceed the demand for water supply throughout the entire RLDP period. Overall, the WRMP covers the entire Monmouthshire RLDP period, and the growth allocated therein. It is therefore considered that implementation of the Plan would not negatively impact the water quantity, level and flow within the River Usk SAC and the River Wye SAC.

The Core Management Plans for the SACs, published by Natural Resources Wales, highlight the potential impact that a few major abstractions (if fully utilised) might have on flow conditions within these rivers. Due to this, the Review of Consents process has set flow targets to remove effects of this impact pathway on the qualifying fish species (for example as detailed in Annex 1 of the Core Management Plan for the River Usk SAC). This process uses recent daily mean flow data to set abstraction license conditions and hourly maximum abstraction rates to reduce human-induced diurnal flow variations. Of particular significance for the SAC features is the inclusion of hands-off flow conditions. Hands-off flow conditions mark the water threshold that is required to maintain the ecological integrity of the SAC, below which any abstraction activities must be stopped. Overall, due to the projected headroom in Monmouthshire's WRZs and the principle of Hands-off Flow, it is concluded that the Monmouthshire RLDP will not result in adverse effects on the integrity of the River Usk SAC and the River Wye SAC regarding the impact pathway water quantity, level and flow.

As outlined in the previous section, the Monmouthshire RLDP (see **Policies S4 and S18**) already contains some broad policy wording that protects European sites, which are reliant on water supply, from adverse effects. It is acknowledged that these policies provide some basic protection to the River Usk SAC and the River Wye SAC regarding adverse effects from the impact pathway water quantity, level and flow. However, due to the sensitivity of these SACs to water abstraction, it is recommended that specific reference to the sites and the relevant flow targets established by Natural Resources Wales is made in the supporting text to either of these policies. The following text could be added to ensure greater protection of the rivers' flow regimes: ***'Any development proposals have to ensure that there will be no adverse effects on the site integrity of the two riverine SACs, the River Usk SAC and the River Wye SAC, regarding water quantity, level and flow. In particular, development will not be permitted if it cannot be accommodated under the Review of Consents for flow in these rivers, including the maximum permissible percentage reduction from naturalised flow levels and hands-off flow conditions.'***

In-Combination Assessment

Similar to the evidence base for the water quality impact pathway, the thresholds for abstraction licenses and hands-off flows are set according to an in-combination approach, such that the integrity of the riverine SACs is protected. As such, the impact pathway water quantity, level and flow, is by definition assessed in-combination with growth in other authorities. Abiding by these thresholds, which account

for the most accurate available scientific evidence, therefore implies that there will be no adverse impacts in-combination with the growth in surrounding authorities. Furthermore, the HRAs of development plans of surrounding authorities (e.g. those of the Brecon Beacons National Park, Blaenau Gwent and Herefordshire) concluded there were no adverse impacts of Plans on the river SACs. It is therefore concluded that there would be no adverse effects on the site integrity of the River Usk SAC and the River Wye SAC regarding water quantity, level and flow in-combination with other Plans.

Severn Estuary SAC

The Severn Estuary SAC includes habitats and species that are likely to be sensitive to changes in the water quantity and flow rate. The primary mechanism by which the Monmouthshire RLDP could affect this would be a change in the water quantity supplied by the Rivers Usk and Wye, most likely a reduction in freshwater input due to water abstraction for the public water supply of new development. For example, the estuary, and the sand- and mudflat habitats are sensitive to changes in water flow rates, which might potentially lead to sediment accretion or erosion in certain locations. Similarly, the Atlantic salt meadow components might be sensitive to a reduction in water flow rates because of the increased deposition rates of sediments in the habitat. The sensitivity of the Severn Estuary SAC also extends to its animal species, which will depend on sufficient hydrological input to migrate up the Rivers Usk and Wye. While many of the qualifying features of the SAC are sensitive to changes in salinity, this mainly relates to reduced salinity within the estuary, for example as a consequence of heavy rainfall events. There is no mechanism by which the Monmouthshire RLDP could trigger a reduction in the salinity of the SAC, and this is therefore not discussed further in this HRA. Changes to the water flow rate within an estuary can be associated with a multitude of further impact pathways, including substratum loss, smothering and changes in wave exposure, and often interact with coastal squeeze. However, in its current form, the Monmouthshire RLDP does not propose for development that might directly affect these processes in the SAC. The remainder of this section therefore addresses whether the RLDP might affect the water flow rate within the Severn Estuary SAC.

As discussed in detail in the Appropriate Assessment section on the River Usk and the River Wye SACs, the Monmouthshire RLDP will increase the water abstraction from both riverine SACs, which may affect the water flow rates in the rivers. However, Dwr Cymru's WRMP (see previous section) concludes that the water supply for Monmouthshire is in surplus for the entire planning period, indicating that the water can be supplied without an adverse effect on relevant European sites. Furthermore, the Review of Consents process undertaken in relation to the River Usk and the River Wye SACs, ensures that the flow will not deviate significantly from natural conditions. While the Review of Consents process was carried out to protect the integrity of the riverine SACs, maintaining the natural flow conditions within the Usk and the Wye will also maintain an appropriate freshwater input into the Severn Estuary SAC. In turn, this ensures that the water flow rate and the hydrological connectivity within the SAC will not adversely affect qualifying habitats (e.g. Atlantic salt meadows) or species (e.g. twaite shad, lampreys). For example, the maintenance of freshwater flow into the SAC will provide hydrological connectivity for anadromous fish species to migrate from the estuary to their upstream spawning grounds. Therefore, given that the policy wording recommended in the previous section (impact pathway water quantity, level and flow in relation to the Rivers Usk and Wye SACs) is incorporated into the Deposit Plan, it is concluded that the Monmouthshire RLDP will not result in adverse effects on the integrity of the Severn Estuary SAC regarding the impact pathway water quantity, level and flow.

In-Combination Assessment

Numerous authorities border the Severn Estuary SAC, including Newport, Forest of Dean and South Gloucestershire. Development allocated within the Plans of these authorities therefore has the potential to affect the water quantity, level and flow in the Severn Estuary SAC in-combination. However, as a legal requirement, HRAs have been undertaken on all these Plans, assessing in-combination effects on European sites. The HRAs have concluded that there will be no in-combination effects on the water quantity, level and flow in the Severn Estuary SAC. For example, the HRA of the Newport LDP concluded that the proposed schemes would have no in-combination effects on the Severn Estuary SAC due to there being no waterways connecting to the SAC. Given the evidence in the relevant HRAs, it is concluded that there would be no adverse effects of the Monmouthshire RLDP on the site integrity of the Severn Estuary SAC regarding the impact pathway water quantity, level and flow in-combination with other Plans.

7. Summary of Conclusions & Recommendations

Due to the relatively limited detail available in the RLDP Preferred Strategy (e.g. no site allocations and only some policy wording is available) and the lack of key evidence (e.g. no air quality assessment), it was not possible to undertake a fully conclusive Appropriate Assessment at this stage. For example, the Deposit Plan HRA will require an Air Quality Impact Assessment and the specific location of the growth allocated in the Plan. This will provide conclusive evidence on how the changed traffic volume / flow might affect European sites or whether specific site allocations might lead to the loss of functionally linked land. However, given that some detailed policy wording is already available, this HRA undertook preliminary Appropriate Assessment of some impact pathways and provides initial recommendations on how to mitigate potential adverse effects of the RLDP on European sites through additional policy wording.

Impact pathway: Atmospheric pollution

Regarding atmospheric pollution, LSEs of the Monmouthshire RLDP on several European sites cannot be excluded, because there is currently no air quality modelling data available. This includes the Usk Bat Sites SAC, the Cwm Clydach Woodlands SAC, the Wye Valley Woodlands SAC and the Severn Estuary SAC / SPA / Ramsar. The following steps should be undertaken for the Deposit Plan HRA:

- Model a minimum of 1 (ideally 2) air quality transect(s) for the A465 that runs along the Usk Bat Sites SAC (upon identification of sensitive heathland components);
- Model a minimum of 1 (ideally 2) air quality transect(s) for the A465 that runs along the Cwm Clydach Woodlands SAC (upon identification of sensitive woodland components);
- In relation to the Wye Valley Woodlands SAC, model 2 air quality transects along the A466 linking Chepstow with Monmouth near Colwell Grove, where the A466 lies approx. 179.7m from the SAC; and on the A40 north-east of Monmouth, where it runs within approx. 126.9m of the SAC; and
- Model 1 air quality transect each on the M4 and M48 in relation to the Severn Estuary SAC / SPA / Ramsar, where these lie within 200m of qualifying saltmarsh on the western side of the Prince of Wales Bridge respectively the Severn Bridge.

Impact pathway: Recreational pressure

Given the existing evidence from other authorities adjacent to the Severn Estuary SPA / Ramsar, and that there are suitable access points to the SPA / Ramsar in southern Monmouthshire, it is concluded that further evidence in relation to recreational pressure is required. Therefore, the following steps are recommended to inform Appropriate Assessment of recreational pressure for the Deposit Plan HRA:

- Undertake a visitor survey at the two access points identified (**Black Rock Picnic Site car park, Wales Coast Path south of Caldicot**) to provide in-combination visitor data that is relevant to Monmouthshire;
- Contact Natural Resources Wales for any available mapping of functionally linked land parcels in the wider area around Severnside and Chepstow to analyse visitor data in the context of the SPA's / Ramsar's sensitive features
- Develop an appropriate policy framework that either makes reference to the existing Stroud Interim Impact Avoidance Strategy or that sets out its own mitigation strategy (i.e. SANG and SAMM) in relation to the Severn Estuary SPA / Ramsar, using the strategy for Stroud and Forest of Dean as a model.

To protect the Severn Estuary SAC, SPA and Ramsar from adverse effects of recreation (e.g. from boating and activities in the intertidal zone) it is recommended to insert the following (or similar) policy wording into an appropriate policy in the Deposit Plan: ***'Any development proposals that would increase visitor access to sensitive habitat features in the Severn Estuary SAC, SPA and Ramsar site, especially on to saltmarsh and mudflat habitat, will not be supported unless it can be demonstrated that no adverse effect on the integrity of the SAC will occur.'***

Impact pathway: Loss of functionally linked land

The HRA determined that adverse effects on the following European sites regarding functionally linked land cannot be excluded: the Usk Bat Sites SAC, the Wye Valley and Forest of Dean Bat Sites SAC and the Severn Estuary SPA / Ramsar. Given that site allocations are not yet available, the definitive Appropriate Assessment for this impact pathway will be undertaken in the Deposit Plan HRA. However, a preliminary assessment of candidate sites highlighted that development allocated in the SGAs of Monmouth, Chepstow and Severnside, may have implications for birds and bats relying on functionally linked habitats. If greenfield sites within the maximum foraging distance of Bewick's swans from the Severn Estuary SPA / Ramsar or the identified foraging ranges surrounding the bat SACs are allocated, it is recommended to insert the following (or similar) policy wording into an appropriate policy of the Deposit Plan:

'To meet the requirements of the Conservation of Habitats and Species Regulations (2017, as amended) regarding allocated greenfield sites that are likely to be functionally linked to the Usk Bat Sites SAC or the Wye Valley and Forest of Dean Bat Sites SAC, the applicant is required to provide evidence that the development will not result in adverse effects on site integrity. Sites with potential functional linkage may be identified using a range of established methods, including radio-tracking data for the two SACs, Core Sustainance Zones (CSZs) derived from other horseshoe bat populations in the UK and habitat assessments. On sites that are potentially linked to the SACs, a suite of bat surveys (e.g. bat activity surveys, roost emergence surveys) will need to be undertaken between April and September as a minimum. Where a land parcel is used by SAC bats, mitigation and avoidance measures might be required, and the planning application will likely need to be assessed through a project-level Habitats Regulations Assessment.'

'To meet the requirements of the Conservation of Habitats and Species Regulations (2017, as amended), the applicant should be required to provide evidence that the development will not result in adverse effects on the integrity of the Severn Estuary SPA / Ramsar regarding its qualifying bird species. To demonstrate this, a survey will be required to determine the habitats and current site use to verify if the land parcel is indeed suitable for supporting a significant population¹⁷⁵ of designated bird species. Where habitats are suitable, non-breeding bird surveys will be required to determine if the site and neighbouring land constitute a significant area of supporting habitat. Bird surveys will need to be undertaken during autumn, winter and spring. If habitat within the site or adjacent land are identified to support significant populations of designated bird species, avoidance measures and mitigation will be required, and the planning application will likely need to be assessed through a project specific Habitats Regulations Assessment to ensure that the development does not result in adverse effects on integrity.'

Impact pathway: Water quality

In order to further protect the integrity of the two riverine SACs (the River Usk SAC and the River Wye SAC), it is recommended that the following text is added to a relevant policy in the Deposit Plan: ***'Any development proposals have to ensure that there will be no adverse effects on the site integrity of the two riverine SACs, the River Usk SAC and the River Wye SAC, regarding water quality generally and phosphorus inputs specifically. This is particularly important because these SACs are designated for habitats and wildlife species that are especially reliant on good water quality.'***

Furthermore, regarding the general protection of aquatic European sites from negative water quality impacts, it is recommended that the following policy wording (or similar) is inserted into an appropriate policy of the Deposit Plan to avoid adverse effects: ***'Regarding new residential and employment development it will be ensured that new growth can be accommodated within the existing wastewater treatment infrastructure network. Where allocated development exceeds the permitted headroom of any Wastewater Treatment Works (WwTW), the development will be delivered in phases to ensure that the consented discharge is not exceeded.'***

The emerging issue of nutrient (phosphate) neutrality in the River Wye SAC and River Usk SAC was also addressed in this HRA. Natural Resources Wales and Natural England advise that all residential development coming forward in the hydrological catchment of these riverine SACs will have to be

¹⁷⁵ A significant population is classified as a site that regularly used by 1% or more of the population of qualifying bird species

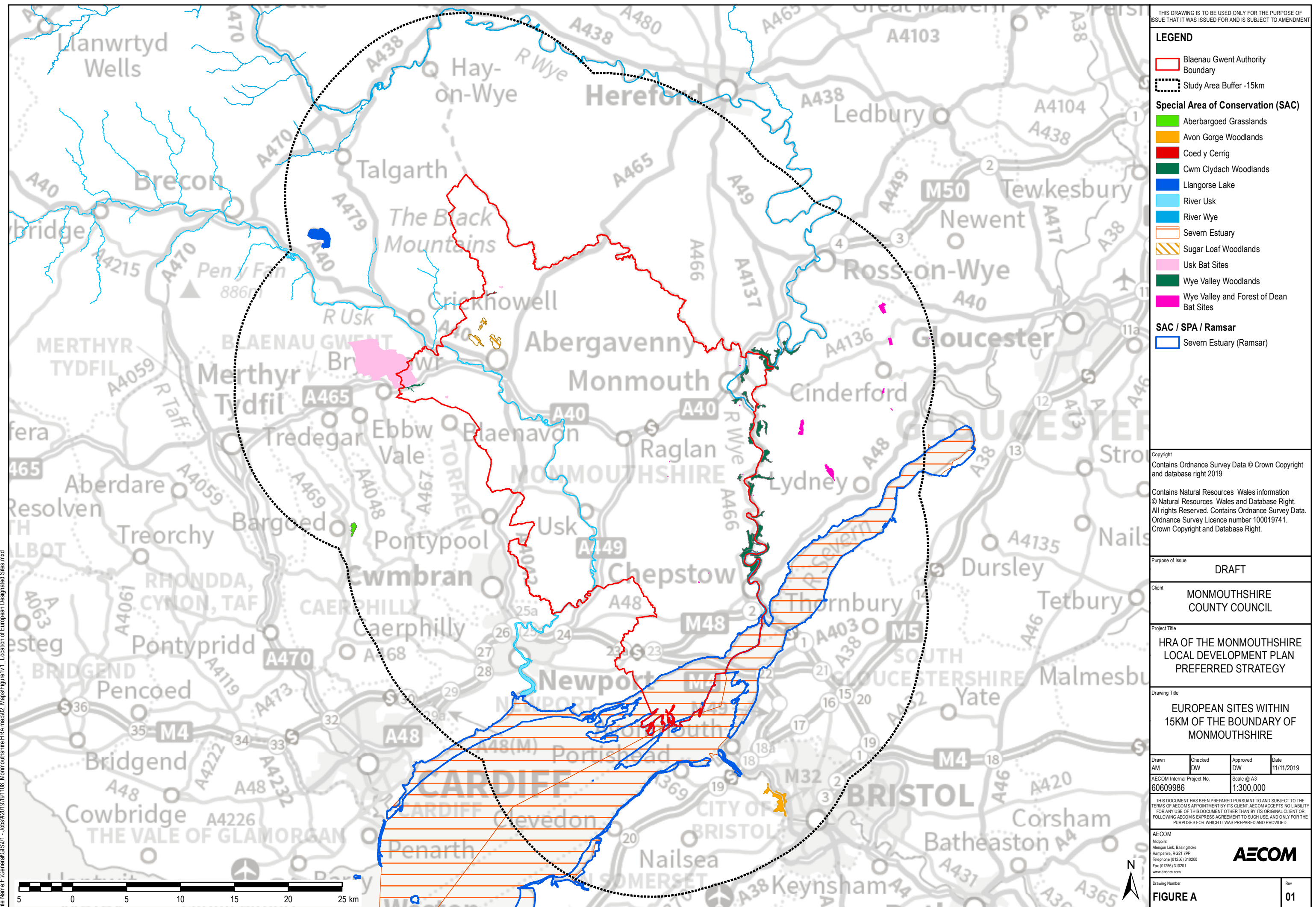
phosphorus neutral and supported by nutrient budgets. AECOM calculated the phosphorus budgets of the potential sites coming forward in the Strategic Growth Areas of Abergavenny and Monmouthshire. All appraised sites show a phosphorus surplus, indicating that a package of mitigation measures will be required to support development coming forward under the Deposit Plan. The phosphorus budget will be recalculated when the final site allocations are available for assessment and more detailed recommendations on mitigation provided.

Impact pathway: Water quantity, level and flow

Due to the sensitivity of the River Usk SAC and the River Wye SAC to changes in the hydrological flow regime as a consequence of water abstraction, it is recommended that specific reference to these sites and their relevant flow targets is made in the supporting text of a relevant policy. The following text (or similar) should be added to the Deposit Plan: ***‘Any development proposals have to ensure that there will be no adverse effects on the site integrity of the two riverine SACs, the River Usk SAC and the River Wye SAC, regarding water quantity, level and flow. In particular, development will not be permitted if it cannot be accommodated under the Review of Consents for flow in these rivers, including the maximum permissible percentage reduction from naturalised flow levels and hands-off flow conditions.’***

8. Appendices

Appendix 1: Map of the European sites within 15km of the boundary of Monmouthshire.



Appendix 2: Screening of the Plan's Strategic Policies

The table presents an HRA screening assessment of all the Strategic Policies within the Preferred Strategy for Monmouthshire. Where policies have been coloured **green** in the 'Test of Likely Significant Effect' column, this indicates that the policy does not contain potential impact pathways linking to European sites and therefore has been screened out from further consideration. Where a policy has been coloured **orange** in the 'Test of Likely Significant Effect' column, this indicates that the policy provides for potential impact pathways linking to European designated sites and has been screened in for Appropriate Assessment.

| Policy number/ name | Policy detail | Test of Likely Significant Effect |
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| Strategic & Spatial Choices | | |
| Strategic Policy S1: Strategic Sustainable and Resilient Growth | <p>In order to meet Monmouthshire's core purpose of building sustainable and resilient communities, between 2018 and 2033 the Plan will make provision for:</p> <ul style="list-style-type: none"> • 7,215 new jobs; and • 8,366* homes to meet a housing requirement of 7,605 homes. <p>The focus of this development will be in accordance with the spatial strategy to distribute growth proportionately across the County's most sustainable settlements, as outlined in the sustainable settlement hierarchy set out in Policy S2.</p> | <p>Likely Significant Effects on European sites cannot be excluded.</p> <p>This policy identifies a quantum of 8,366 net new homes and 7,215 new jobs to be provided in Monmouthshire during the Plan period of 2018-2033. The growth will be focused in the county's most sustainable settlements.</p> <p>Potential impact pathways are present:</p> <ul style="list-style-type: none"> • Atmospheric pollution • Recreational pressure • Loss of functionally linked land • Water quality • Water quantity, level and flow • Noise and visual disturbance from urbanization (e.g. construction, light pollution) <p>Due to these potential linking impact pathways the policy is screened in for Appropriate Assessment.</p> |

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| Strategic Policy S2: Spatial Distribution of Development – Settlement Hierarchy | In order to deliver sustainable and resilient communities, the main focus for new development will be distributed based on the following settlement hierarchy: | | | Likely Significant Effects on European sites cannot be excluded. This policy identifies the settlements in which development will occur in Monmouthshire during the Plan period of 2018-2033. It also provides the quantum of residential development, but not for employment development. The largest amount of growth is predicted for the Primary Settlements Abergavenny (23%), Chepstow (18%) and Monmouth (17%). The quantum and location of development are key factors in determining the magnitude of negative impact pathways linking to European sites. Potential impact pathways are present: <ul style="list-style-type: none">• Atmospheric pollution• Recreational pressure• Loss of functionally linked land• Water quality• Water quantity, level and flow• Noise and visual disturbance from urbanization (e.g. construction, light pollution) Therefore, as a precautionary measure and due to these potential linking impact pathways, the policy is screened in for Appropriate Assessment. |
| | Settlement Hierarchy | Sustainable and Resilient Communities Strategy | | |
| | | Indicative Distribution of Residential Growth | | |
| | | Indicative % of distribution | Indicative No. of homes | |
| | | This will be set out in the Deposit RLDP and will be consistent with the spatial strategy and commensurate to the level of housing growth. | | |
| Tier 1 | Primary Settlements: <ul style="list-style-type: none">• Abergavenny (inc. Llanfoist) 23%• Chepstow 18%• Monmouth (inc. Wyesham) 17% | 1,893 1,521 1,418 | | |
| Tier 2 | Severnside Area made up of: <ul style="list-style-type: none">• Caldicot• Caerwent• Crick 28% across Severnside Area• Magor Undy• Portskwett | 2,323 across Severnside Area | | |

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| | <ul style="list-style-type: none"> • Rogiet • Sudbrook | | | |
| Tier 3 | Secondary Settlements: <ul style="list-style-type: none"> • Penperlleni • Raglan • Usk | 5% across Secondary Settlements | 449 across Secondary Settlements | |
| Tier 4 | Main Rural Settlements: Devauden Dingestow Little Mill Llandogo Llanellen Llangybi Llanishen Llanover Llanvair Discoed Llanvapley Mathern Penallt Pwllmeyric Shirenewton/Mynydd Bach St Arvans The North Tintern | 9% across Main Rural and Minor Rural Settlements | 762 across Main Rural and Minor Rural Settlements | |

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| | <div>Trellech Werngifford/Pandy</div> <div>Tier 5</div> <div>Minor Settlements:</div> <div>Rural</div> <div>Bettws Newydd Broadstone/Catbrook Brynygwenin Coed y Paen Cross Ash Cuckoo's Row Great Oak Grosmont Gwehelog Llanarth Llanddewi Rhydderch Llandegveth Llandenny Llangwm Llansoy Llantilio Crossenny Llantrisant Llanvair Kilgeddin Mitchel Troy Penpergwm The Bryn Tredunnock</div> <div>Tier 6</div> <div>Open Countryside</div> | | | |
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| | <p>Development boundaries will be defined for Settlement Tiers 1 – 4, within which the principle of development is considered to be acceptable, subject to the detailed policy considerations to be set out in the RLDP.</p> <p>Within Tier 5 – Minor Rural Settlements, minor infilling between existing buildings will be considered acceptable, subject to the detailed policy requirements to be set out in the RLDP.</p> <p>Outside of Tiers 1 – 5, open countryside policies will apply where planning permission will only be allowed for the following types of development, subject to satisfying detailed planning criteria:</p> <ul style="list-style-type: none"> • Acceptable conversions of rural buildings • Sub-divisions of existing dwellings • Rural Enterprise Dwellings • One Planet Development • Rural diversification and rural enterprise uses • Affordable housing exception sites adjoining settlement boundaries to meet local needs | |
| Strategic & Spatial Choices | | |
| Strategic Policy S3: Sustainable Placemaking & High Quality Design | <p>Development shall contribute to creating high quality, attractive and sustainable places that support the well-being of the community. In order to achieve this, all development should:</p> <ul style="list-style-type: none"> i) Include and promote high quality, sustainable, safe and inclusive design that offers ease of access for all and provides connectivity between uses; ii) Promote the co-location of uses to minimise the need to travel and to maximise opportunities for active travel and public transport use; iii) Promote a Green Infrastructure-led approach that respects local distinctiveness and the character of the site and its surroundings; and iv) Protect and enhance the natural, historic and built environments and show an understanding of how these function together to contribute towards the quality of places. | <p>There are no LSEs of this policy on European sites.</p> <p>This is a development management policy that establishes design and placemaking criteria for Monmouthshire, including high quality design, public transport use and green infrastructure.</p> <p>The policy does not specify any quantum or location of housing and / or employment development. Furthermore, there are no other mechanisms by which European sites might be affected.</p> |

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| | | Overall, there are no impact pathways present and this policy can thus be screened out from Appropriate Assessment. |
| Strategic Policy S4: Climate Change | <p>All development proposals will be required to make a positive contribution towards addressing the causes of, and adapting to the impacts of, climate change. Means of achieving this will include:</p> <ul style="list-style-type: none"> i) Having low/zero carbon energy requirements by reducing energy demand and promoting energy efficiency; ii) Supporting the development of renewable and low/zero carbon energy generation and a presumption against energy generation utilising fossil fuels, fracking and methods that are not low/zero carbon; iii) Utilising sustainable construction techniques and local supplies through the adoption of the circular economy principles; iv) Incorporating water efficiency measures and minimising adverse impacts on water resources and quality; v) Promoting the efficient use of land and co-location of uses to minimise the overall need to travel and maximise opportunities for active travel and public transport use; vi) Promoting the provision of ultra-low emission vehicle charging infrastructure to reduce emissions and improve air quality; vii) Support resilience of development through Green Infrastructure solutions including: opportunities for biodiversity and resilient ecosystems, greenspace provision and connectivity, sustainable energy use, local food production and flood attenuation and water resource management; and viii) Avoid locating development in areas at risk of flooding, or where appropriate, minimise the risk of flooding including the incorporation of measures such as Sustainable Urban Drainage Systems and flood resilient design. | <p>There are no LSEs of this policy on European sites.</p> <p>This is a development management policy addressing measures to tackle climate change in Monmouthshire, including low / zero carbon energy requirements, ultra-low emission vehicles, water efficiency measures and Green Infrastructure solutions.</p> <p>The water efficiency detailed within the policy might have a positive impact on the freshwater and marine European sites located wholly or partly within Monmouthshire.</p> <p>The policy does not specify any quantum or location of housing and / or employment development. Furthermore, there are no other mechanisms by which European sites might be affected.</p> <p>Overall, there are no impact pathways present and this policy can thus be screened out from Appropriate Assessment.</p> |
| Strategic Policy S5: Infrastructure Provision | Where existing infrastructure is inadequate to serve the development, new or improved infrastructure and facilities to remedy deficiencies must be provided in phase with proposed development. Where provision on-site is not appropriate, off-site provision, or a financial contribution towards it, will be sought. | <p>There are no LSEs of this policy on European sites.</p> <p>This is a development management policy detailing that infrastructure must be in place</p> |

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| | <p>Financial contributions will also be required towards the future management and maintenance of facilities provided, either in the form of initial support or in perpetuity.</p> <p>Planning Obligations may be sought to secure improvements in infrastructure, facilities, services and related works, where they are necessary to make development acceptable. In identifying appropriate contributions due regard will be paid to the overall development viability, including the cost of measures that are necessary to physically deliver a development and ensure that it is acceptable in planning terms. Such obligations may include:</p> <ol style="list-style-type: none"> 1. Affordable Housing Provision 2. Education Facilities 3. Broadband Infrastructure 4. Active Travel 5. Sustainable Transport Measures 6. Transport Infrastructure 7. Recreation and Leisure Facilities including formal and informal open space 8. Green Infrastructure 9. Community and Cultural Facilities 10. Ecological Mitigation and Enhancement 11. Strategic utilities 12. Renewable / Low Carbon Energy Infrastructure 13. Local Climate Change Mitigation and Adaption Measures 14. Flood Risk Management Measures 15. Waste management facilities 16. Commuted payments for the management and maintenance of facilities provided 17. Other facilities and services considered necessary. <p>In the event that viability considerations indicate that not all the identified contributions can be reasonably required, priority contributions will be determined on the basis of the individual circumstances of each case. In the case of housing developments, priority will be given to the affordable housing required by Policy S7 unless there is an overwhelming need for the available contribution, in whole or in part, to be allocated for some other necessary purpose/s.</p> <p>Proposals for utility services to improve infrastructure provision will be permitted, subject to detailed planning considerations.</p> | <p>or provided in phase to serve proposed development. It stipulates that financial contributions towards the management and maintenance of infrastructure should be made in perpetuity.</p> <p>The infrastructure that is addressed in this policy covers sustainable transport measures, open space for recreation and strategic utilities, such as wastewater treatment facilities. These measures would have a positive effect on European sites that are linked to the impact pathways atmospheric pollution, recreational pressure and water quality.</p> <p>Overall, there are no impact pathways present and this policy can thus be screened out.</p> |
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| Active & Social Places | | |
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| Strategic Policy S6: Delivery of Homes | In order to meet the housing requirement of 7,605 new dwellings provision will be made for the development of up to 8,366 new dwellings during the Plan period to enable a 10% flexibility allowance (to be given further consideration through the Deposit Plan preparation process). | <p>Likely Significant Effects on European sites cannot be excluded.</p> <p>This is a housing management policy that identifies while only 7,605 net new homes will be needed in the Plan period, a provision of 8,366 dwellings is made to enable a 10% flexibility buffer.</p> <p>Potential impact pathways are present:</p> <ul style="list-style-type: none"> • Atmospheric pollution • Recreational pressure • Loss of functionally linked land • Water quality • Water quantity, level and flow • Noise and visual disturbance from urbanization (e.g. construction, light pollution) <p>Due to these potential linking impact pathways the policy is screened in for Appropriate Assessment.</p> |
| Strategic Policy S7: Affordable Homes | <p>The affordable housing target for the Plan period of 2018 – 2033 is set at 2,450 homes.</p> <p>Further detail relating to affordable housing percentage thresholds will be included in the Deposit RLDP to reflect the outcomes of the emerging viability work.</p> | <p>Likely Significant Effects on European sites cannot be excluded.</p> <p>This is a housing management policy that identifies the affordable housing target for Monmouthshire to be 2,450 homes in the Plan period. This policy sets out an actual quantum of affordable housing which increases the overall housing delivery in Monmouthshire.</p> |

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| | | <p>Potential impact pathways are present:</p> <ul style="list-style-type: none"> • Atmospheric pollution • Recreational pressure • Loss of functionally linked land • Water quality • Water quantity, level and flow • Noise and visual disturbance from urbanization (e.g. construction, light pollution) <p>Due to these potential linking impact pathways the policy is screened in for Appropriate Assessment.</p> |
| Strategic Policy S8: Strategic Development Sites | <p>Strategic Development Sites will be allocated to contribute to the delivery of the housing and job growth rates set out in Policy S1.</p> <ul style="list-style-type: none"> - To be specified in the Deposit RLDP following consideration of the responses to the Preferred Strategy, the second call for Candidate Sites and detailed site assessments. | <p>Likely Significant Effects on European sites cannot be excluded.</p> <p>This policy identifies that Strategic Development Sites will be allocated throughout Monmouthshire, to aid the delivery of housing and employment across the authority. The supporting text identifies potential Strategic Growth Areas for each of the Primary Settlements and Severnside, all of which are allocated in Policy S2. Depending on which Strategic Growth Areas are developed, this might have implications for European sites.</p> <p>Potential impact pathways are present:</p> <ul style="list-style-type: none"> • Atmospheric pollution • Recreational pressure • Loss of functionally linked land • Water quality |

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| | | <ul style="list-style-type: none"> • Water quantity, level and flow • Noise and visual disturbance from urbanization (e.g. construction, light pollution) <p>Due to these potential linking impact pathways the policy is screened in for Appropriate Assessment.</p> |
| Strategic Policy S9: Gypsy and Travellers | Land will be made available to accommodate future unmet gypsy and traveller accommodation needs if a need is identified in the updated Gypsy & Traveller Accommodation Assessment. | <p>There are no LSEs of this policy on European sites.</p> <p>This is a housing management policy detailing that additional land will be made available to accommodate any future need by gypsies and travellers. The provision of such land would effectively entail housing beyond the quantum provided in Policy S1 and would be associated with similar impact pathways.</p> <p>However, this policy currently does not explicitly identify such need, nor does it allocate gypsy and traveler pitches. It is therefore screened out from Appropriate Assessment.</p> |
| Strategic Policy S10: Sustainable Transport | <p>Development proposals should promote sustainable, safe forms of transport which reduce the need to travel, increase provision for walking and cycling and improve public transport provision. This will be facilitated by:</p> <ul style="list-style-type: none"> • Favouring development that accords with the Sustainable Transport Hierarchy of reducing the need to travel, especially by car, and promoting walking, cycling and public transport. | <p>Likely Significant Effects on European sites cannot be excluded.</p> <p>This is a transport management policy outlining the delivery of sustainable transport infrastructure with a focus on active travel modes. Overall, this might have a positive effect on European sites that are sensitive to atmospheric pollution.</p> |

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| | <ul style="list-style-type: none">• Promoting and enabling use of ultra low emission vehicles by providing charging infrastructure;• Promoting active travel through safeguarding, enhancing and expanding on the Active Travel Network identified in the Integrated Network Maps;• Favouring development close to public transport facilities and designing developments to facilitate and incorporate public transport infrastructure and connections;• Improving road safety;• Minimising the adverse effects of parking;• Improving public transport links between the County's main towns and other key settlements in the region; and• Developing the role of the key settlements of Abergavenny, Caldicot, Chepstow and Monmouth, around which high-capacity sustainable transport links can be developed. <p>The Deposit Plan will safeguard sites necessary to deliver the key transport measures and schemes identified in the Updated Local Transport Plan.</p> | <p>It is noted that this policy has the potential to impact functionally linked habitat usage through lighting requirements, particularly in relation to European sites designated for bats. Furthermore, depending on schemes brought forward under this policy, there is also the potential for enhancing recreational access to sensitive European sites. Because no detail on potential schemes is provided, the policy will be further assessed in the Deposit Plan HRA.</p> <p>The policy does not identify a quantum and location of residential and employment development.</p> <p>Potential impact pathways are present:</p> <ul style="list-style-type: none">• Recreational pressure• Loss of functionally linked land <p>Due to these potential linking impact pathways the policy is screened in for Appropriate Assessment.</p> | | | | |
| Strategic Policy S11: Retail & Commercial Centres Hierarchy | <p>To sustain and enhance a network of town centres, a retail hierarchy is defined below. All new or enhanced retail and commercial developments should be consistent in scale and nature with the size and character of the centre and its role in the retail hierarchy. Proposals which would undermine the retail hierarchy will not be permitted.</p> <table><tr><td>County Towns</td><td>Abergavenny Caldicot Chepstow Monmouth</td></tr><tr><td>Local Centres</td><td>Magor</td></tr></table> | County Towns | Abergavenny Caldicot Chepstow Monmouth | Local Centres | Magor | <p>There are no LSEs of this policy on European sites.</p> <p>This is a development management policy outlining the retail hierarchy in Monmouthshire, with Abergavenny, Caldicot, Chepstow and Monmouth as County Towns. However, the policy does not specifically allocate residential and / or employment</p> |
| County Towns | Abergavenny Caldicot Chepstow Monmouth | | | | | |
| Local Centres | Magor | | | | | |

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| | <p>Raglan Usk</p> <p>Neighbourhood Centres/Shops (These will be reviewed as part of the Deposit RLDP)</p> <p>Abergavenny</p> <ul style="list-style-type: none"> • Hillcrest Road • Rother Avenue • The Mardy <p>Caldicot</p> <ul style="list-style-type: none"> • West End <p>Chepstow</p> <ul style="list-style-type: none"> • Bulwark • Thornwell <p>Monmouthshire</p> <ul style="list-style-type: none"> • Overmonnow • Wyesham • The Albion | <p>development, and therefore has no direct implications for European sites.</p> <p>Therefore, there are no impact pathways present and this policy can be screened out from Appropriate Assessment.</p> |
| Strategic Policy S12: Community and Recreation Facilities | <p>Development proposals that provide and/or enhance community and recreation facilities will be permitted within or adjoining town and village development boundaries subject to detailed planning considerations. Development proposals that result in the unjustified loss of community and recreation facilities will not be permitted.</p> | <p>There are no LSEs of this policy on European sites.</p> <p>This is a development management policy that stresses the importance of community and recreation facilities within Monmouthshire. This is positive because the provision of recreation infrastructure might help to reduce visitor pressure in sites that are more sensitive to recreational pressure.</p> <p>The policy itself does not identify a quantum and location of residential and employment development. There is no other policy wording that might have negative implications for European sites.</p> |

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| | | Therefore, there are no impact pathways present and this policy can be screened out from Appropriate Assessment. |
| Strategic Policy S13: Employment Sites Provision | <p>Provision will be made for a minimum of 43 ha of land on a suitable range and choice of sites for industrial and business development (classes B1, B2 and B8 of the Town and Country Planning Use Classes Order 1987) in accordance with the Plan's Spatial Strategy.</p> <p>Existing employment land and premises that continue to be required for employment purposes will be protected from alternative forms of development.</p> <p>To ensure that a range of types and sizes of employment land and premises is provided, development for the following will be permitted, subject to detailed planning considerations:</p> <ul style="list-style-type: none"> • Small units and workshops for small businesses throughout the County to assist in providing regeneration opportunities, enabling SMEs to start up and grow, and ensuring sustainable economic growth; • The integration of new employment opportunities in mixed-use developments. | <p>Likely Significant Effects on European sites cannot be excluded.</p> <p>This is an employment management policy that allocates 43ha of employment land to be delivered in the Plan period. There are potential linking impact pathways associated with the delivery of industrial and business development.</p> <p>Potential impact pathways are present:</p> <ul style="list-style-type: none"> • Atmospheric pollution • Loss of functionally linked land • Water quality • Water quantity, level and flow • Noise and visual disturbance from urbanization (e.g. construction, light pollution) <p>Due to these potential linking impact pathways the policy is screened in for Appropriate Assessment.</p> |
| Strategic Policy S14: Rural Enterprise | Development to enable rural enterprise uses and the diversification of the rural economy will be permitted outside settlement development boundaries where it is of a scale and type compatible with the surrounding area and will cause no unacceptable harm to the surrounding landscape, historic and cultural heritage, biodiversity or local amenity value. Development must re-use or adapt existing buildings where possible. The exceptional circumstances in which new buildings may be permitted outside the settlement boundaries to support the rural economy will be set out in the Deposit RLDP. | <p>There are no LSEs of this policy on European sites.</p> <p>This is a development management policy providing for the development of the rural economy, provided there is no unacceptable harm to the surrounding landscape and biodiversity value. Therefore, while the policy</p> |

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| | | <p>might accommodate employment development, this is covered in Policy S13, and as such is not reassessed here.</p> <p>Overall, there are no impact pathways present and this policy can be screened out from Appropriate Assessment.</p> |
| Strategic Policy S15: Visitor Economy | <p>Development proposals that provide and / or enhance sustainable forms of tourism will be permitted subject to detailed planning considerations.</p> <p>Development proposals that would have an unacceptable adverse impact on features and areas of tourism interest and their settings, or that would result in the unjustified loss of tourism facilities will not be permitted.</p> | <p>Likely Significant Effects on European sites cannot be excluded.</p> <p>This policy supports the delivery of sustainable forms of tourism in Monmouthshire. Tourism policies might have similar effects to those that deliver housing, as they are likely to result in a temporary increase in a given population, potentially visiting sensitive European sites in the process.</p> <p>Potential impact pathways are present:</p> <ul style="list-style-type: none"> • Atmospheric pollution • Recreational pressure • Loss of functionally linked land • Water quality • Water quantity, level and flow • Noise and visual disturbance from urbanization (e.g. construction, light pollution) <p>Due to these potential linking impact pathways the policy is screened in for Appropriate Assessment.</p> |

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| <p>Strategic Sustainable Management</p> <p>Policy S16: Waste</p> | <p>To facilitate the delivery of sustainable management of waste the Plan will:</p> <ul style="list-style-type: none"> i) Ensure that proposals conform to the principles of the waste hierarchy supporting those that move waste up the hierarchy; ii) Support an integrated and adequate network of waste management installations that has regard to the nearest appropriate installation concept and self-sufficiency principles where necessary; iii) Identify suitable allocated and protected Class B2 industrial sites that are appropriate for in-building waste management treatment facilities, subject to detailed planning considerations; iv) Support the circular economy by encouraging the minimisation of the production of waste and the use of reused and recycled materials in the design, construction and demolition stages of development; and v) Ensure that provision is made for the sustainable management, sorting, storage and collection of waste in all new development. | <p>There are no LSEs of this policy on European sites.</p> <p>This is a positive development management policy providing for the sustainable management of waste, including support for the principles of the waste hierarchy and an integrated network of waste management installations.</p> <p>The policy itself does not identify a quantum and location of residential and employment development. There is no other policy wording that might have negative implications for European sites.</p> <p>Overall, there are no impact pathways present and this policy can be screened out from Appropriate Assessment.</p> |
| <p>Strategic Minerals</p> <p>Policy S17:</p> | <p>The Council will sustainably manage its mineral resources by:</p> <ul style="list-style-type: none"> i) Safeguarding known / potential sand and gravel and limestone resources for future possible use; ii) Maintaining a minimum 10-year land bank of crushed rock and 7 years land-based sand and gravel reserves throughout the Plan period in line with national guidance; and iii) Encouraging the efficient and appropriate use of high-quality minerals and maximising the potential for the use of secondary and recycled aggregates as an alternative to primary land won resources. | <p>There are no LSEs of this policy on European sites.</p> <p>This is a resource management policy identifying the sustainable use of minerals resources. While the policy does safeguard known sand / gravel / limestone resources for future possible use, the mere safeguarding of such sites is not of direct relevance to European sites. Any change in this policy could be assessed as part of a future HRA of the RLDP review.</p> <p>The policy itself does not identify a quantum and location of residential and employment</p> |

| | | |
|---|--|---|
| | | <p>development. There is no other policy wording that might have negative implications for European sites.</p> <p>Overall, there are no impact pathways present and this policy can be screened out from Appropriate Assessment.</p> |
| Distinctive & Natural Places | | |
| Strategic Policy S18: Green Infrastructure, Landscape and Nature Conservation | <p>Green Infrastructure assets and opportunities should embrace the placemaking approach and be designed and managed to deliver a multifunctional resource; capable of delivering a wide range of social, economic, environmental and health and well-being benefits for local communities and the county as a whole, including climate change action and mitigation.</p> <p>Development proposals must:</p> <p>Maintain, protect and enhance the integrity and connectivity of Monmouthshire's green infrastructure, including landscape, biodiversity, public rights of ways and heritage assets through the following key functions:</p> <ul style="list-style-type: none"> (i) Landscape Setting and Quality of Place, by identifying, protecting and, where appropriate, enhancing the distinctive landscape, historical, cultural, ecological and geological heritage, including natural and man-made elements associated with existing landscape character; (ii) Biodiversity and Resilient Ecosystems by protecting, positively managing and enhancing biodiversity and geological interests, including designated and non-designated sites, and habitats and species of importance and the ecological connectivity between them; (iii) Greenspace Provision, Connectivity and Enjoyment by ensuring the creation of accessible multifunctional interconnected spaces that offer opportunities for recreation and health and well-being; (iv) Sustainable Energy Use; (v) Local Food Production; and (vi) Flood Attenuation and Water Resource Management. | <p>There are no LSEs of this policy on European sites.</p> <p>This is a development management policy providing for the protection of green infrastructure, landscape and nature conservation, including both designated and non-designated sites. It explicitly states that development proposals must protect and enhance the integrity of Monmouthshire's green infrastructure and biodiversity.</p> <p>The policy also explicitly provides for and protects the ecological connectivity of both habitats and individual populations of a species. As such, this policy might have a positive general effect on the European sites linked to the Plan.</p> <p>The policy itself does not identify a quantum and location of residential and employment development. There is no other policy wording that might have negative implications for European sites.</p> |

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| | | Overall, there are no impact pathways present and this policy can be screened out from Appropriate Assessment. |
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Appendix 3: Preliminary Nutrient Neutrality Technical Note

Nutrient Neutrality for the River Wye and River Usk – Phosphates

Background to Nutrient Neutrality at the River Wye and River Usk

- 1.1 The River Usk is a riverine freshwater system of plain to montane levels with *Ranunculus fluitantis* and *Callitriche-Batrachion* vegetation. The Core Management Plan¹ published by Natural Resources Wales highlights the water quality in the system as a primary determinant of its ecological status, which is currently classified as unfavourable. While the main water quality impact in this catchment originates from agriculture, pollutants from sewage effluent, particularly increases in phosphorus concentrations, have the potential to increase the abundance of filamentous algae and to decrease the aquatic flowering plants. Eutrophication can lead to reduced dissolved oxygen concentrations, which in turn reduces the viability of fish populations.
- 1.2 The River Wye is also sensitive to aquatic pollutants. Natural England's Site Conservation Objectives Supplementary Advice Note² highlights that elevated nutrient levels in the river, especially the concentration of phosphorus, are likely to lead to eutrophication. This might change plant growth and community composition of the 'water courses of plain to montane levels' qualifying feature, as well as having knock-on effects (e.g. loss of substrate for spawning and early life stages, reduced dissolved oxygen (DO) concentrations, increased turbidity) on fish species, such as Atlantic salmon and shad, which generally require high DO and clear water.
- 1.3 The Monmouthshire Replacement Local Development Plan (RLDP) makes a provision for 8,366 new homes, which will increase the production of sewage effluent and therefore input of phosphorus into both the River Wye and River Usk. As a result, nutrient neutrality calculations are required to support the HRA of the Monmouthshire RLDP and to determine the level of phosphorous offsetting that is likely to be required to enable the quantum of development identified within the Plan (specifically within the Wye and Usk catchments) to be brought forward without resulting in the deterioration of phosphorous levels within these rivers.

Background to the Phosphorous Nutrient Neutrality Calculations

- 1.4 The main contribution to phosphorus release into surface water is provided by the effluent discharge, and as such increased residential development should not be ignored. In comparison, diffuse pollution from agricultural runoff is likely to provide a small contribution to phosphate levels and this issue is managed via Catchment Sensitive Farming). As described by Jarvie *et al.*³, new residential units within the hydrological catchment for the Arun Valley are likely (through increased sewage production) to add phosphates to a site via wastewater treatment effluent.

¹ Available at: https://naturalresources.wales/media/673384/River_Usk%20SAC%20core%20plan.pdf [Accessed on the 23/08/2019]

² Available at: <http://publications.naturalengland.org.uk/file/6041981725966336> {accessed 10/03/2021}

³ Jarvie, H. P., Neal, C., & Withers, P. J. (2006) *Sewage-effluent phosphorus: a greater risk to river eutrophication than agricultural phosphorus?* Science of the total environment, 360(1-3), 246-253.

- 1.5 Since the issue remains under investigation at this stage no nutrient neutrality calculation methodology for the River Wye and River Usk European sites has been developed. However, a methodology for calculating the phosphate release of new development (through both changes in land use and, particularly, release of treated sewage effluent) has been developed for Stodmarsh SAC, SPA and Ramsar site in Kent and the calculation methodology would be essentially identical if Natural Resources Wales did determine that development in the Wye and Usk catchments also needed to achieve nutrient neutrality. Nutrient neutrality calculations have therefore been undertaken for the residential candidate sites within the RLDP Preferred Strategy Strategic Growth Areas located in the catchment areas of both rivers, using the phosphorus calculation method developed for Stodmarsh.
- 1.6 Note that this assessment is based on candidate sites submitted during the Initial Call for Candidate Sites. All candidate sites within the relevant Strategic Growth Areas have been assessed. However, since the total capacity of all the sites far exceeds the development requirement for the RLDP it should be noted that in practice only a small number of these sites are likely to ultimately be included in the Deposit Plan as allocations.

Appropriate Assessment

- 1.7 A proportion of the new residential development provided by the Monmouthshire RLDP will be serviced by Wastewater Treatment Works (WwTW) that discharge into watercourses that ultimately drain to the River Wye and River Usk (and their associated designated sites). The Council has provided the WwTW which they expect the planned residential development to be serviced by. At this stage it has not been confirmed which WwTW will service a particular candidate site. This will generally not occur until a water company has a planning application to consider. For the purposes of this assessment, the WwTW identified by the Council to service each particular residential candidate site has been used. A more detailed and accurate Nutrient Neutrality calculation may therefore need to be provided by the applicant at the individual planning application stage.
- 1.8 Achieving nutrient neutrality is one way to address the existing uncertainty surrounding the impact of new development on designated sites. Natural England and Natural Resources Wales advise that a phosphate budget (referred to as Total Phosphorus (TP)) can be calculated for new developments and Natural England has provided a guidance document to enable this to be calculated⁴. That document was specifically prepared for the Stour catchment in Kent. However, the basic phosphate calculation methodology is transferable to other European sites. The main reason for this is that both systems are freshwater systems that are likely to have similar sensitivities to phosphorus, the primary growth-limiting nutrient in freshwater ecosystems. This Technical Note uses the methodology for the Stour Valley catchment to estimate the nutrient balance for the Monmouthshire RLDP within the River Wye and the River Usk. The results are summarised in Table 1 below; with full detail provided in Appendix A.

Phosphorus Balance within the Monmouthshire RLDP

- 1.9 The phosphorus nutrient neutrality calculation undertaken for the Monmouthshire RLDP indicates whether development would avoid harm to protected sites (in this case the River Wye SAC and River Usk SAC) from phosphate discharge (generally by

⁴ Natural England (July 2020). Advice on Nutrient Neutrality for New Development in the Stour Catchment in Relation to Stodmarsh Designated Sites - For Local Planning Authorities.

resulting in a net reduction in phosphorus entering the catchment), or whether mitigation would be required to ensure that there is no adverse effect from phosphorus discharge.

1.10 The nutrient budget calculation for the Monmouthshire RLDP residential candidate sites involved four stages:

- Stage 1: Future phosphorus load in treated wastewater effluent
- Stage 2: Phosphorus loss due to conversion of existing land uses
- Stage 3: Phosphorus leachate from future land uses
- Stage 4: Overall phosphorus budget for the site

1.11 Existing land use was determined at this high-level by assessing satellite imagery on Google Maps. Future land uses (e.g. the extent of the urban fabric and any open space) were identified either by using masterplans where available, or by calculating the broad area that would be taken up by residential development using a standard housing density of 30 dwellings per hectare and defining the resulting area as the 'urban' land on the developed site. At this early stage in plan preparation no masterplans were available to determine the amount of green SANG space that is to be provided by each candidate site. All collected information fed into the nutrient calculation described below. Each type of broad land use (urban, park/SANG, cereal, lowland grazing etc.) has a P load assigned to it in the nutrient neutrality calculation methodology. Therefore, converting land from (for example) cereal cropping to urban land considerably reduces the P load. However, whether this is enough to offset the increased P load due to treated sewage effluent is dependent on the types of habitat involved and the area of land involved.

1.12 Note that the calculations make a series of broad assumptions about a) the existing habitats on site (and thus the amount of phosphorus they currently release into the catchment) and b) how each site is to be developed (the areas to be altered) and thus the future balance between areas of housing and areas of retained greenspace. Therefore, the calculations undertaken for this report would need to be re-run by the applicants for each housing scheme and planning application as each scheme is developed and a detailed masterplan becomes available.

1.13 These calculations are based on a worst-case assumption that all phosphorus discharged from these sites will reach the River Wye and Rive Usk SAC sites.

1.14 The below table (

- 1.15 **Table 1)** identifies which Monmouthshire RLDP candidate sites discharge to WwTWs that ultimately discharge to the River Wye or River Usk SAC international sites and the amount of phosphorus each candidate site is predicted to produce as a result of the changed land use and residential development. Those candidate sites identified in red in the final column (candidate site phosphorus loading) are calculated to result in a Phosphorous surplus.

Table 1: Candidate sites That Are Likely to Ultimately Discharge to the River Wye and River Usk Internationally Designated Sites, and Associated WwTW.

| Candidate Site | Site Name | Number of Residential Dwellings | Likely Wastewater Treatment Works (WwTW) | Candidate Site Phosphorus loading |
|-----------------------|--------------------------------------|--|---|--|
| Abergavenny | | | | |
| CS0093 | Land at Evesham Nurseries, Llanfoist | 180 | Llanfoist | 171.9 |
| CS0094 | Land at Penlanlas Farm | 146 | Llanfoist | 139.5 |
| CS0125 | Abergavenny Urban Extension | 1698 | Llanfoist | 1610.2 |
| CS0128 | Land at Chapel Farm Fields | 130 | Llanfoist | 127.9 |
| CS0192 | Land off Old Hereford Road | 45 | Llanfoist | 48.6 |
| Monmouth | | | | |
| CS0051 | Land at Croft Y Bwla Farm | 400 | Monmouth | 403.6 |
| CS0078 | Land adj Croft Y Bwla Farm | 350 | Monmouth | 332.7 |
| CS0090 | Land north Wonastow Road | 264.6 | Monmouth | 250.7 |
| CS0099 | Drybridge Farm | 200 | Monmouth | 196.6 |
| CS0160 | Land at Vauxhall Fields | 257.4 | Monmouth | 241.6 |
| CS0182 | Land north of Dixon Road | 950 | Monmouth | 882.6 |
| CS0196 | Land at Drewwen Farm | 180 | Monmouth | 173.7 |

1.16 The Plan Level nutrient neutrality assessment of the above candidate sites (provided in

- 1.17 **Table 1)** identified that all sites are likely to result in a net increase in phosphate levels within the River Wye and River Usk in comparison to current land use. As such, these are all development sites for which phosphorus offsetting will need to be identified before planning consent could be granted.
- 1.18 In order to be compliant with the Conservation of Habitats and Species Regulations 2017 (as amended) it is likely to be necessary for the Council to address the potential need for avoidance measures and / or mitigation for phosphate discharge from the candidate sites within the Local Plan identified to ultimately discharge to the River Wye and River Usk, at least regarding the first five years of plan delivery (on the basis that all Local Plans must be reviewed every five years in any event). However, the issue of phosphorus neutrality is very difficult to address purely at the Local Plan or planning application level and will in the opinion of AECOM need to be driven by the wastewater company, the Welsh Government and Natural Resources Wales.
- 1.19 The below table outlines the current or already planned future phosphorus discharge permits for each relevant WwTW, and the expected phosphorus discharge resulting from the RLDP. Detail of the surplus from each residential candidate site is provided in **Appendix A**

Table 2 Summary of Calculation of Increased WwTW / STW Phosphorous Output Due to all candidate sites combined.

| Likely Wastewater Treatment Works (WwTW) | Number of Residential Dwellings | Current or Future Planned Phosphorus Environmental Permit per WwTW (mg/l) TP | Surplus phosphate discharge resulting from all candidate sites combined (kg/P/yr) |
|--|---------------------------------|--|---|
| Llanfoist WwTW | 2199 | 8 | 2098.07 |
| Monmouth WwTW | 2602 | 8 | 2481.43 |

- 1.20 Table 2 indicates that if all candidate sites located within each of the above WwTW catchments (as identified in red in

- 1.21 Table 1) came forward this would result in an exceedance of the existing permitted phosphate discharge limits when compared to a 'no change' in existing land use scenario. Since only some candidate sites will ultimately become allocations in the Deposit Plan the effect on the River Wye SAC and River Usk SAC will actually be much smaller than indicated in Table 2. However, Table 1 indicates that all individual sites would result in a nutrient surplus in the receiving SAC.
- 1.22 Based on the calculation described above, there will be an increase in phosphorous output into the hydrological catchment of both the River Wye and River Usk designated sites as a result of new housing proposed within the Monmouthshire RLDP. Therefore, nutrient neutrality would not be met in the absence of mitigation.
- 1.23 It should be noted that the above calculations have only been undertaken on candidate sites identified within the Monmouthshire RLDP. By their nature, any windfall development has not been included within the above calculation since it is not known where these would be located, how they would change existing land use or how many dwellings would be delivered on each site. Nutrient Neutrality will require consideration at the individual planning application stage once the location, and extent of that windfall development has been identified.

Potential Avoidance Strategies / Solutions to Explore

1.24 The following mitigation options are potentially available:

- i. Removing additional land from agricultural production – While agriculture does not contribute as much phosphorus to watercourses as treated sewage effluent, it does contribute some phosphorus. For example, each hectare of mixed-use land generally contributes approximately 0.27 kilograms of phosphorus per year, while each hectare of dairy contributes 0.49 kilograms. Therefore, removing additional land from agricultural production and putting it down to parkland (which has a relatively low phosphorus loss rate of 0.14 kilograms per hectare) would offset the phosphorus released in treated wastewater from the new housing. However, initial broad calculations indicate that a further 13,000ha of additional dairy⁵ or c. 17,000ha of additional mixed farmland would need to be removed from agricultural production within the River Wye and River Usk catchments to offset the phosphorus produced by the new housing. Clearly this is not feasible as a solution for all the planned growth within the catchments, although it could play a small part of the solution if, for example, Monmouthshire Council is planning a new country park or similar which involves turning agricultural land to unfertilised habitats;
- ii. Securing further improvement to Wastewater Treatment Works (WwTW) Infrastructure – Current Environment Agency (EA) guidance suggests that the use of conventional on-site treatment methods can produce effluent with phosphorus concentrations as low as 0.25mg/l. Many WwTW have treatment thresholds above this level or no permit limit. This is true for the two WwTW relevant to Monmouthshire. There is thus considerable scope for improving phosphorus removal which if applied to both WwTW would likely create headroom for growth by treating all effluent (including from all existing housing) to a much higher standard. However, any further improvements to the infrastructure at WwTW would need to be secured through a formal agreement with the water company if it isn't being required by Natural Resources Wales, the Welsh Government or the regulator. As there is currently no requirement for reducing to a 0.25 mg/l phosphorus consent for works that are not already doing so, any request to improve effluent quality would require external investment in a new Tertiary treatment plant (at a likely cost of £1 million+). Moreover, obtaining consent for, and delivering, tertiary treatment at WwTW that do not already have it is likely to take at least 5 years;
- iii. Identifying an alternative wastewater discharge location - Discharging to ground would 'bypass' surface waterbodies, ultimately contributing to groundwater. It is considered that this would reduce the phosphorus loading in surface water and help in protecting the River Wye and River Usk sites. This is because adsorption and metal complex formation retain most of the potentially mobile phosphorus and thus reduce mobilisation from groundwater into surface waters. However, at the scale required this is not feasibly something that could be accommodated without extensive involvement from Natural Resources Wales, Welsh Water and Welsh Government as it would involve fundamentally changing the discharge approach for the catchment;

⁵ Assuming converting dairy (phosphorus loss rate of 0.49 kg/ha/yr) to unfertilised semi-natural habitat (phosphorus loss rate of 0.14 kg/ha/yr), 1ha of conversion will offset 0.35 kilograms of phosphorus ($0.49 - 0.14 = 0.35$). To offset the 4,579.5 kg of phosphorus produced by the planned residential development would therefore require c. 13,000ha of dairy land to be removed from agricultural production ($4579.5 / 0.35 = 13,084$).

- iv. Utilising local packaged WwTW - A local packaged WwTW associated specifically with the development could be used to provide a removal route for the additional phosphorus. However, treatment would require the use of a chemical dosing system which would still only achieve a 1mg/l phosphorus concentration. The only method to achieve a lower concentration through packaged treatment would be to include a further tertiary treatment method such as reedbeds and similar. However, this requires increased operational effort and eventually will require a Water Authority to adopt and operate it for its asset life. Moreover, in broad terms a shift to a large number of packaged treatment plants is likely to be considered a retrograde step for wastewater treatment;
- v. Utilising downstream wetlands - A wetland/reedbed filtration system that was not linked to a WwTW would be unlikely to be effective in removing phosphorus from sewage effluent (although it would contribute to removal of phosphorus from surface runoff). The UKWIR Chemical Investigations Programme (CIP)⁶ identified a relatively poor phosphate (as opposed to nitrogen) removal performance. In the UK, such wetlands are rarely used for wastewater treatment because on their own they are not expected to achieve a lower phosphate concentration than 2mg/l. Therefore, they are most suitable as a tertiary sewage treatment method following initial treatment stages at a WwTW or packaged treatment plants.
- vi. Since wetlands are able to remove some phosphorus, an offsetting solution being explored elsewhere is to deliver new wetlands, not to treat effluent from development, but to remove an equivalent amount of P from agricultural runoff that would otherwise enter the rivers. It should be noted that the science behind wetland P removal efficiency is variable and generally wetlands are only considered to be about 50% efficient at removing phosphates⁷. However, if such a wetland creation programme was to be used as an option for removal of phosphorus, c.380ha would be required to remove an equivalent amount of phosphorus to the net increase entering the Wye and Usk from new development⁸. Clearly, this would seem to be unfeasible on such a scale.

1.25 It is advisable that as part of future-proofing the Monmouthshire RLDP, its allocations and windfall provision, the Council explores potential solutions to phosphorous nutrient neutrality issues as this appears to have been identified as a requirement by Natural Resources Wales. As a minimum it would be advisable to identify mitigation solutions to allow the first 4 years of RLDP growth to come forward, acknowledging that all Local Development Plans must be reviewed every 4 years in any event and that allocations or housing growth levels may change at that time. However, it is considered that feasible solutions that can be delivered by local authorities and developers on a sufficiently large scale are likely to be very difficult to identify. The best solution will be to work with the Welsh Government, Natural Resources Wales, Welsh Water and the regulator to identify and deliver tertiary treatment upgrades to the two receiving WwTW.

⁶ Available at: <https://ukwir.org/the-chemicals-investigation-programme-phase-2.-2015-2020> [Accessed 13/10/2020].

⁷ Land et al (2016). How effective are created or restored freshwater wetlands for nitrogen and phosphorus removal? A systematic review. Environmental Evidence 5:9

⁸ Using an average wetland removal rate of 12 kgP/ha/yr based on research reported in Land et al (2016)

Appendix A: Phosphorous Nutrient Neutrality Calculations

The following Tables show the workings for the phosphorous nutrient neutrality calculations for the Monmouthshire RLDP following the methodology set out in Natural England's Advice on Nutrient Neutrality for New Development in the Stour Catchment in Relation to Stodmarsh Designated Sites, as this is the most recent guidance available concerning this issue⁹

Stage 1 – WwTW Effluent

| Candidate Sites | Step 1 - Additional Population | | Step 2 - Wastewater Generation by Development | | Step 3 - Receiving WwTW permit limit | | Step 4 - TP discharged after WwTW | | |
|-----------------|---------------------------------|---|---|--|--|--|---|---|--|
| A | B | C | D | E | F | G | H | I | J |
| | Number of Residential Dwellings | Number of new residents assuming 2.4 residents/dwelling occupancy | Water consumption person / day (litres) | Total wastewater generated by development (litres / day) | Likely Wastewater Treatment Works (WwTW) | TP Environmental permit for WwTW (mg/l TP) | TP Discharge after WwTW treatment (mg/TP/day) | TP Discharge after WwTW treatment (kg/TP/day) | TP Discharge after WwTW treatment (kg/TP/year) |
| Abergavenny | | | | | | | | | |
| CS0093 | 180 | 432 | 110 | 47520 | Llanfoist | 8 | 380160 | 0.38016 | 138.7584 |
| CS0094 | 146 | 350.4 | 110 | 38544 | Llanfoist | 8 | 308352 | 0.308352 | 112.54848 |
| CS0125 | 1698 | 4075.2 | 110 | 448272 | Llanfoist | 8 | 3586176 | 3.586176 | 1308.95424 |
| CS0128 | 130 | 312 | 110 | 34320 | Llanfoist | 8 | 274560 | 0.27456 | 100.2144 |
| CS0192 | 45 | 108 | 110 | 11880 | Llanfoist | 8 | 95040 | 0.09504 | 34.6896 |
| Monmouth | | | | | | | | | |
| CS0051 | 400 | 960 | 110 | 105600 | Monmouth | 8 | 844800 | 0.8448 | 308.352 |
| CS0078 | 350 | 840 | 110 | 92400 | Monmouth | 8 | 739200 | 0.7392 | 269.808 |
| CS0090 | 264.6 | 635.04 | 110 | 69854.4 | Monmouth | 8 | 558835.2 | 0.5588352 | 203.974848 |
| CS0099 | 200 | 480 | 110 | 52800 | Monmouth | 8 | 422400 | 0.4224 | 154.176 |
| CS0160 | 257.4 | 617.76 | 110 | 67953.6 | Monmouth | 8 | 543628.8 | 0.5436288 | 198.424512 |
| CS0182 | 950 | 2280 | 110 | 250800 | Monmouth | 8 | 2006400 | 2.0064 | 732.336 |
| CS0196 | 180 | 432 | 110 | 47520 | Monmouth | 8 | 380160 | 0.38016 | 138.7584 |

⁹ Natural England (November 2020). Advice on Nutrient Neutrality for New Development in the Stour Catchment in Relation to Stodmarsh Designated Sites - For Local Planning Authorities.

Stage 2 – Loss from Farm Types

| Step 1 - Total area of existing (agricultural) land | | | | Step 2 - Identify current land use in candidate sites | | | | | | Step 3 - Determine phosphate loss from current land use | Discounting Notes |
|---|----------------|--------------------------|--|---|--|-----------------|---------------------|-----------------------------------|-----------------------------------|--|---|
| A | B | C | D | E | F | G | H | I | J | K | |
| Site Name | Site area (ha) | Discounted land use (ha) | Site area discounting non-agricultural uses (ha) | Current Land Use | Comments | Confident (Y/N) | Site Visit (Yes/No) | Confidence after site visit (Y/N) | Rate of Phosphate Loss (kg/ha/yr) | Estimated Total Phosphate Loss (kg/yr) for whole candidate sites (Column D * Column J) | |
| Abergavenny | | | | | | | | | | | |
| CS0093 | 8.3 | 0.8 | 7.5 | Mixed | Google Earth shows cattle and horse grazing | N | N/A | N/A | 0.27 | 2.025 | 0.8ha discounted for trees/ hedgerows |
| CS0094 | 6.08 | 0.1 | 5.98 | Lowland Grazing | Google Earth shows sheep | Y | N/A | N/A | 0.24 | 1.4352 | 0.1ha discounted for hedgerows |
| CS0125 | 65 | 8.4 | 56.6 | Mixed | Google shows cropping/ sheep and cattle | | N/A | N/A | 0.27 | 15.282 | 8.4ha discounted (gardens/ agricultural buildings/ hardstanding and hedgerows) |
| CS0128 | 9.6 | 0.1 | 9.5 | Lowland Grazing | Google Earth shows predominantly fallow with sheep in one image. | N | N/A | N/A | 0.24 | 2.28 | 0.1ha discounted for hedgerows |
| CS0192 | 8.3 | 0.1 | 8.2 | Lowland Grazing | Google Earth shows hay meadows plus one photo with cattle | | N/A | N/A | 0.24 | 1.968 | 0.1ha discounted for hedgerows |
| Monmouth | | | | | | | | | | | |
| CS0051 | 49.9 | 1.3 | 48.6 | Cereals | Google Earth shows mixed crops | Y | N/A | N/A | 0.36 | 17.496 | 1.3ha discounted for hedgerows (mature) and woodland. |
| CS0078 | 13.63 | 0.9 | 12.73 | Mixed | Google Earth shows grazing cattle and arable crops | Y | N/A | N/A | 0.27 | 3.4371 | 0.9 discounted for woodland/ track and boundary mature trees/ hedgerows. |
| CS0090 | 9.12 | 0.3 | 8.82 | Mixed | Google Earth shows grazing cattle and arable crops | Y | N/A | N/A | 0.27 | 2.3814 | 0.3ha discounted for hedgerows. |
| CS0099 | 22.5 | 0.7 | 21.8 | Dairy | Cattle show on Google street view | Y | N/A | N/A | 0.49 | 10.682 | 0.7ha discounted as agricultural buildings/ hardstanding and a small amount of hedgerows. |
| CS0160 | 8.58 | 0 | 8.58 | Dairy | Cattle show on Google street view | Y | N/A | N/A | 0.49 | 4.2042 | None |
| CS0182 | 42.1 | 1 | 41.1 | Mixed | Arable, cattle and sheep shown on Google Earth | y | N/A | N/A | 0.27 | 11.097 | 1.0ha for hedgerows and existing buildings. |
| CS0196 | 11.52 | 0.5 | 11.02 | Cereals | Google Earth shows mixed crops | Y | N/A | N/A | 0.36 | 3.9672 | Discounted for mature hedgerows (0.5ha) |

Stage 3 – Future Land Use

Note: Masterplans and vision statements (often early versions) are only available for a few of the candidate sites. The size of greenspaces and public open spaces (have a different phosphate leaching rate) has been done using the best available information and completing measurements in GIS

| | | | Steps 1 + 2 New urban area and associated leachate | | | | Steps 3 + 4 New open space area and associated leachate | | | | Step 5 Combined phosphate leachate from future land uses |
|--------------|---|--|--|-------------------------------|--|---|---|----------------------------|---|--|--|
| A | B | C | D | E | F | G | H | I | J | K | L |
| Site Name | Number of new residents (from Stage 1 Column C) | Total Site area (ha) (from Stage 2 Column D) | Type of development (urban, open spaces, food growing) | Total urban surface area (ha) | Urban phosphate leachate standard (kg P/ha/yr) | Total urban phosphate leachate for candidate site (Column E * Column F) | Public Open Space (Y/N) | Total open space area (ha) | Greenspace phosphate leachate standard (kg P/ha/yr) | Total greenspace phosphate leachate for candidate site (Column I * Column J) | Overall leachate from all surfaces (kg P/yr) (Column G + Column K) |
| Abergavenney | | | | | | | | | | | |
| CS0093 | 432 ¹⁰ | 7.5 | Urban | 7.5 | 0.83 | 6.225 | Y | 2.3 | 0.14 | 0.322 | 6.547 |
| CS0094 | 350.4 ¹¹ | 5.98 | Urban | 5.98 | 0.83 | 4.9634 | Y | 1.21 | 0.14 | 0.1694 | 5.1328 |
| CS0125 | 4075.2 ¹² | 56.6 | Mixed Use | 56.6 | 0.83 | 46.978 | Y | 8.4 | 0.14 | 1.176 | 48.154 |
| CS0128 | 312 ¹³ | 9.5 | Urban | 9.5 | 0.83 | 7.885 | Y | 5.27 | 0.14 | 0.7378 | 8.6228 |
| CS0192 | 108 ¹⁴ | 8.2 | Urban | 8.2 | 0.83 | 6.806 | Y | 6.8 | 0.14 | 0.952 | 7.758 |
| Monmouth | | | | | | | | | | | |
| CS0051 | 960 ¹⁵ | 48.6 | Urban | 48.6 | 0.83 | 40.338 | Y | 36.57 | 0.14 | 5.1198 | 45.4578 |
| CS0078 | 840 ¹⁶ | 12.73 | Urban | 12.73 | 0.83 | 10.5659 | Y | 1.96 | 0.14 | 0.2744 | 10.8403 |
| CS0090 | 635.04 ¹⁷ | 8.82 | Urban | 8.82 | 0.83 | 7.3206 | Y | 0.3 | 0.14 | 0.042 | 7.3626 |
| CS0099 | 480 ¹⁸ | 21.8 | Urban | 21.8 | 0.83 | 18.094 | Y | 15.83 | 0.14 | 2.2162 | 20.3102 |
| CS0160 | 617.76 ¹⁹ | 8.58 | Urban | 8.58 | 0.83 | 7.1214 | N | 0 | 0.14 | 0 | 7.1214 |
| CS0182 | 2280 ²⁰ | 41.1 | Urban | 15.45 | 0.83 | 12.8235 | Y | 10.43 | 0.14 | 1.4602 | 14.2837 |
| CS0196 | 432 ²¹ | 11.02 | Urban | 11.02 | 0.83 | 9.1466 | Y | 5.52 | 0.14 | 0.7728 | 9.9194 |

¹⁰ No Masterplan available - Promoter identifies 180 dwellings

¹¹ No Masterplan available - Promoter identifies 146 dwellings

¹² No Masterplan available - assumed no open space and all residential as worst case scenario

¹³ No Masterplan available - Promoter identifies 130 dwellings

¹⁴ No Masterplan available - Promoter identifies 45 dwellings

¹⁵ No Masterplan available - Promoter identifies 400 dwellings

¹⁶ No Masterplan available - Promoter identifies 350 dwellings

¹⁷ No Masterplan available - assumed no open space and all residential as worst case scenario

¹⁸ No Masterplan available - Promoter identifies 200 dwellings

¹⁹ No Masterplan available - assumed no open space and all residential as worst case scenario

²⁰ No Masterplan available - Promoter identifies 950 dwellings

²¹ No Masterplan available - Promoter identifies 180 dwellings

Stage 4 – Site Budget

Note: Individual candidate sites with an overall phosphorus deficit are shaded green, whereas candidate sites with a phosphorus surplus (i.e. requiring mitigation) are marked in red

| A | Stage 1 - Phosphate in treated WwTW Effluent | Stage 3 - Phosphate leachate from future land use | Stage 2 - Loss of phosphorus from current farm types | Stage 4 - Total phosphorus budget | | | |
|-------------|--|--|--|---|---|--------------------------------------|---|
| | B | C | D | E | F | G | H |
| | TP Discharge after WwTW treatment (kg/TP/year) (Stage 1, Column J) | Overall leachate from all surfaces (kg P/ha/yr)(Stage 3, Column L) | Estimated Total Phosphorus Loss (kg/ha/yr) for whole candidate sites (Stage 2, Column K) | Phosphorus Balance Present and Future Land Uses (Column C - Column D) | Overall Phosphorus Budget (Column B + Column E) | 20% Buffer (from values in Column F) | Candidate sites Phosphorus Budget with 20% buffer |
| Site Name | | | | | | | |
| Abergavenny | | | | | | | |
| CS0093 | 138.7584 | 6.547 | 2.025 | 4.522 | 143.2804 | 28.65608 | 171.9 |
| CS0094 | 112.54848 | 5.1328 | 1.4352 | 3.6976 | 116.24608 | 23.249216 | 139.5 |
| CS0125 | 1308.95424 | 48.154 | 15.282 | 32.872 | 1341.82624 | 268.365248 | 1610.2 |
| CS0128 | 100.2144 | 8.6228 | 2.28 | 6.3428 | 106.5572 | 21.31144 | 127.9 |
| CS0192 | 34.6896 | 7.758 | 1.968 | 5.79 | 40.4796 | 8.09592 | 48.6 |
| Monmouth | | | | | | | |
| CS0051 | 308.352 | 45.4578 | 17.496 | 27.9618 | 336.3138 | 67.26276 | 403.6 |
| CS0078 | 269.808 | 10.8403 | 3.4371 | 7.4032 | 277.2112 | 55.44224 | 332.7 |
| CS0090 | 203.974848 | 7.3626 | 2.3814 | 4.9812 | 208.956048 | 41.7912096 | 250.7 |
| CS0099 | 154.176 | 20.3102 | 10.682 | 9.6282 | 163.8042 | 32.76084 | 196.6 |
| CS0160 | 198.424512 | 7.1214 | 4.2042 | 2.9172 | 201.341712 | 40.2683424 | 241.6 |
| CS0182 | 732.336 | 14.2837 | 11.097 | 3.1867 | 735.5227 | 147.10454 | 882.6 |
| CS0196 | 138.7584 | 9.9194 | 3.9672 | 5.9522 | 144.7106 | 28.94212 | 173.7 |