

Ein cyf/Our ref: CAS-191602-L3J7  
Eich cyf/Your ref: DCPRSrep2

Flintshire County Council,  
Ty Dewi Sant,  
St. Davids Park,  
Ewloe,

28/07/2022

For the attention of: Mr Andy Roberts

Dear Andy,

**RE: FLINTSHIRE LOCAL DEVELOPMENT PLAN (LDP) – MATTERS ARISING CHANGES CONSULTATION**

Thank you for the above consultation, which we received on 16/6/2022.

We note that the following documents have been provided as part of the consultation:

- Schedule of Matters Arising Changes (MAC) (June 2022)
- Integrated Impact Assessment MAC Addendum (December 2021)
- Habitats Regulations Assessment MAC Addendum (November 2021)
- Dee Catchment Phosphorus Reduction Strategy (November 2021)
- Statement of Common Ground (Reference: SOCG012) (November 2021)

Our advice is provided in our role as a statutory consultee for the purposes of the LDP under the Town and Country Planning (Local Development Plan) (Wales) Regulations 2005, and 'Appropriate Nature Conservation Body' (ANCB) for the purposes of the Conservation of Habitats and Species Regulations 2017.

We have reviewed the documents provided and have the following advice.

**Protected Sites - River Dee and Bala Lake Special Area of Conservation (SAC)**

In relation to policy EN15 (as set out in the Schedule of the MACs), we welcome the inclusion of this amended policy which secures implementation of mitigation to demonstrate that proposals would not have an adverse effect on the integrity of the SAC.

We welcome the work undertaken by the Council in the development of the Dee Catchment Phosphorus Reduction Strategy (DCPRS) and the progress made in the preparation of this 'first version', dated November 2021. As stated in the Statement of Common Ground (SOCG012) prepared with yourselves, we support the approach being taken in developing the DCPRS and are satisfied that, in principle, the proposed strategic approach to the delivery of mitigation is acceptable. We are satisfied that the DCPRS contains a range of

measures that could deliver phosphorus reductions which are technically feasible and could potentially be delivered.

We support the Council's commitment (as detailed in SOCG012) to continue to develop the DCPRS prior to Plan Adoption and as you know, we have separately provided you with detailed comments to assist in this regard (email from Tom Lewis dated 27<sup>th</sup> June 2022). With respect to further revisions prior to Plan adoption, we advise that the milestones need to be updated. Robust milestones are required to ensure that Category 1 measures do not "use up" measures that may have been identified as Category 2 measures for restoring the SAC to favourable condition. The milestones also need revised deadlines for delivery and additional detail to explain who will be responsible for delivery.

As explained in SOCG012, the DCPRS is a living document, and it will further evolve over the lifetime of the LDP with regular reviews to reflect learning and to take account of any new evidence or information that may be available. We also note the intention that it will further develop under the umbrella of the Nutrient Management Board for the Dee. We welcome this approach and look forward to providing further advice and guidance as part of this work.

### **Other MAC matters**

We note that the Schedule of the MACs also details a number of amendments that have been made in response to matters set out in our Statement of Common Ground dated January 2021 (SOCG006). These include matters relating to flood risk, protected sites, and protected landscapes. We have reviewed the Schedule and are satisfied that the detailed amendments are in accordance with that agreed in our SOCG006.

If you have any queries on the above, please do not hesitate to contact us.

Yn gywir / Yours faithfully

[Redacted signature block]

[Redacted footer block]

# The Dee Catchment Phosphorus Reduction Strategy

CONSULTATION DRAFT – November 2021



## Preface to the Strategy

This, the Dee Catchment Phosphorus Reduction Strategy (DCPRS) is a “living document”. It has been developed jointly by Wrexham County Borough Council and Flintshire County Council in consultation with Natural Resources Wales, and other stakeholders. Both Councils are currently at similar stages in their respective Local Development Plan (LDP) Examinations in Public and are approaching the stage of advertising Matters Arising Changes (MACs).

In January 2021, Natural Resources Wales (NRW) published evidence following a review of tighter standards set by JNCC in 2016 which showed that over 60% of riverine Special Areas of Conservation (SAC) waterbodies fail against revised phosphorus standards. In both Wrexham and Flintshire, a compliance test undertaken by NRW found failure to meet these new standards in the River Dee and Bala Lake SAC. Following NRW advice, the Councils’ view is that it would not be appropriate for the LDPs to rely on existing phosphorus permits at Wastewater Treatment Works to conclude there would be no adverse effect to the integrity of the SAC from development proposed in the Wrexham LDP and Flintshire LDP.

This document sets out the strategic approach for delivering phosphorus reductions in the Dee catchment while also facilitating LDP growth and demonstrating that mitigation can be delivered in practise. It is intended to serve two purposes, firstly, to meet the immediate need of providing an evidence base to demonstrate that adverse effects from development in both Wrexham’s and Flintshire’s LDPs will be avoided, and secondly, to begin to set out a longer-term approach to deliver wider reductions across the catchment which it is envisaged will be further developed and taken forward by a Nutrient Management Board for the Dee Catchment.

The DCPRS is directly linked to Policy NE6: Waste Water Treatment and River Water Quality in Wrexham’s LDP (2013-2028) and Policy EN15 Water Resources in Flintshire’s LDP (2015-2030). It will support the Councils’ associated supplementary planning guidance which will be prepared in due course once both LDPs have been approved by their respective Councils for adoption.

If the LDPs are approved for adoption by their respective Councils, the intention is for development of the strategy to continue under the governance of a new Nutrient Management Board for the River Dee and Bala Lake SAC which will have a wider remit with a broader aim to deliver the longer term solutions to address the issue of excessive phosphorus in rivers, much of which is not related to new development.

The information contained in this document is accurate at the time of preparation (November 2021).

1	Introduction	3
1.1	The River Dee – why is your river important?	3
1.2	The need for a Dee Catchment Phosphorus Reduction Strategy	4
1.3	Objectives of the Dee Catchment Phosphorus Reduction Strategy	7
2	Background to the River Dee Phosphorus Reduction Strategy	<del>1</del>
2.1	Why is phosphorus a problem?	<del>1</del>
2.2	Scope for review of existing permits and the ‘least onerous’ principle	<del>5</del>

2.3 Related work and supporting information .....	<a href="#">65</a>
2.4 The Planning Context.....	<a href="#">86</a>
3 What a nutrient management strategy can achieve .....	<a href="#">1312</a>
3.1 Existing water quality status and issues .....	<a href="#">1312</a>
3.2 Impactful measures that can deliver phosphate reductions.....	<a href="#">2018</a>
3.3 Mechanisms for implementation and the reductions which might be achieved.....	<a href="#">2624</a>
3.4 Legislation / Regulatory Tools and delivery parties.....	<a href="#">4740</a>
3.5 Considerations which will inform the selection of measures to be delivered .....	<a href="#">5953</a>
4 How a DCPRS will allow development provided for within the Local Development Plans to avoid adverse effects to the integrity of the River Dee and Bala Lake SAC .....	<a href="#">6155</a>
4.1 Proposed approach to facilitate compliance with requirements of Habitats Regulations ...	<a href="#">6155</a>
4.2 The legal provisions which support the preparation of the DCPRS.....	<a href="#">6256</a>
4.3 The additional phosphorus contribution from new development.....	<a href="#">6458</a>
4.4 Category 1 measures (to demonstrate compliance for plan HRA).....	<a href="#">7870</a>
4.5 Category 2 measures (to deliver overall reductions in phosphorus).....	<a href="#">8879</a>
5 Implementation and Delivery .....	<a href="#">108100</a>
5.1 The need for developer contributions.....	<a href="#">108100</a>
5.2 Additional sources of funding.....	<a href="#">116107</a>
5.3 Pathway to achieve targets and associated milestones.....	<a href="#">119110</a>
5.4 Provisions for Monitoring and Review .....	<a href="#">121111</a>
Appendices .....	<a href="#">124114</a>

## 1 Introduction

### 1.1 The River Dee – why is your river important?

- 1.1.1 The Dee is the largest river in North Wales with a catchment area of more than 1,800 km<sup>2</sup>. The River Dee has its source in Snowdonia at the outflow of Llyn Tegid and it includes the Ceiriog, Meloch, Tryweryn and Mynach tributaries. Its catchment contains a variety of landscapes from high mountains around Bala, rugged peaks near Llangollen, steep sided wooded valleys, and the plains of Cheshire, Flintshire, north Shropshire and Wrexham.

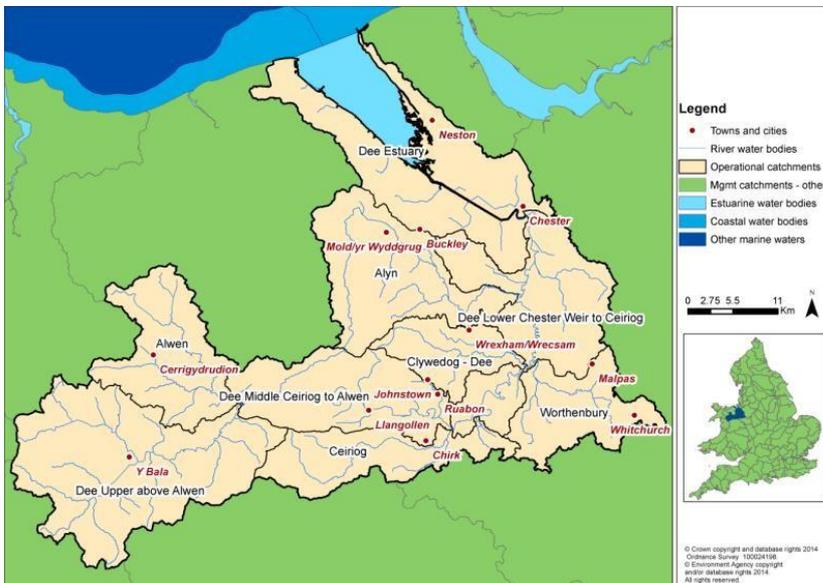


Figure 1.1 River Dee catchment (source [NRW Dee Management Catchment Summary](#))

### Biodiversity and conservation

1.1.2 The River Dee is a designated Special Area of Conservation and a river of the highest conservation value in both Welsh and UK context in terms of its global significance<sup>1</sup>. It is also one of the most highly regulated Rivers in Wales/UK. The qualifying features for which the river has been designated as being of international importance are:

- Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
- Atlantic salmon *Salmo salar*
- Floating water-plantain *Luronium natans*
- Sea lamprey *Petromyzon marinus*
- Brook lamprey *Lampetra planeri*
- River lamprey *Lampetra fluviatilis*
- Bullhead *Cottus gobio*
- Otter *Lutra lutra*

1.1.3 Other aquatic plants which occur within the site include intermediate water-starwort *Callitriche hamulata*, alternate-flowered water-milfoil *Myriophyllum alterniflorum* and

<sup>1</sup>Category A for Selection as a Special Area of Conservation under the Habitats Regulations. The site is designated under article 4(4) of the Directive (92/43/EEC)

bryophytes including *Rhynchostegium riparoides* and *Fontinalis antipyretica*. Marginal vegetation consists mainly of reed canary-grass *Phalaris arundinacea* with occasional branched bur-reed *Sparganium erectum*. There is good tree cover along the banks of the River Dee and the tributaries, with the Ceiriog being tree lined on both banks along much of its length. The dominant species are alder *Alnus glutinosa* and willow *Salix spp.*, with occasional ash *Fraxinus excelsior* and oak *Quercus spp.*<sup>2</sup>

#### Land Use

Parts of the Dee catchment are underlain by a Permo-Triassic Sandstone aquifer. This aquifer is used to support agricultural, industrial and water supply abstractions and contributes to baseflows in the lower Dee and some of the tributaries. The river is an important source of drinking water for nearly three million people, in Wales and North West England. In 1999, the lower part of the Dee was designated as the UK's first, and to date only Water Protection Zone.

#### Recreational use

- 1.1.4 The River has high amenity value as a tourist destination for fishing, canoeing and other watersports. Rivers in a clean and healthy condition creates a more pleasant location for undertaking recreational activities. The River Dee RBMP<sup>3</sup> outlines that reduction in pollution of water bodies from improvements to sewage infrastructure will improve the water environment for recreation and tourist use. The River Dee is recognised as one of North Wales' premier rivers for Atlantic salmon *Salmo salar* fishing.

### 1.2 The need for a Dee Catchment Phosphorus Reduction Strategy

- 1.2.1 Addressing nutrient levels in rivers requires a co-ordinated approach which recognises the different sources of pollution and the extent to which they are amenable to future control. The treatment of wastewater associated with development influences water quality within the river, but land use also exerts a strong influence over the amount of nutrients within a catchment and the pathway along which they travel. The predominant land use of the Dee catchment is for livestock grazing and the physical characteristics of the land can affect how water and pollutants move through the landscape.
- 1.2.2 This current version of the strategy relates to land within Wrexham County Borough Council and Flintshire County Council. The strategy is a live document however and could include other planning authorities within the catchment in due course.
- 1.2.3 There are different drivers behind the need for a Dee Catchment Phosphorus Reduction Strategy (DCPRS) as set out below.

Commented [A1]: These LPA's could be listed here

<sup>2</sup> SAC Citation

<sup>3</sup> <https://cyfoethnaturiolcymru.gov.uk/media/674594/deerbdsummary.pdf>

### *Habitats Regulations*

- 1.2.4 As a Special Area of Conservation (SAC) there is a legal requirement to undertake an assessment of new plans and projects to ensure that they do not represent a threat to the integrity of the site. In addition there is a requirement to maintain or restore the qualifying habitats and species to a 'favourable conservation status' and to establish the necessary conservation measures which correspond to the ecological requirements of the river. Further duties exist to take appropriate steps to avoid deterioration or disturbance of the qualifying natural habitats and species.
- 1.2.5 Regulation 9(3) places a general duty on decision-makers (referred to as competent authorities) in exercising any of their functions to have regard to the requirements of the Habitats Directive, so far as they may be affected by the exercise of those functions.
- 1.2.6 In their role as nature conservation adviser Natural Resources Wales has set phosphorus targets for the River Dee and Bala Lake SAC. The river needs to meet these levels to be considered to be in a favourable condition, and to make a full contribution to achieving 'favourable conservation status.'

### *Water Framework Directive*

- 1.2.7 The River Dee is also protected under the Water Framework Directive Regulations 2017<sup>4</sup>. Natural Resources Wales is responsible for publishing river basin management plans for two river basin districts in Wales: Western Wales and Dee. The current [River Basin Management Plan](#) for the Dee was published in 2015 and is under review<sup>5</sup>; a summary of consultation responses has now been published<sup>6</sup>. According to statutory requirements under the Water Framework Directive Regulations 2017, water bodies must achieve good status by 22 December 2027. The plans set out how organisations, stakeholders and communities will work together to improve the water environment in each district. The plans describe the pressures facing the water environment for the river basin district, set objectives for rivers, lakes, estuaries, coastal and ground waters from 2021-2027, outline proposed actions needed to improve the water environment and the benefits that could be achieved.
- 1.2.8 The Dee river basin plan outlines the approach for managing water, including an existing programme of work, operating through national measures (many of which will be applied in a local context), and local measures.

### *North East Wales Area Statement*

- 1.2.9 Area Statements are produced in accordance with the Environment (Wales) Act. A key theme identified in the North East Wales Area Statement is 'protecting water and soil

<sup>4</sup> [The Water Environment \(Water Framework Directive\) \(England and Wales\) Regulations 2017](#)

<sup>5</sup> [https://ymgyngghori.cyfoethnaturiol.cymru/evidence-policy-and-permitting-tystiolaeth-polisi-a-thrwyddedu/dee-river-rbmp/supporting\\_documents/Draft%20Dee%20uRBMP%20consultation%202020.pdf](https://ymgyngghori.cyfoethnaturiol.cymru/evidence-policy-and-permitting-tystiolaeth-polisi-a-thrwyddedu/dee-river-rbmp/supporting_documents/Draft%20Dee%20uRBMP%20consultation%202020.pdf)

<sup>6</sup> [Western Wales river basin management plan 2021-2027 - Natural Resources Wales Citizen Space](#); [Dee river basin management plan 2021-2027 - Natural Resources Wales Citizen Space](#)

through farming and sustainable land management<sup>7</sup>. This theme helps delivery against the following Natural Resource Policy priorities:

- Reverse the decline in biodiversity and develop resilient ecological networks
- Maintain productive capacity by improving soil quality
- Reduce pollution levels in our air and enhance air quality
- Improve the quality, and ensure the quantity, of our water
- Ensure healthy populations of fish
- Safeguarding and increasing carbon stores in soils and biomass
- Climate change adaptation

1.2.10 Of relevance to the need for a phosphorus reduction strategy, explanatory text against this theme states that ‘The Area Statement will seek to promote nutrient reduction, create environmental benefits and nurture successful relationships between stakeholders and communities’.

#### *Well-Being of Future Generations Act 2015*

1.2.11 The Well-being of Future Generations Act 2015 places a well-being duty on all public bodies to carry out sustainable development. Actions taken by public bodies must include setting and publishing objectives that are designed to maximise its contribution to achieving each of the well-being goals. The resilient Wales goal is described as

*‘a nation which maintains and enhances a biodiverse natural environment with healthy functioning ecosystems that support social, economic and ecological resilience and the capacity to adapt or change (for example climate change).’*

1.2.12 The Act furthermore lays out **ways of working** which can be helpful to consider in the design and delivery of the DCPRS.

- Long term - balancing short term needs with those of the long term;
- Involvement - the importance of involving those people with an interest in achieving the stated goal;
- Collaboration - allowing those with an interest to work together supportively towards the goal;
- Prevention – creating ways of preventing the problem occurring in the first place.

**Commented [A2]:** There are five ways of working, with integration missing.

### 1.3 Objectives of the Dee Catchment Phosphorus Reduction Strategy

1.3.1 The primary driver for the Strategy is the protection afforded to the river under the Habitats Regulations, and the need to undertake an assessment of the implications of planned

---

<sup>7</sup> Refer <https://naturalresources.wales/about-us/area-statements/north-east-wales-areastatement/protecting-water-and-soil-through-farming-and-sustainable-land-management/?lang=en>

growth. The DCPRS, and the measures contained therein, can be relied upon to ensure that the delivery of development provided for within the Wrexham County Borough Council and Flintshire Council’s emerging Local Development Plans will not have an adverse effect on the integrity of the SAC.

1.3.2 The DCPRS is also part of a broader initiative to contribute towards achieving the wider objectives of the Habitats Directive as well as Water Framework Directive obligations, Area Statement objectives and the well-being duty. A Nutrient Management Board for the Dee catchment will be established with a primary objective to coordinate existing and identify and deliver new actions to secure overall improvements in water quality and achieve the phosphorus conservation objective targets for the SAC. The DCPRS will sit under the umbrella and oversight of the Nutrient Management Board and will identify the main sources of nutrients in a river catchment and the potential measures that could be implemented to better manage these inputs.

**Commented [A3]:** The Strategy will only identify the main sources of P

1.3.3 The DCPRS will therefore deliver measures with two parallel objectives in mind:

- a) To facilitate the delivery of development and avoid adverse effects to the SAC from planned growth as a result of the treatment of wastewater (referred to as ‘category 1 measures’)
- b) To achieve the phosphorus conservation objectives of the SAC and Water Framework Directive requirements (referred to as ‘category 2 measures’).

*Other examples of strategic approaches to nutrients in rivers*

1.3.4 The development of a strategic approach to address nutrients and to deliver measures to reduce pollutant loading is not a novel approach. The DCPRS can learn from and build upon other approaches.

Table 1.2: Other strategic approaches to nutrient management in rivers
<a href="#">River Wye Nutrient Management Plan</a>
<a href="#">River Mease Develop Contributions Strategy</a>
<a href="#">River Avon Nutrient Management Plan</a>
<a href="#">Nutrient neutrality in the Solent Region</a>
<a href="#">Stodmarsh nutrient neutrality methodology</a>
<a href="#">River Clun Nutrient Management Plan</a>

1.3.5 The River Wye Nutrient Management Plan is of particular relevance to the development of the DCPRS. A case study of the River Wye approach is provided in Box 1.1. The Terms of Reference for the overarching Nutrient Management Board for the River Wye are provided as Appendix E.

**Commented [A4]:** The inclusion of ‘lessons learned’ i.e. what worked well and what didn’t, would help provide more certainty for the Strategy going forward.

### Box 1.1: Case Study – The River Wye Nutrient Management Plan



The

Environment Agency with Natural England and other partners have developed a Nutrient Management Plan (NMP) for the River Wye Special Area of Conservation (SAC) which provides an example for the River Dee to build upon. The River Wye NMP identifies sources of nutrients that are entering the river and steps that can be taken to manage them. The plan aims to manage nutrients in the River Wye SAC to enable growth in Herefordshire whilst conserving the river’s ecological values. For the River Wye SAC, the NMP focuses on sources of phosphorus. The plan has been developed in consultation with groups such as the National Farmers’ Union, the Country Land and Business Association and Welsh Water.

The NMP comprises of three parts:

- Evidence base,
- Options appraisal and
- Action plan.

The action plan set out a broad approach to reducing phosphorus levels across the River Wye catchment. Measures have been identified following consultation with stakeholders at local level. The action plan is currently being reviewed and updated.

The Wye catchment management partnership – jointly hosted by Natural Resources Wales and the Wye and Usk Foundation provide the day to day delivery of the NMP. Associated with the partnership is a NMP Stakeholder group, which is responsible for engaging widely [with](#) Communities affected by the plan and a Nutrient Management Board, with membership drawn from Herefordshire and Powys Councils, Dwr Cymru/ Welsh Water, the Environment agency, Natural England, Natural Resources Wales, National Farmers Union [\(NFU\)](#), the Country Land and Business Association (CLA). The Board has a rotating Chair drawn from the members and has overall responsibility for the delivery of the plan (Terms of reference for the Board are provided at Appendix 1)

The measures have been identified through an apportionment study – which identified two major contributors to phosphorus enrichment – thus the focus is on water company sewage treatment works (point source) and the agriculture sector- (diffuse sources). The Action Plan identifies for each, the Action, the Lead team, start date, target completion date, outcome sought and the potential to reduce phosphorus.

## 2 Background to the River Dee Phosphorus Reduction Strategy

### 2.1 Why is phosphorus a problem?

2.1.1 There are nine riverine special areas of conservation (SACs) across Wales. These rivers support some of Wales' most special wildlife like Atlantic salmon, freshwater pearl mussel, white-clawed crayfish and floating water-plantain.

2.1.2 NRW monitors the water quality of all rivers on a regular basis. In 2014 the Joint Nature Conservation Committee (JNCC) recommended that the UK nature conservation organisations should adopt tighter targets for river SACs after considering new evidence about the environmental impacts of phosphorus. An evidence base report by Natural England<sup>8</sup> identifies the following key biodiversity concerns associated with nutrient enrichment in rivers:

- Changes in the composition and increased abundance/biomass of the algal community, both attached (periphyton) and planktonic.
- Changes in the composition and increased abundance/biomass of the rooted macrophyte community, with a reduction in extent of species adapted to conditions of lower nutrient availability.
- A choking of river channels with submerged higher plants and algae, with high nocturnal respiration rates and diurnal sags in dissolved oxygen in the water column.
- Loss of macrophyte abundance associated with algal smothering of riverbed substrates, attracting enhanced siltation and causing poor substrate conditions for benthic invertebrates and fish species with a requirement for coarse open sediments with high interstitial dissolved oxygen concentrations.
- Changes in macroinvertebrate and fish community abundance and composition associated with changes in the plant community.

2.1.3 As a result of the JNCC recommendations NRW tightened the targets for SAC Rivers. After assessing compliance in Welsh rivers against these new targets, over 60% of waterbodies failed to meet them<sup>9</sup>.

2.1.4 The NRW compliance report identifies localised phosphorus failures in the Dee catchment and referred to the magnitude of the failures as 'low to moderate'. In the context of tackling existing failures, the compliance report continues as follows:

*'The relatively limited scale and extent of these failures suggests that it may be possible to tackle these issues in a relatively targeted way with relevant stakeholders without the need for large-scale investment. It is also recommended that actions be taken to increase the resilience of the river habitat to nutrient pressures.'*

2.1.5 NRW subsequently issued a planning policy position statement<sup>10</sup> which identified a 38% failure rate for the River Dee. An extract from the position statement is provided in Box 2.1 below.

Commented [A5]: 2016

<sup>8</sup> [An evidence base for setting nutrient targets to protect river habitat - NERR034 \(naturalengland.org.uk\)](https://www.naturalengland.org.uk/About-us/What-we-do/Our-work/Policy-and-strategy/An-evidence-base-for-setting-nutrient-targets-to-protect-river-habitat-NERR034)

<sup>9</sup> NRW [Compliance Assessment of Welsh River SACs against Phosphorus Targets](#)

<sup>10</sup> NRW [Planning policy position statement: SAC designated rivers and phosphates](#)

**Box 2.1: Extract from NRW planning policy position statement**

Any proposed development within the catchment or waterbody that might increase the amount

of phosphate within the catchment or waterbody could lead to additional damaging effects to the SAC therefore such proposals should be screened through a HRA to determine whether they are likely to have a significant effect on the site's qualifying features. Once issued by NRW, this

position statement in combination with the Compliance Assessment Report (Compliance Assessment Report of Welsh River SACs against Phosphorus Targets - NRW Report No: 489), applies to all development proposals yet to be determined by the relevant planning authority.

- 2.1.6 More detailed 'Advice to planning authorities for planning applications affecting phosphorus sensitive river SACs'<sup>11</sup> was produced by NRW in May 2021. This included more specific advice in respect of Local Development Plans at section 7 (refer box 2.2).

---

<sup>11</sup> NRW [Advice to planning authorities for planning applications affecting phosphorus sensitive river SACs](#)

**Box 2.2: Extract from NRW advice to planning authorities (correct at time of writing)**

**Advice for the review of local development plans (LDPs)**

All LDPs should be screened to determine whether any policies are likely to have a significant effect on a river SAC.

Policies can be screened out as not likely to have a significant effect in relation to increased phosphorus loading if there are no pathways for increased phosphorus impacts.

Any LDP policies relating to schemes for private sewage treatment systems should ensure no adverse effects on the integrity of any river SACs where:

- discharges are direct to surface waters; or
- discharges are to ground and do not meet the screening criteria set out in this document.

Allocations for development that are proposed to be connected to a mains wastewater treatment works and have the potential to increase phosphorus loading, should be assessed as follows:

**Allocations where there is capacity for additional wastewater**

Where the wastewater treatment works has capacity to accommodate additional wastewater and any additional phosphorus from the proposed development (in-combination with other planned development) within existing discharge permit limits, the planning authority should review the appropriate assessments carried out for the extant environmental permit(s), along with any new information or changes in circumstances to be certain there will be no adverse effect on site integrity.

#### Allocations where capacity for additional wastewater is planned

Where the wastewater treatment works does not currently have sufficient treatment capacity but it is planned under the Asset Management Plan (AMP) - the planning authority should undertake an appropriate assessment or a review of the appropriate assessment already carried

out for extant environmental permits (along with any new information or changes in circumstances) to be certain that there will be no adverse effect on site integrity. Considering the Dutch Nitrogen ruling, a conclusion of no adverse effect on site integrity can only be made

where future improvements or enhancements within the AMP are certain at the time of appropriate assessment.

#### Allocations where there is no capacity for additional wastewater

Where the wastewater treatment works has no capacity in place or planned within the current AMP period the planning authority should undertake an appropriate assessment.

- 2.1.7 Welsh Water have confirmed that there is capacity within the existing permit at the receiving treatment works for the development provided for within the respective LDPs. In accordance with the advice from NRW, when considering the potential effects of proposed development on the River Dee and Bala Lake SAC the Local Planning Authorities were required to *'review the appropriate assessments carried out for the extant environmental permit(s), along with any new information or changes in circumstances to be certain there will be no adverse effect on site integrity'*.
- 2.1.8 In their role as the Appropriate Nature Conservation Body, NRW advised that the revised (more stringent) phosphorus targets, and the implications of recent case law decisions, meant it would not be appropriate to rely on the HRA for the existing permits at DCWW waste water treatment works in the Authorities area to conclude there would be no adverse effect to the integrity of the River Dee and Bala Lake SAC from development provided for within the plan. The Local Planning Authorities are therefore unable to assume that the remaining permitted capacity at the treatment works can be utilised without a risk of adverse effects to the integrity of the River Dee and Bala Lake SAC.
- 2.1.9 As a consequence, in spite of there being extant permit capacity at the receiving wastewater treatment works, the development of a suitable phosphorus reduction strategy is a necessary mitigation measure in order to avoid adverse effects to the integrity of the River Dee and Bala Lake SAC from the delivery of development provided for within the Local Development Plans for both Wrexham County Borough Council and Flintshire County Council.

## 2.2 Scope for review of existing permits and the ‘least onerous’ principle

- 2.2.1 As set out in section 1.2, Local Planning Authorities and Natural Resources Wales are both ‘competent authorities’ under the Habitats Regulations and they must have regard to the requirements of the Habitats Directive in exercising any of their functions<sup>12</sup>.
- 2.2.2 In addition to this general provision to ‘have regard’ to the Habitats Directive, the Regulations also set out further site-specific protection. Part 6 of the Regulations incorporates both ‘assessment provisions’ which are relevant to *new* plans and projects and ‘review provisions’ which relate to *existing* permitted activities.
- 2.2.3 The effects of wastewater treatment works on water quality are subject to control through the environmental permit issued by Natural Resources Wales. Where development provided for within Local Development Plans connects to a permitted wastewater treatment works, these permits will have already been subject to some form of assessment under the Habitats Regulations<sup>13</sup>. Wastewater treatment is a material consideration when considering the implications of planned development and a Local Planning Authority would generally seek to be satisfied that sufficient capacity exists at a receiving works, on the assumption that available capacity can legitimately be utilised, or that a reasonable prospect exists for provision of additional capacity.
- 2.2.4 As set out in section 2.1 however, in light of the updated phosphorus targets and the implications of subsequent court decisions, NRW has advised that conclusions of earlier assessments undertaken by Natural Resources Wales can no longer be relied upon to provide confidence that use of extant permitted capacity at wastewater treatment works will not adversely affect the integrity of the River Dee and Bala Lake SAC. As a consequence, it cannot be assumed that available capacity at permitted treatment works can be assigned to new development without a risk of adverse effects to the integrity of the River Dee to Bala Lake SAC.
- 2.2.5 There are ongoing obligations to undertake periodic reviews of permits under the Environmental Permitting (England and Wales) Regulations 2016. NRW Regulatory Guidance Series, No EPR 12<sup>14</sup> sets out how NRW will meet their statutory duty to periodically review environmental permits. Para 1.2 refers to Welsh Assembly Core Guidance which says that “*permit reviews are required to check whether permit conditions continue to reflect appropriate standards and remain adequate in light of experience and new knowledge. Reviews should guard against permits becoming obsolete as techniques develop.*” Section 2 of this guidance provides the ‘key principles of permit reviews’ and recognises the need for permits to ‘fulfil statutory obligations’. A permit review process includes two stages. NRW guidance refers to the steps as follows:
1. *Checking a permit or group of permits to see whether they ‘remain adequate’ in ensuring the operator achieves the relevant environmental and regulatory objectives. It is not always necessary - and may not be cost-efficient - to check each individual permit to assess whether*

---

<sup>12</sup> Refer regulation 9(3) of [Conservation of Habitats and Species Regulations 2017](#) (As amended)

<sup>13</sup> Either through the Review of consents completed in 2009 in respect of permits which pre-dated the regulations or through subsequent assessment in respect of any new permits or variations to existing permits after the Regulations came into force.

<sup>14</sup> [Environmental Permitting Regulations \(England and Wales\) 2010 Regulatory Guidance Series, No EPR 12 Statutory Periodic Permit Reviews.](#)

it 'remains adequate'. Where appropriate, we will do high level performance checks on groups of similar permits and target effort on those that need attention.

2. Revising individual permits if necessary. Some permits will not require any changes if they already deliver expected levels of performance.

2.2.6 As such, whilst the review of consents under the Habitats Regulations has been completed, there are ongoing periodic review duties which continue to apply through which the adequacy of environmental permits can be subject to scrutiny. It will be for Natural Resources Wales to trigger any such review in respect of the existing permits affecting the Dee catchment. In considering the need for a review, and the form it might take, NRW will need to have regard to its own guidance and the statutory obligations imposed upon them by the Environmental Permitting (England and Wales) Regulations 2016.

2.2.7 When considering the delivery of this DPRMS and any future periodic review, it is relevant to note the general principles established by regulation 66(3) of the Habitats Regulations in respect of the earlier formal review of consents.

2.2.8 Regulation 66(3) applies when considering the findings of an appropriate assessment undertaken in respect of an existing activity. Where adverse effects arise as a consequence of the combined effects of an existing permit and other sources (some of which might not be subject to regulatory control) it is possible to affirm a consent through reliance on future action 'to be taken'. Regulation 66(3) and (4) are copied below.

*'(3) The decision, or the consent, permission or other authorisation, may be affirmed if it appears to the competent authority reviewing it that other action taken or to be taken by it, or by another authority, will secure that the plan or project does not adversely affect the integrity of the site.'*

*'(4) Where that object may be attained in a number of ways, the competent authority or authorities concerned must seek to secure that the action taken is the least onerous to those affected.'*

2.2.9 Whilst regulation 66(4) does not apply as a matter of law, the 'least onerous' principle introduced in regulation 66(4) is potentially of relevance to the DCPRS. **Where the 'object' of securing the integrity of the SAC through the DCPRS may be attained in a number of ways. It is reasonable to seek to secure that the action taken is least onerous to those affected.**

## 2.3 Related work and supporting information

2.3.1 The DCPRS will operate alongside other initiatives which are concerned with delivering ecological improvements and enhancements. Of particular relevance are the River Dee LIFE Project<sup>15</sup> and the NRW SAC Rivers Project. The objectives of the LIFEDeeRiver project are much broader in scope than those for the DCPRS (see Box 2.3).

<sup>15</sup> <https://naturalresources.wales/about-us/our-projects/nature-projects/life-dee-river-project/?lang=en>

**Commented [A6]:** Request that section 2.2 should remove reference to Regulation 66 and the least onerous principle.

The reason for this is that the text in section 2.2, and in particular sections 2.2.7 – 2.2.9 could be misinterpreted as suggesting that there is a requirement for NRW to ensure that any actions taken as a result of a WWTW discharge permit review that we may choose to undertake are bound by Regulation 66, and in particular are the least onerous to those affected. Whilst we recognise that the 'least onerous' principle is best practice and should be observed where appropriate, there may be instances where it is not appropriate, or would not deliver the best outcome for the SAC, etc., and in such instances the actions that NRW take may not be considered to be the least onerous to those affected.

### Box 2.3 LIFEDeeRiver project objectives

**Objective 1.** Remove the constraints to fish migration and wider ecological connectivity currently caused by weirs in the River Dee. Remove (partially or fully) five weirs and improve fish passage at a further six weirs in the Afon Dyfrdwy a Llyn Tegid SAC to restore migratory fish access and wider ecological connectivity, making an additional 88km of river accessible to *L. fluviatilis* and *P. marinus* (7.4% of UK favourable range) and improving access in at least 120km for *S. salar*.

**Objective 2.** Restore or improve natural riverine physical processes, features and physical habitats in at least 55km of river. This will benefit all targeted features and will progress the entire 318ha of H3620 on the Dee SAC (12% at a UK level) towards favourable condition.

**Objective 3.** Improve agricultural and forestry land management practices to reduce the input

of nutrients and sediment entering the SAC.

**Objective 4.** Initiate conservation management for the critically endangered *Margaritifera margaritifera* by the captive rear and release at least 3000 juveniles in suitable locations in the Afon Dyfrdwy a Llyn Tegid SAC with the long-term goal of re-establishing a healthy, self-sustaining population in the river that qualifies for designation in its own right, secures the future of this species in Wales and delivers additional ecosystem services in the Dee.

**Objective 5.** Establish and build long-term positive relationships with key stakeholders during and beyond the life of the project.

**Objective 6.** Revise the Core Management Plan for the Afon Dyfrdwy a Llyn Tegid/River Dee and Bala Lake SAC supported by legal agreements, to ensure a sustainable future for the Annex I habitats and Annex II species.

2.3.2 The LIFEDeeRiver project will run in parallel with the DCPRS. There is some overlap between the objective of the DCPRS and objective 3 of the LIFEDeeRiver project but the measures delivered through LIFEDeeRiver project related to objective 3 will be recognised as category 2 measures within the DCPRS. This will ensure that measures delivered to offset the effects of development do not undermine the delivery of wider improvements to secure overall improvements in water quality.

2.3.3 NRW has instigated its own internal 'SAC Rivers Project' which will feed into the wider delivery of reductions. The objectives of the NRW 'SAC Rivers Project' include:

- Working with others to develop new policy, positions, advice and tools to make sure there is no detriment to SAC Water Quality.
- Identifying improvement measures in failing water bodies and prioritising ~~our own~~ work.

- Establishing a programme for monitoring and gathering evidence for water quality in ~~our~~ SACs.

2.3.4 There are **four** work streams under the project as follows:

1. Advice/position statements
2. Standards/compliance – including Core Management Plan updates
3. Water quality improvements – including Interventions/Actions to build capacity
4. Monitoring and Evidence

2.3.5 As with the LIFEDeeRiver project, there is some overlap between the objective of the DCPRS and work stream 3 of the NRW SAC Rivers Project; as such, measures proposed through work stream 3 will also be recognised as category 2 measures within the DCPRS.

**Commented [A7]:** Now 5 – needs updating to add the permitting WS

## 2.4 The Planning Context

### *Planning and Key Environmental Legislation*

2.4.1 The Council has a statutory duty to produce a local development plan. The Planning and Compulsory Purchase Act 2004 introduced the Local Development Plan (LDP) system to Wales.

Local Planning Authorities have a duty to produce an LDP for their area. A plan-led approach is the most effective way to secure sustainable development through the planning system.

2.4.2 The Planning Act introduced a statutory purpose for the planning system. Any statutory body carrying out a planning function must exercise those functions in accordance with the principles of sustainable development as defined in the Well-being of Future Generations Act for the purpose of ensuring that the development and use of land contribute to improving the economic, social, environmental and cultural well-being of Wales.

2.4.3 Planning applications must be determined in accordance with the adopted plan, unless material considerations indicate otherwise<sup>16</sup>.

2.4.4 The Environment (Wales) Act 2016 promotes the sustainable management of natural resources. A public authority must seek to maintain and enhance biodiversity in the exercise of functions in relation to Wales, and in so doing promote the resilience of ecosystems, so far as consistent with the proper exercise of those functions.

2.4.5 Habitats Regulations: WCBC is a competent authority under the Conservation of Habitats and Species Regulations 2017, commonly referred to as the Habitats Regulations. In accordance with Regulation 105 of those regulations, WCBC and FCC must make an assessment of the implications of the Local Development Plan as a matter of law before it is adopted, the plan can only be adopted if adverse effects on site integrity can be avoided.

**Commented [A8]:** And Flintshire

### *Planning Policy*

<sup>16</sup> Section 38(6) of the Planning and Compulsory Purchase Act 2004

### Future Wales – the National Plan 2040

- 2.4.6 Future Wales – the National Plan 2040<sup>17</sup>, sets the strategy for addressing key national priorities through the planning system. It is a spatial plan, setting a direction for where Welsh Government and key stakeholders should be investing in infrastructure and development for Wales.
- 2.4.7 As the national development framework, Future Wales is the highest tier of development plan, Strategic (none commenced) and Local Development Plans are required to be in conformity with Future Wales.
- 2.4.8 The water quality issues the DCPRS deals with are directly relevant to the policies of Future Wales. Firstly, from an environmental perspective, natural resources (such as river systems) should be sustainably managed and pollution reduced, and ecosystems should be biodiverse, resilient and connected. Secondly, for economic outcomes, development plans should be forward thinking, with a positive attitude towards enabling economic development, investment and innovation.
- 2.4.9 Future Wales has a number of policies of relevance to the DCPRS, the most significant are Policy 1 Where Wales will grow, and Policy 20, which identifies Wrexham and Deeside as National Growth Areas. Strategic and Local Development Plans across the region must recognise the National Growth Area as the focus for strategic economic and housing growth; essential services and facilities.
- 2.4.10 In making decisions about where to invest in infrastructure, such as may be required to address phosphorus pollution in Wales, Welsh Government and key stakeholders will have regard to Future Wales, and the national growth areas as a material consideration. There will of course be other competing priorities but nonetheless, growth areas are considerations.
- 2.4.11 In bringing forward mitigation measures, the DCPRS needs to be mindful of Policy 9 Resilient Ecological Networks and Green Infrastructure of Future Wales which supports resilient ecological networks and green infrastructure. Nature based solutions are one of the potential mitigation measures for water quality, in addressing phosphorus pollution they could also help deliver this national policy. The policy sees nature-based solutions as part of shaping urban growth and securing biodiversity enhancements. While it may not always be appropriate to deliver nature-based solutions, there are multiple benefits in doing so.
- 2.4.12 In the Introduction, Future Wales states 'Future Wales does not support lower-tier plans or projects where adverse effects on site integrity cannot be ruled out. Development at the lower-tier plan or project stage will need to demonstrate there are no adverse effects on the features for which a National Site Network site or Ramsar site has been designated, and where this is not concluded, lower-tier plans or projects cannot be approved (unless there are no less damaging alternative solutions, Imperative Reasons of Overriding Public Interest (IROPI) and appropriate compensatory measures have been secured).

---

<sup>17</sup> <https://gov.wales/future-wales-national-plan-2040>

## Planning Policy Wales

- 2.4.13 Planning Policy Wales Edition 11 (PPW)<sup>18</sup> sets out the land use planning policies of the Welsh Government. It is supplemented by a series of Technical Advice Notes (TANs), Welsh Government Circulars, and policy clarification letters, which together with PPW provide the national planning policy framework for Wales.
- 2.4.14 PPW makes it clear that the planning system should not be used to secure objectives which are more appropriately achieved under other legislation, planning should maintain the principle of non-duplication. It is important the DCPRS is consistent with this requirement, the delivery of wider improvements to phosphorus in the River Dee and Bala Lake SAC (i.e. category 2 measures) is more appropriately achieved under other legislation. However, planning, can prevent new development ~~form from the~~ making the situation any worse by delivering the category 1 measures.
- 2.4.15 PPW contains a framework of National Sustainable Placemaking Outcomes considered to be optimal for development plans and individual developments. The 2 key outcomes and how they relate to the DCPRS now follow;
- *Growing our Economy in a Sustainable Manner and Making best Use of Resources*; Growth needs to be facilitated without compromising the integrity of the River Dee SAC and to do so in the most long term sustainable, effective, efficient and least onerous manner;
  - *Maximising Environmental Protection and Limiting Environmental Impact*; The DCPRS will be particularly relevant to promoting resilient biodiversity, reducing environmental risks, helping to ensure the River Dee is resilient to the effects of climate change, promoting biodiversity, managing water resources sustainably and reducing overall pollution.
- 2.4.16 PPW contains national policy for a range of planning topics, the implications for the DCPRS of the most pertinent now follow:
- 2.4.17 *Infrastructure* - PPW requires planning authorities, in conjunction with key providers, to take a strategic and long term approach towards the provision of infrastructure as part of plan making. Development should be located so that it can be well serviced by existing or planned infrastructure. This will involve maximising the use of existing infrastructure or considering how the provision of infrastructure can be effectively co-ordinated to support development plans. ~~These issues were addressed-considered~~ in the preparation of both LDPs working collaboratively with NRW and Dwr Cymru/Welsh Water. ~~T~~he spatial strategies ~~esy focusses-includes~~ development ~~to-in~~ areas served with waste water treatment works that have phosphorus limits on the Permits ~~and capacity for growth~~ and, in the case of Flintshire ~~focusses-includes~~ development also in areas where WWTWs discharge into the tidal section of the Dee. The DCPRS will need to continue working with key stakeholders in delivering a strategic approach to phosphorus management and the provision of mitigation.
- 2.4.18 *Housing* - Planning authorities are required to identify the housing needs for its communities, identify land to meet the requirement and demonstrate delivery. The DCPRS, iteratively through the lifetime of each LDP, will have an important role in demonstrating that the housing requirement and any associated mitigation can be delivered.

<sup>18</sup> <https://gov.wales/planning-policy-wales>

**Commented [A9]:** Some changes suggested to text for clarity

2.4.19 *Environment* – A key principle for planning relates to the environment. Natural assets must be protected, promoted, conserved and enhanced. Negative environmental impacts should be avoided in the wider public interest. This means acting in the long term to respect environmental limits and operating in an integrated way so that resources and/or assets are not irreversibly damaged or depleted. The polluter pays principle applies where pollution cannot be prevented and applying the precautionary principle ensures cost effective measures to prevent environmental damage.

2.4.20 It is also important to have regard to the relative significance of international, national and local designations in considering the weight to be attached to nature conservation interests, the River Dee and Bala Lake SAC is the highest tier of internationally protected sites. Development can normally only be authorised, or the plan adopted, if the planning authority ascertains that it will not adversely affect the integrity of the site, if necessary, taking into account any additional measures, planning conditions or obligations.

#### Local Development Plan

2.4.21 The emerging Local Development Plans (LDPs) ~~is area~~ land use plans that sets out the planning requirements for achieving sustainable development in Wrexham County Borough over the period 2013-2028 and for Flintshire County over the period 2015 to 2030. The Plans identify where and how much new development will take place in the two administrative areas, as well as which areas need to be protected for their environmental qualities.

2.4.22 The current adopted development plan for Wrexham, the Unitary Development Plan, is past its end date. The emerging, Wrexham Local Development Plan ~~2012-2028~~ and Flintshire Local Development Plan, are both currently in examination, for which the outstanding issue is phosphorus and procedurally, further public consultation on Matters Arising Changes from the examination. Once the examination has closed and the Inspectors have issued their final binding report, the LDP will be presented to each Council for adoption.

Commented [A10]: Above para gives a start date of 2013

2.4.23 With regards to the key LDP policies, bearing in mind the Wrexham plan is currently in examination, the plan contains two types of policies, strategic and detailed, the most significant ones for the DCPRS are;

*Spatial and Growth Policies*; these direct where development should take place and the amount of growth:

- Policy SP1: Housing Provision, sets the overall housing requirement and details the sources of housing supply (allocations, completions, commitments, windfall etc.);
- Policy SP2: identifies the location for development according to a settlement hierarchy with growth located in the most sustainable locations;
- Three policies for Key Strategic Sites (KSS) identify key spatial areas for growth and growth levels - Policy SP3: KSS1 Land at Lower Berse Farm, Ruthin Road, Wrexham: Policy SP4: KSS2: Land East of Cefn Road, Wrexham) and Policy SP10: KSS3: Land to the north of Bryn Lane,
- Policies for spatial areas and growth levels – Policy SP7: Wrexham Town promoting Wrexham as a key priority for growth; SP8: Economic Growth Employment and Enterprise setting employment growth levels; Policy SP9: Wrexham Industrial Estate protecting a

strategic employment area; allocated housing sites (Policy H1: Housing Allocations); Policy EM1: Protection of Existing Employment Land, and Policy.

- There are also a range of other policies that direct non-strategic growth e.g. Gypsy and Traveller sites, housing in the countryside etc.

Environmental Protection Policies:

- Strategic Policy SP14 Natural Environment; SP19 Green Infrastructure; Policy NE1: International and Nationally Designated Nature Conservation Designations- general protective policies for designated sites and promoting green infrastructure
- [Policy NE6: Waste Water Treatment and River Water Quality](#) this is a key policy protecting the integrity of the River Dee and Bala Lake SAC

Other Relevant Policies:

- Planning Obligations – Strategic Policy SP5: Planning Obligations for securing obligations arising from development.

2.4.24 For the Flintshire Plan, the key policies are:

Growth and Spatial Policies:

- STR1 Strategic Growth - sets the overall level of housing development and employment development over the Plan period.
- STR2 The Location of Development – sets the distribution of housing development by scale and type based on a sustainable settlement hierarchy.
- Detailed policies in respect of growth and spatial approach: PC1 The Relationship of Development to Settlement Boundaries; PE1 General Employment Land Allocations – identifying employment allocations; PE2 Principal Employment Areas – identifying existing employment areas; HN1 New Housing Development Proposals – identifying new housing allocations.
- There are also a range of other policies that direct non-strategic growth e.g. Gypsy and Traveller sites, housing in the countryside, tourism, etc

Environmental Protection Policies:

- STR4 Principles of Sustainable Development, Design and Placemaking; STR13 Natural and Built Environment, Green Networks and Infrastructure; STR14 Climate Change and Environmental Protection; PC4 Sustainability and Resilience of New Development; EN2 Green Infrastructure; EN6 Sites of Biodiversity Importance – this policy is proposed to be amended to include specific safeguards regarding International designations.
- EN15 Water Resources – this is a key policy protecting the integrity of the River Dee and Bala Lake SAC

Other relevant policies:

- STR6 Services, Facilities and Infrastructure – sets out the approach to delivering new or improved infrastructure arising from new development.

## Supplementary Planning Guidance

- 2.4.25 Supplementary Planning Guidance (SPG) is produced to provide further detail on certain policies and proposals contained within the Local Development Plan (LDP). They help ensure certain policies and proposals are better understood and applied more effectively. SPGs do not have the same status as adopted development plan policies, however, the Government advises that they may be taken into account as a material consideration in determining planning applications.
- 2.4.26 An SPG could be used by Flintshire and Wrexham County Borough to support policies EN15 (Flintshire) and NE6 (Wrexham), this could be produced jointly or individually.

**Commented [A11]:** This is different to the reference to SPG in the preface on page 2 which states: '...the Councils' associated supplementary planning guidance which will be prepared in due course.'

## 3 What a nutrient management strategy can achieve

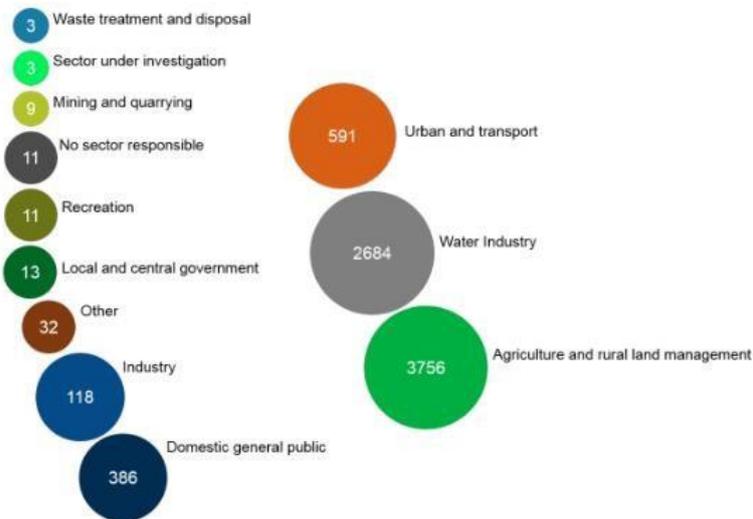
### 3.1 Existing water quality status and issues

- 3.1.1 Sewage effluent and agriculture (losses from fertilisers and feed/ manures) are the largest source contributors of phosphorus to waterbodies. Phosphorus and Nitrogen are also one of the most common reasons for water bodies not achieving good status under the Water Framework Directive (WFD) Regulations. Detergents are now a minor source of phosphorus within sewage since the introduction of EU and UK restrictions<sup>19</sup>. The Natural Resources Wales Water Watch Map Gallery contains web maps and data related to the Water Framework Directive in Wales as well as the Reason for Not Achieving Good Status (RNAG)<sup>20</sup>. At the moment this strategy is focussed on phosphate reduction but as this strategy evolves phosphate recovery should be examined as phosphate is a limiting element with finite reserves.
- 3.1.2 Figure 3.1 below also shows the counts of numbers of RNAG (EA March 2019)<sup>21</sup> in several River Basin Districts across England. From the 7617 reasons for not achieving good status for phosphate, agriculture and rural land management is the main sector responsible in 3756 cases and the water industry in 2684 cases. It is worth noting that existing housing mostly falls under the Water Industry count.

<sup>19</sup> [https://consult.environment-agency.gov.uk/++preview++/environment-and-business/challenges-andchoices/user\\_uploads/phosphorus-pressure-rbmp-2021.pdf](https://consult.environment-agency.gov.uk/++preview++/environment-and-business/challenges-andchoices/user_uploads/phosphorus-pressure-rbmp-2021.pdf)

<sup>20</sup> [Water Watch Wales \(naturalresourceswales.gov.uk\)](https://naturalresourceswales.gov.uk)

<sup>21</sup> Phosphorus and Freshwater Eutrophication Pressure Narrative ( EA October 2019)  
[https://consult.environmentagency.gov.uk/++preview++/environment-and-business/challenges-andchoices/user\\_uploads/phosphorus-pressure-rbmp2021.pdf](https://consult.environmentagency.gov.uk/++preview++/environment-and-business/challenges-andchoices/user_uploads/phosphorus-pressure-rbmp2021.pdf)



**Figure 3.1 Counts of numbers of Reasons for Not Achieving Good Status (RNAG) EA March 2019**

3.1.3 For the River Dee, the Reasons for RNAG are also largely due to agriculture and rural land management and Wastewater Treatment Works (WwTW) with Mining and Quarrying the third followed closely by Urban and Transport. For WwTW, this is largely due to their inability to completely remove P from effluent before discharging into the surrounding waterbodies (Figure 3.2).



weir to Ceiriog). The WFD Cycle 2 overall status of the waterbodies that existing WWTWs are discharging to are shown as “moderate”.

3.1.7 Phosphorus standards are used in managing the risk of these adverse ecological impacts. Where rivers are already adversely affected, phosphorus standards can indicate the likely degree to which phosphorus concentrations would need to be reduced (e.g., by reducing concentrations in discharges) to improve ecological quality. Where a new discharge is proposed, phosphorus standards can indicate whether or not the river is likely to be able to accommodate the additional inputs without significant risk of adverse ecological effects. The relevant standards for nutrients must also be met for a river to be classed as being at good or high ecological status. The equation produces standards in the form of annual mean concentrations of reactive phosphorus in µg/l estimated for the lower class boundary of ‘high’, ‘good’, ‘moderate’ and ‘poor’ ecological status.

3.1.8 The watercourses within Wrexham County Borough Council district which do not achieve ‘good’ status because of P are:

- Dee – Ceiriog to Alwen;
- Dee – Chester Weir to Ceiriog;
- Dungrey Brook;
- Emral Brook\*;
- Worthenbury Brook (middle and lower)\*;
- Pulford Brook\*;
- Alyn – Hope to Dee

\*these are cross boundary waterbodies with England.

3.1.9 For Flintshire County Council, the waterbodies which do not achieve ‘good’ status because of P are:

- Alyn – Hope to Dee
- Alyn – Dolfechlas to Leadmill
- Alyn – Leadmill to Hope
- Alyn – upstream Dolfechlas Brook
- Terrig
- Sandycroft Drain\*\*
- Wepre Brook\*\*
- Glanfyddion Cut\*\*
- Black Brook
- Dolfechlas Brook

\*\*these waterbodies however are not draining to the River Dee Freshwater Catchment

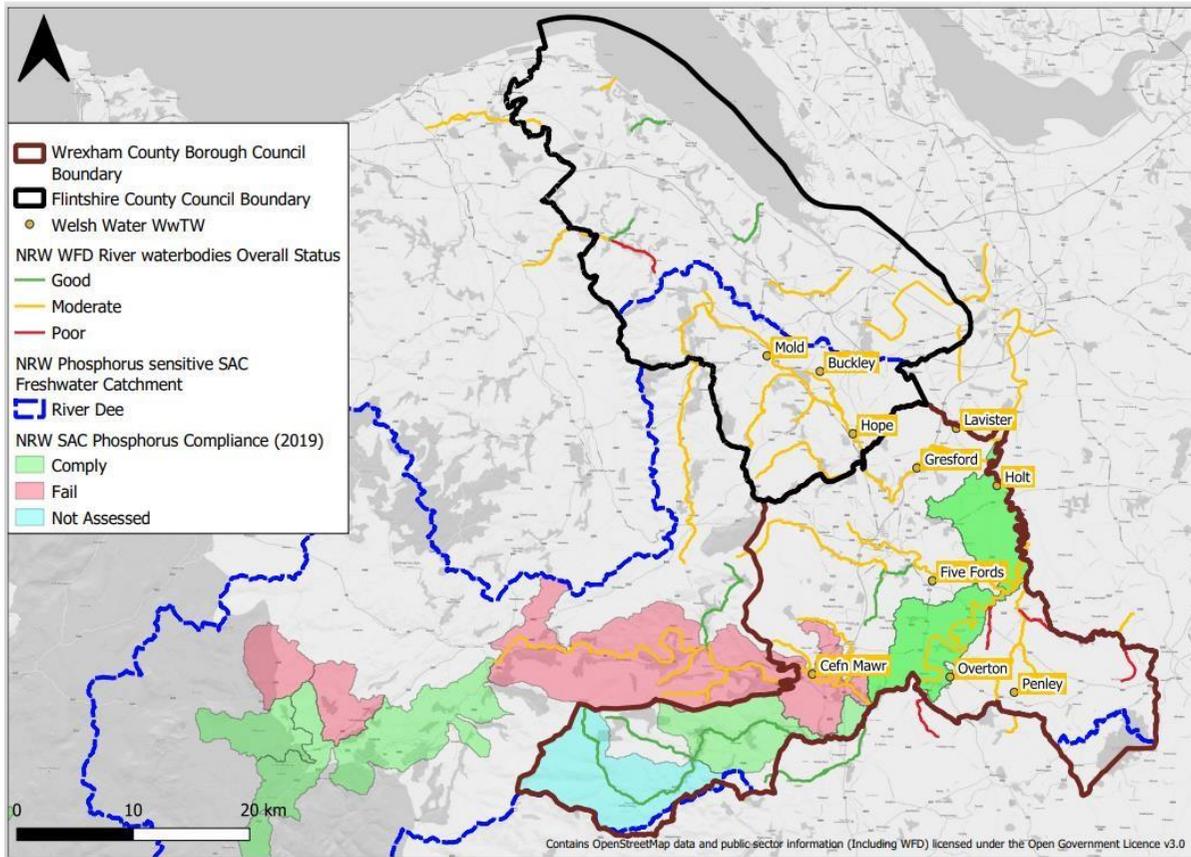


Figure 3.3 Natural Resources Wales WFD cycle 2 (2018) overall ecological status and SAC P compliance status (2019)

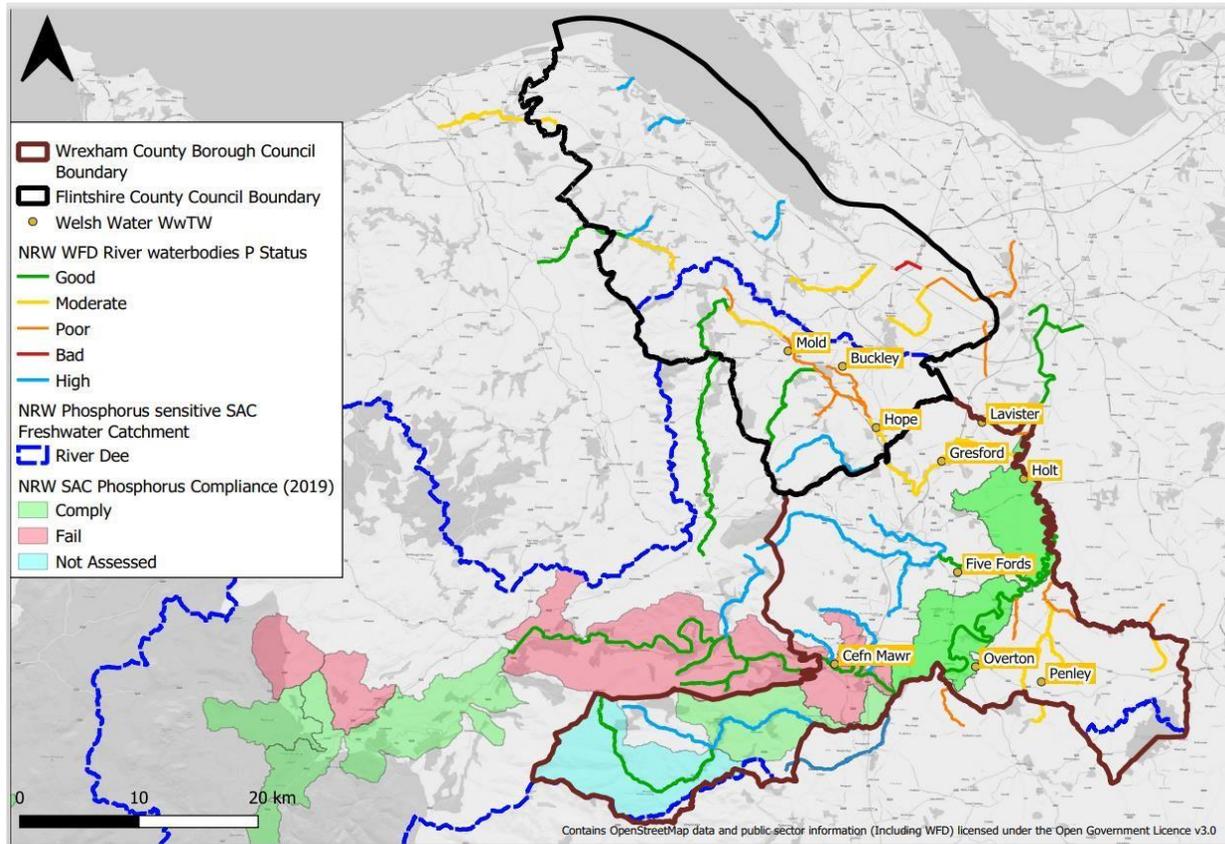


Figure 3.4 Natural Resource Wales WFD cycle 2 (2018) P status and SAC P compliance status (2019)

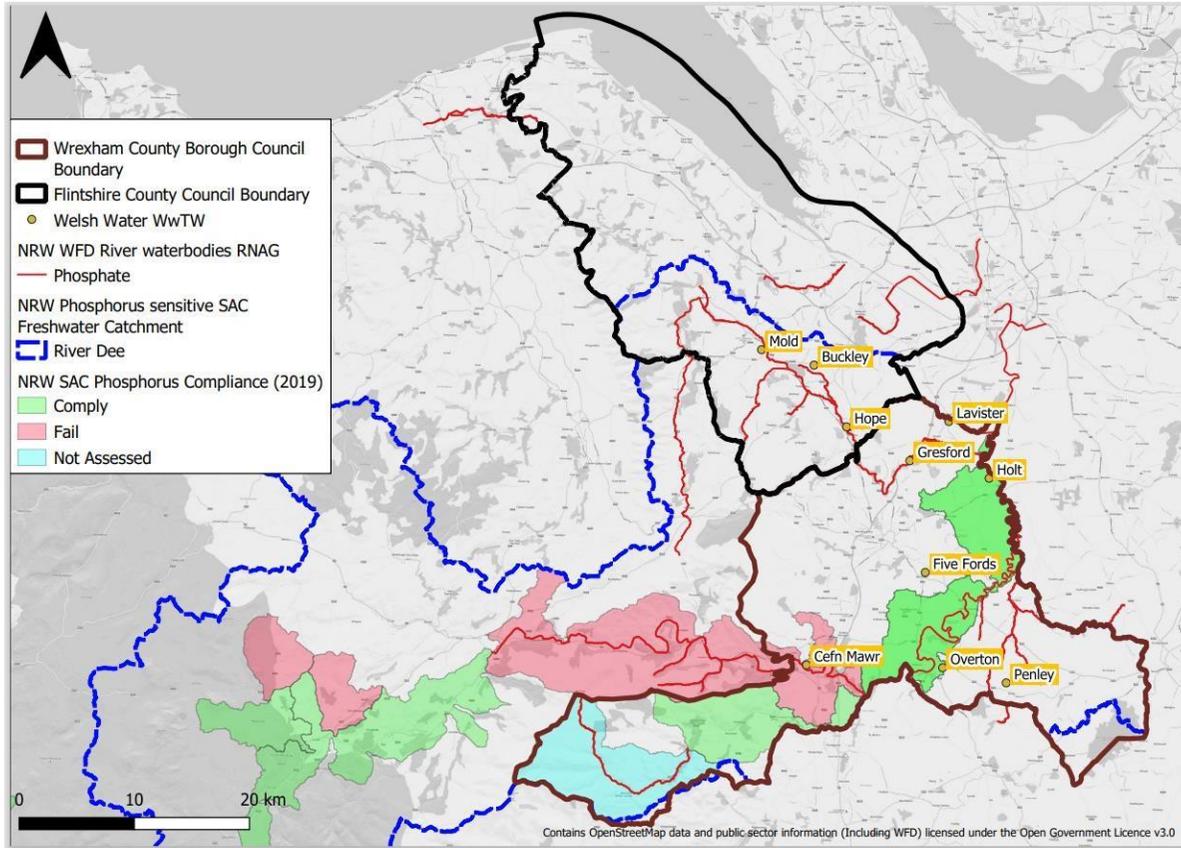


Figure 3.5 RNAG status is P within WFD Cycle 2 data (2017) and SAC P compliance status (2019)

### 3.2 Impactful measures that can deliver phosphate reductions

3.2.1 The key measures that can deliver the required phosphate reductions include:

- Identifying the key sources of P, including their % contributions, pathways and receptors;
- Agricultural source control which includes addressing crop P need and the added impact of soil P from soil erosion, through reducing the use of phosphorus, increasing phosphorus use efficiency and preventing phosphorus from entering watercourses;
- Wastewater treatment preventing phosphorus entering watercourses; and
- Sustainable Drainage Systems (SuDS) and Integrated Buffer Zones (IBZs) protection strategically positioned preventing runoff into watercourses by interception and metabolization.

Commented [A14]: Identifying and then reduce

#### Agricultural source control

3.2.2 Around 80 per cent of Welsh land is managed for farming in some way<sup>24</sup>. Phosphorus (P) is a limiting nutrient in many agroecosystems and fertilizer inputs are not only costly to the farmer but can result in P reaching watercourses. Table 3.1 is an example of the major agricultural practices and pollution concerns for three catchments in the UK from Ockenden *et al* 2017<sup>25</sup>. This does not include the deployment of biosolids to land for agricultural benefits that is subject to different legislation. These impacts will be increased by the effect of climate change predicting a 30% increase by the 2050s. For livestock-dominated catchments, the storage and spreading of organic livestock waste is a major concern. For arable and horticulture-dominated catchments, diffuse pollution from nitrate and phosphate fertilisers as well as sewage sludge digestate applied to the land is also a major concern. For the Dee catchment, the main land uses are rough grazing and forestry in the upper catchment, with arable and dairy farming in the lower catchment<sup>26</sup>. In addition, soil erosion from roadside verges and field entrances, where frequent passage of farm machinery can damage the soil structure, results in sediment and nutrient laden road runoff when it rains.

Commented [A15]: increase in what?

**Table 3.1 Major agricultural practices and pollution concerns for three catchments in the UK**

Catchment	Dominant agricultural activities	Major agricultural concerns and key sources of pollution	Current mitigation practices
Newby Beck, Eden, Cumbria	Livestock grazing (cattle and sheep)	Hard standings Slurry storage and management  Inorganic fertiliser application	Runoff detention features

<sup>24</sup> Farming in Wales (rspb.org.uk)

<sup>25</sup> Major agricultural changes required to mitigate phosphorus losses under climate change | Nature Communications <sup>26</sup> <https://naturalresources.wales/media/3225/dee-management-catchment.pdf>

	Dairy production	Soil compaction	
	Arable crops	Nitrate and phosphate fertilisers	Cover crops
<b>Catchment</b>	<b>Dominant agricultural activities</b>	<b>Major agricultural concerns and key sources of pollution</b>	<b>Current mitigation practices</b>
Blackwater, Wensum, Norfolk		Runoff from road verges, hard standings, field entrances, eroding arable topsoils	Reduced cultivation measures Roadside sediment traps
		Soil denitrification (greenhouse gas emissions)	
		Pesticide spraying	
		Sewage Treatment Works	
Wylde, Avon, Hampshire	Livestock	Livestock waste management	Clean and dirty water separation
		Inorganic fertiliser application	Fencing watercourses
		Faecal pollution	Settling ponds
		Soil erosion	
		Septic tanks	

3.2.3 There are many possibilities for the agricultural system to improve the use of phosphorus, including, but not limited to<sup>26</sup>:

- **Adopting Nutrient Management Techniques:** Farmers can improve nutrient management practices by applying nutrients (e.g. fertilizer and manure) in the right amount, at the right time of year, with the right method and with the right placement.
- **Separation of clean and dirty water:** Includes separation of manure and slurry, keeping rainwater out of slurry stores by covering them and maintaining separate drainage systems.
- **Ensuring Year-Round Ground Cover:** Farmers can plant cover crops or perennial species to prevent periods of bare ground on farm fields when the soil (and the soil and nutrients it contains) are most susceptible to erosion and loss into waterways.

<sup>26</sup> <https://www.epa.gov/nutrientpollution/sources-and-solutions-agriculture>

- **Creating Field Buffers:** Farmers can plant trees, shrubs and grasses along the edges of fields to create riparian corridors; this is especially important for a field that borders water bodies. Planted buffers can help prevent nutrient loss from fields by absorbing or filtering out nutrients before they reach a water body.
- **Implementing Conservation Tillage:** Farmers can reduce how often and how intensely the fields are tilled. Doing so can help to improve soil health, and reduce erosion, runoff and soil compaction, and therefore the chance of nutrients reaching waterways through runoff.
- **Changing livestock feed to P low feed types:** Reducing the amount of nutrient being fed to livestock there will be lower levels in their manures/slurries which will result in lower levels being applied to land when this is used for crop need. Need to consider the full lifecycle from cradle to grave for nutrient including all sources, pathways and receptors (including air) to manage the risk in the **NMS**.
- **Managing Livestock Access to Streams:** Farmers can install fence along streams, rivers and lakes to block access from animals to help restore stream banks and prevent excess nutrients from entering the water.
- **Engaging in Watershed Efforts:** The collaboration of a wide range of people, stakeholders and organizations across an entire watershed is vital to reducing nutrient pollution to our water and air.

**Commented [A16]:** Should this be the DCPRS ?

3.2.4 Subsequent sections will discuss the effectiveness of these measures and those that may be applicable to this reduction strategy.

#### *Wastewater treatment works*

3.2.5 A small quantity of phosphorus is naturally removed through wastewater treatment works with solids settlement and biological treatment processes. However, this is not enough to remove the quantities required to meet phosphorus permit limits. To achieve this, many techniques have been developed to remove phosphorus through the treatment process. In some cases where existing phosphorus permits ~~are~~ may being tightened, a combination of techniques may be required. These consist of: -

- **Chemical Precipitation** – where metal salts are used to precipitate the phosphate component through flocculation and settlement. The use of rare elements to remove phosphorus has also shown to be effective at P removal as rare earths form a strong crystalline ionic bond with phosphates, unlike the chemical approach of iron- and aluminium-based coagulants, which do not bind to phosphorus as efficiently<sup>27</sup>.
- **Physical separation** – where filtration is used to remove the suspended solids phosphorus component. One example of this is electrocoagulation which destabilizes and aggregates contaminant particles, ions such as heavy metals, and colloids, using an electrical charge to hold them in solution.

**Commented [A17]:** This point could include consideration of the wider impact of chemical use, such as increased discharges of chemicals to the watercourse. This could be listed in table 4.6

<sup>27</sup> [Phosphorus Removal From Wastewater, Reduce Sludge From Wastewater \(neowatertreatment.com\)](#) <sup>29</sup>  
[South West Water to use I-Phyc's algae-based treatment to sustainably remove Phosphorus and micropollutants from sewage - Industrial Phycology](#)

- **Enhanced biological phosphorus removal** – where an anaerobic phase positioned upstream of an activated sludge process encourages growth of phosphorus accumulating microorganisms to take up phosphorus in the downstream aerated stage.
- **Algae treatment** – where algae is used to naturally consume the phosphorus as a nutrient. This is a relatively new technology. This solution is already being used by South West Water.<sup>29</sup>
- **Reedbeds** – where there have been developments in phosphorus adsorbing media being used as the base for the reedbed.
- **Constructed wetlands** – where high retention times encourage settlement and natural uptake of phosphorus.

3.2.6 The disposal of sewage sludge and any waste material from reedbeds or wetlands (e.g., dredged silt and dead plants) that are used in the treatment processes will also need careful consideration, to minimise the potential release of phosphorus and other nutrients into the receiving watercourses due to sludge spreading and composting in agricultural fields. Pre-treatment with solar drying and reedbeds, balancing crop needs, spreading sludge and other material away from watercourses, incorporating extra phosphorus removal measures (e.g. wetlands, integrated buffer zones) in the agricultural fields and taking sludge away from the Dee Freshwater Catchment are some possible measures to address this issue.

#### *Water quality protection using Sustainable Drainage Systems (SuDS) and Integrated Buffer Zones (IBZs)*

3.2.7 There is a growing acceptance that we need a more sustainable approach to managing surface water. SuDS mimic natural drainage processes to reduce the effect on the quality and quantity of runoff from developments and provide amenity and biodiversity benefits. SuDS can also deliver additional environmental benefits.<sup>28</sup> In addition to SuDS, IBZs which are strips of habitat surrounding agricultural fields or adjacent to watercourses, that can support drainage and protect watercourses.

3.2.8 Schedule 3 of the Flood and Water Management Act 2010 ~~for Wales~~<sup>29</sup>, which came into effect [in Wales on](#) 7<sup>th</sup> January 2019, outlines the mandatory SuDS standards and requirements developers need to meet before gaining approval from the SuDS Approving Body (SAB).

3.2.9 The Technical Advice Note 15 (TAN15) for Development, flooding and coastal erosion (December 2021) requires developers to submit a surface water drainage strategy and Drainage Statement as part of their planning application. TAN15 creates a requirement for developers to ~~think about~~ **consider** SuDS early on in the process and ensure approval by applying for both types of consents simultaneously, ensuring the planning application documentation provides full details of the proposed SuDS. Further details about the requirements for a Drainage Statement can be found in Figure 4 of ~~the~~ **TAN15 guidance**.<sup>30</sup>

**Commented [A18]:** These could be combined into one bullet point due to similarity.

**Commented [A19]:** Needs updating to reflect WG's decision (in Nov 2021) to postpone implementation of the TAN until June 2023

<sup>28</sup> <https://www.susdrain.org/delivering-suds/using-suds/benefits-of-suds/SuDS-benefits.html>

<sup>29</sup> <https://senedd.cymru/media/1350bsj4/sub-ld11776-em-w.pdf>

<sup>30</sup> [Technical Advice Note 15, Developing, flooding and coastal erosion \(gov.wales\)](#)

### Water quality benefits of SuDS and IBZs

3.2.10 SuDS components differentiate from traditional drainage by providing water quality improvements by reducing sediment and contaminants from runoff either through settlement or biological breakdown of pollutants. This can improve the quality of downstream water bodies such as streams, rivers, lakes, bathing or shellfish waters. Furthermore, where SuDS reduce flows entering combined sewers, this can lead to reduced combined sewer overflow discharges (controlled discharge of surface water runoff and sewage), again improving the quality of the receiving water body. Such water quality improvements (or prevention of deterioration) can lead to a number of additional environmental and social benefits including visual amenity, health (e.g. reduced risk of infection from bathing) ~~and~~ enhanced recreation and opportunities for wildlife and biodiversity.

3.2.11 In general, the use of SuDS components, especially if a SuDS management/treatment train is used and they are appropriately designed, constructed and maintained, can improve water quality in downstream waterbodies as well as deliver wider benefits (see the SuDS pathway diagram below from <https://www.susdrain.org/>).



Figure 3.6 SuDS pathway diagram (source: susdrain)

### SuDS typologies

3.2.12 Sustainable drainage includes a variety of components, each having different approaches to managing flows, volumes, water quality and providing amenity and biodiversity benefits. There are a variety of SuDS components, and there is often some overlap. Components that materially contribute to the improvement of water quality are:

- **Source control** – a key method of source control includes permeable paving which can attenuate flow and enhance water quality. Green roofs can help provide interception storage which can handle and treat some of the more frequent but smaller, polluting rainfall events (at least 5mm, if not 10mm). Their purpose is to manage rainfall close to where it falls, not allowing it to become a problem elsewhere;
- **Swales and conveyance channels** – these carry surface water runoff using vegetated channels across the site and can be used to manage floodwater. Swales may need to be lined appropriately in certain situations to avoid pollutants entering into undesired zones (e.g. contaminated land, areas with high groundwater table and source protection zones);
- **Filtration** – Filtration and removing sediment or other particles from surface water runoff is one of the main treatment methods for sustainable drainage, filter strips including street trees and bioretention areas include vegetation that traps silt to remove pollutants and reduce runoff downstream. Bioretention areas are shallow depressions that are aimed at managing and treating runoff from frequent rainfall events;

- **Infiltration** – Infiltration components are used to capture surface water runoff and allow it to infiltrate (soak) and filter through to the subsoil layer, before returning it to the water table below. These include rain gardens which are relatively small depressions in the ground that can act as infiltration points for roof water and other ‘clean’ surface water;
- **Retention & detention** –Provide storage, through the retention of surface water runoff, or attenuation through the detention of surface water runoff. Retention is primarily provided on the surface through ponds, however, there should be upstream components or treatment stages before surface water is conveyed to ponds. Detention is often useful in attenuating the peak flow from a rainfall event, but it also allows filtering and sedimentation to take place, which contributes to water quality improvement;
- **Constructed Wetlands** – Constructed wetlands are densely vegetated water bodies that use natural processes to provide treatment of surface water runoff. Wherever possible wetlands should be the last stage of the SuDS treatment train otherwise there's a risk of extensive siltation. They remove fine sediments, metals and particulates, and dissolved nutrients. They can provide the largest P removal capacity of the SuDS solutions and the greatest biodiversity benefits.

#### *Integrated Buffer Zones*

3.2.13 IBZs are different-sized areas or strips of permanent vegetation that minimize soil erosion by reducing surface runoff. They can also trap and degrade a portion of runoff adsorbed to sediments or dissolved in water; they can be used along with other best management practices to protect water quality. IBZs are an effective and cost-efficient best management practice that can be used to improve water quality. Habitats within these IBZs used for water control and water quality improvement, include woodland, grassland and wetlands that may provide a physical barrier to prevent water contamination and prevent degradation of soil, reducing soil erosion, minimise the movement of soil sediment and nutrient loading to surface and groundwater, moderating water temperatures. Other benefits include biodiversity benefits which in turn can minimise pathogens, maximise pest predators and maximise conditions for metabolization of pollutants.

#### *Other environmental benefits*

3.2.14 One of the most appealing aspects of nature-based solutions is that is that they deliver multiple benefits in addition to water volume and quality attenuation. For city and suburban developments this can encourage active transport and support health and wellbeing delivery ecotherapy as well as recreation opportunities. These can also provide biodiversity and carbon sequestration on site to reduce the impact of development. Figure 3.7 below from susdrain presents the range of benefits provided. [3.2.15](#)

Benefit category	What it covers	Benefit category	What it covers
 Flood risk management	Impact on people and property	 Enabling development	Water Infrastructure capacity (headroom) for housing/other growth
 Water quality management	Surface water quality improvements to aesthetics, health, biodiversity, etc	 Flexible infrastructure/ climate change adaptation	Improved ability to make incremental changes and adapt infrastructure (no regrets)
 Biodiversity and ecology	Sites of ecological value	 Groundwater recharge	Improved water availability or quality
 Amenity	Attractiveness and desirability of an area	 Health and wellbeing	Physical, emotional, mental health benefits from recreation and aesthetics
 Air quality	Impact on health from air pollution	 Pumping wastewater	Reduced flows of wastewater to treatment works
 Building temperature	Thermal comfort, It cooling (summer) or insulation (winter).	 Rainwater harvesting	Reduced flows in sewers, pollution or dependence on potable (mains) water
 Carbon reduction and sequestration	Operational and embodied carbon reduction together with sequestration (planting)	 Recreation	Involvement in specific recreational activities
 Crime	Crimes against people or property	 Tourism	Attractiveness of tourist sites
 Economic growth	Business, jobs and productivity	 Traffic calming	Reducing the risk of road accidents or increasing street-based recreation opportunities
 Education	Enhanced educational opportunities	 Treating wastewater	Reduced volume of wastewater to treat from combined drainage systems

**Figure 3.7 Multiple benefits of SuDS (source: susdrain)**

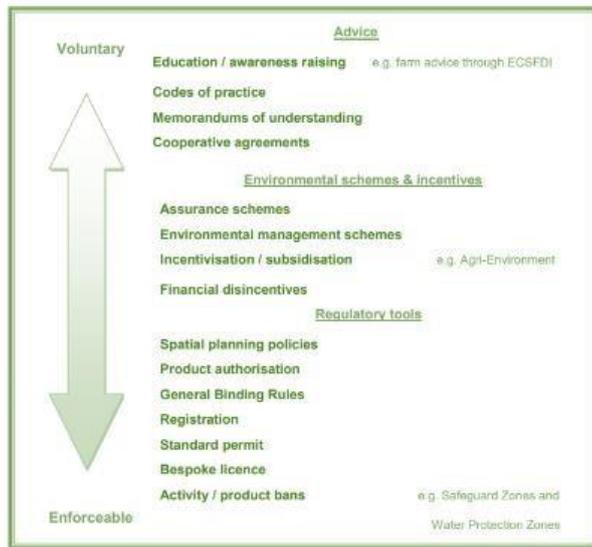
### 3.3 Mechanisms for implementation and the reductions which might be achieved

#### *Mechanisms for implementation*

3.3.1 There are various mechanisms for implementing these P reduction opportunities ranging from:

- providing advice on funding sources, best practice, and effective solutions;
- promoting co-delivery mechanisms to maximise wider opportunities and benefits through collaboration and building stakeholder trust and confidence; and
- exercising regulatory tools that are within the power of Ofwat, NRW, the LPAs/LAs and the Welsh Government.

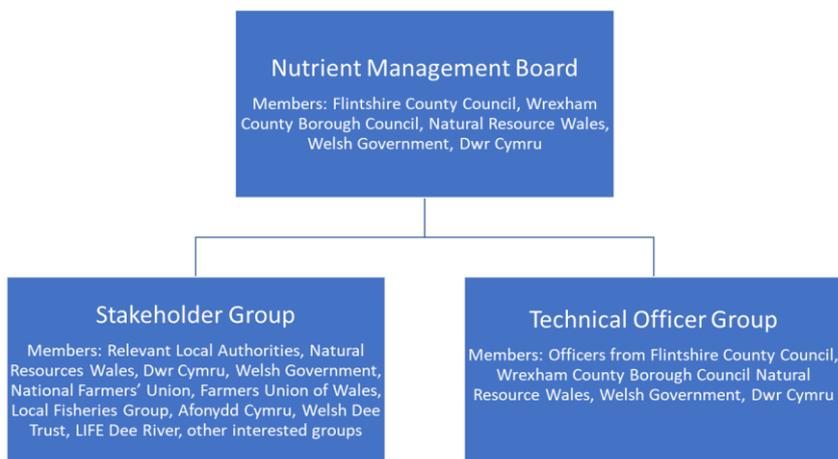
3.3.2 Figure 3.7 below shows an initial example from the River Wye Nutrient Management Plan, although this will need careful reviewing and updating as DCPRS is evolved to reflect the current legislative and planning context, lessons learned and stakeholder feedback, advances in technologies and best practice, and priorities and opportunities in the River Dee Catchment.



**Figure 3.7 Example mechanisms for implementing improvements -used in River Wye Nutrient Management Plan**

3.3.3 It is expected that a Nutrient Management Board will be set up to coordinate and deliver the DCPRS. Below is a high-level breakdown of the proposed Nutrient Management Board panel as well as the relevant stakeholder groups and proposed technical officer groups which would input into the delivery of the DCPRS.

**Commented [A20]:** Need to include all LA's on both side of the border in the NMB



3.3.4 NRW's SAC Rivers project includes a **workstream** looking at potential short and long term solutions to reduce **phosphate-phosphorus** levels in SAC catchments which could relieve the pause on some developments. This is a complex area which requires consideration of the appropriate regulations. ~~NRW are working on developing appropriate screening criteria for likely significant effect for agricultural developments and surface water discharges which are expected to be agreed early in the New Year. NRW are also developing Appropriate Assessment Guidance.~~ NRW are in discussion with the water company in relation to phosphate dosing treatments in some sewage treatment works. The water company has indicated these would take **6-9 months to install**. Further work is ongoing in relation to the application of nutrient calculators and NRW are starting to develop their internal guidance in this area.

**Commented [A21]:** The main aim of this workstream is to restore the condition of the SAC rivers, not enable development

3.3.5 Tightening of existing wastewater discharge permits to reduce phosphorus entering the watercourses can be undertaken from a permit review or looking at P compliance, in relation to conservation objectives, **undertaking during an AMP planning cycle**. For example, planning for AMP8, 2025 – 2030, will take place over the next two years where all failing SAC P catchments in Wales would be looked at. As described in Table 3.4 below, permit review is a duty NRW have under Environmental Permitting Regulations (EPR), where NRW check that the permit is protective of the Environment by assessing compliance with Regulations, such as WFD & Habitats Regulations that influence the National Environment Programme (NEP) and Asset Management Programme process, standards and priorities. There are also Waste Regulation and Pollution Prevention and Control permits that could be varied.

**Commented [A22]:** Is this timescale correct for such treatment

**Commented [A23]:** Wording needs amendment to avoid confusion

3.3.6 Phosphorus reduction measures will need to be implemented and maintained indefinitely to ensure the benefits of the measures are realised. Maintenance needs and funding mechanisms will be agreed in advance of implementing the preferred intervention measures, and who is responsible for maintenance will depend on each measure involved (e.g., type, location, ownership, access, etc.). It may range from LPA contractors to DCWW contractors to farmers and landowners. This may be done on a paid basis implementing "all reasonable measures" under a land covenant or other legal agreement. There are also legislative and regulatory powers that can be exercised to ensure that measures are put in place (see further **below**).

**Commented [A24]:** Para ref needed here

#### *Opportunities for P reduction*

3.3.7 The interventions presented in section 3.2 have significant capacity to reduce P in the system and prevent P entering watercourses, this includes the following interventions opportunities during:

- **New development** – supporting the delivery of biodiversity net gain and wider benefits;
- **Urban retrofitting** – supporting climate and urban resilience;
- **Agricultural improvements and large-scale nature-based solutions** – reducing agricultural impacts;
- **Wastewater treatment** – increasing the capacity and performance of wastewater treatment works; and

**Commented [A25]:** This isn't an opportunity for P reduction but for other benefits

- **Surface water separation** – separating surface water drainage inputs to combined sewer.

3.3.8 Further details for specific opportunities for collaboration and co-delivery will be presented in Sections 4.4 and 4.5.

*New development*

3.3.9 Integrating nature-based SuDS, constructed wetlands and tree planting into new development should be a priority, as these can be delivered on site. The formation of high quality and efficient SuDS opportunity areas to accompany Local Development Plans would support the implementation of current legislation and policies to support SuDS delivery. This would reduce surface runoff and improve water quality (by sedimentation, filtration and biofiltration, separation, adsorption and biodegradation) as well as drive water efficiency and climate resilience. The current drivers to deliver biodiversity net gain and carbon net zero will also support these aspirations. Otterpool Park (Figure 3.8) is an example of a development where 50% of the 770ha site was designated as green space and incorporated a range of blue/green corridors throughout the masterplan. This development will also achieve nutrient neutrality to protect the downstream Stodmarsh Lakes SAC.



Figure 3.8 Otterpool Park, 10,000 homes new development in South Kent<sup>31</sup>

*Urban retrofitting*

3.3.10 Retrofitting SuDS based opportunities fall into two categories:

<sup>31</sup> <https://www.otterpoolpark.org/>

- **Opportunistic retrofitting or “nibbling”** - where the primary aim is overall area improvement. These can include major retrofitting including green roofs and pocket parks in city centres and streetscape enhancement in suburban areas. Many small interventions can make large differences over time and significantly contribute to urban regeneration (Figure 3.9).



**Figure 3.9 Suburban retrofitting opportunities**

- **SuDS led** - drainage driven, either to control flooding or pollution (or both). Such opportunities usually (but not always) occur across comparatively larger areas and may be considered to be more strategic than the opportunistic retrofitting (Figure 3.10).



**Figure 3.10 Drainage led SuDS Detention and Retention basins<sup>32</sup>**

3.3.11 These schemes may be driven by the need for urban regeneration, traffic calming, active transport aspirations in addition to flood reduction.

#### *SuDS Maintenance and Adoption in Wales*

3.3.12 Evidence has demonstrated that the effectiveness of SuDS is largely based upon optimum design and maintenance. Standards for SuDS design and maintenance have been provided for Wales<sup>33</sup>. Like all drainage systems, an inventory of all SuDS locations should be kept to

<sup>32</sup> <https://www.sudswales.com/>

<sup>33</sup> <https://gov.wales/sites/default/files/publications/2019-06/statutory-national-standards-for-sustainable-drainagesystems.pdf>

ensure all SuDS components are inspected and maintained. This should include routine and long-term actions that can be incorporated into a maintenance plan. A SuDS management plan for the maintenance of SuDS should be prepared.

3.3.13 The North Wales Flood Risk Management Group (NWFRMG) have recently produced the North Wales SuDS guide which provides developers with an overview of the processes and design requirements for obtaining SuDS Approving Body (SAB) approval in North Wales. Wrexham County Borough Council and Flintshire County Council are two of the six SABs covered in this guidance.

3.3.14 Table 3.2 provides a breakdown of typical maintenance requirements. Further information can be found in The SUDS Manual (CIRIA publication C753)<sup>34</sup>.

**Table 3.2 Typical inspection and maintenance requirements**

Activity	Indicative frequency	Typical tasks
Routine/regular maintenance	Monthly (for normal care of SuDS)	<ul style="list-style-type: none"> <li>litter picking</li> <li>grass cutting</li> <li>inspection of inlets, outlets and control structures.</li> </ul>
Occasional maintenance	Annually (dependent on the design)	<ul style="list-style-type: none"> <li>silt control around components</li> <li>vegetation management around components</li> <li>suction sweeping of permeable paving</li> <li>silt removal from catchpits, soakaways and cellular storage.</li> </ul>
Remedial maintenance	As required (tasks to repair problems due to damage or vandalism)	<ul style="list-style-type: none"> <li>inlet/outlet repair</li> <li>erosion repairs</li> <li>reinstatement of edgings</li> <li>reinstatement following pollution □ removal of silt build up.</li> </ul>

3.3.15 Under Schedule 3 of the Flood and Water Management Act 2010<sup>35</sup>, the SuDS Approval Body (SAB) must adopt SuDS that serve two or more properties in Wales. The SuDS scheme is unlikely to be handed over for maintenance until all parties are confident that the scheme is constructed and performs as designed. Before adoption can be completed, construction of the SuDS scheme should be verified by an appropriately qualified individual. The verification process is likely to take the form of developer supplied documentation and inspections during constructions.

<sup>34</sup> [https://www.ciria.org/Memberships/The\\_SuDs\\_Manual\\_C753\\_Chapters.aspx](https://www.ciria.org/Memberships/The_SuDs_Manual_C753_Chapters.aspx)

<sup>35</sup> <https://senedd.cymru/media/135obsj4/sub-ld11776-em-w.pdf>

### *Agricultural improvements and large-scale nature-based solutions*

- 3.3.16 There are a wide range of opportunities for agricultural improvements to remove P from the system as previously discussed. These range from small scale infrastructure improvements including fencing to large scale wetland and IBZ interventions to reduce wider phosphate impacts. The Farmscoper Tool<sup>36</sup> is a decision support tool that allows the assessment of the cost and effectiveness of mitigation methods against multiple pollutants and contains over 100 mitigation methods, including costs and implementation methods.
- 3.3.17 The Welsh Information for Nature-based Solutions<sup>37</sup> (WINS) provides a spatial database for opportunities for such solutions. Figure 3.11 below provides a high-level overview of the potential for nature-based solutions within Flintshire County Council and Wrexham County Borough Council. Figures A.1 to A1.4 (in Appendix A) then focus on the specific areas and associated WwTWs that are impacted by the proposed sites in the two LDPs to illustrate the potential nature-based solution opportunities that may be available to reduce P and other nutrients, subject to further assessment.
- 3.3.18 The management options displayed on the figures below focus on reducing the amount of diffuse nutrients that reach the hydrological environment. Management opportunities considered for reduction of nutrient enrichment are the restoration of land well-connected to the local water environment; hedgerow planting in proximity to agricultural land; crop need; run-off pathway management; buffer zones and planting riparian woodland or wooded shelterbelts along drainage channels are likely to be a diffuse source of nutrients. Areas had been prioritised according to the number of downstream waterbodies with known issues with nutrient inputs; areas feeding into multiple at-risk waterbodies were ranked a higher priority than areas feeding into a single waterbody (Figure 3.11).
- 3.3.19 As seen in the key from Figures 3.11, each opportunity is categorised into 3 priority groups (Some, Moderate and Most). As per paragraph 3.2.12, this is based on how many at risk waterbodies an area is draining to. These categories should be treated as Low, Medium and High priority respectively.
- 3.3.20 The grey scale heat map in the background of each figure shows the constraints to intervention types for reduction of excess nutrients from diffuse sources entering the water environment. The darker the colour, the more constraints there are in that area. The constraints considered include:
- Habitat restoration/management change
  - Area not well connected to the local water environment
  - Land has no potential to be restored to enhance its potential to take up excess nutrients
  - Hedgerow planting
  - Land not adjacent to arable land
  - Drainage channel shelter belts

<sup>36</sup> <https://catchmentbasedapproach.org/learn/farmscoper-tool/>

<sup>37</sup> [Natural Resources Wales / BETA: Wales environmental information portal](#)

- Area not within 30m of drainage channel
- Area not on or near agricultural land
- Areas unsuitable for tree planting
- Habitats where conversion to woodland would be undesirable
- Scheduled ancient monuments
- Urban areas
- Peat areas that are likely to be climate change resilient
- Riparian woodland planting
- Area not on or near agricultural land

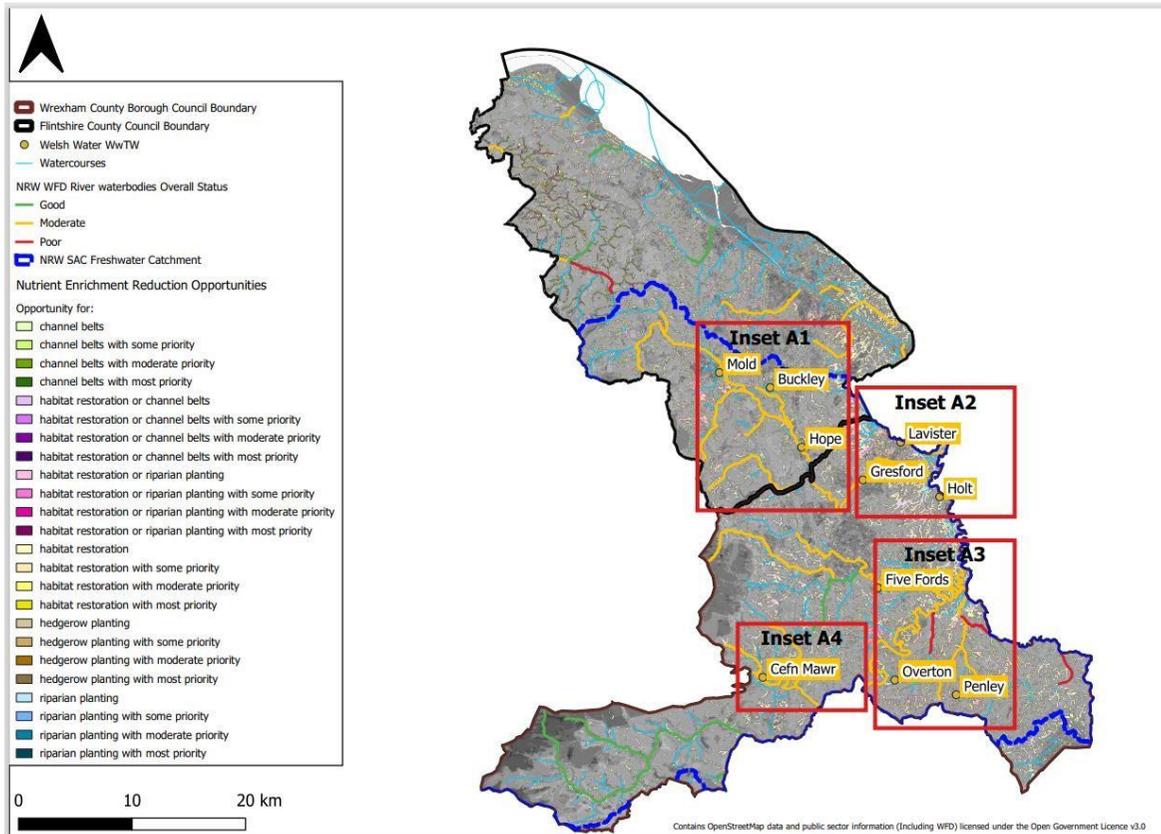
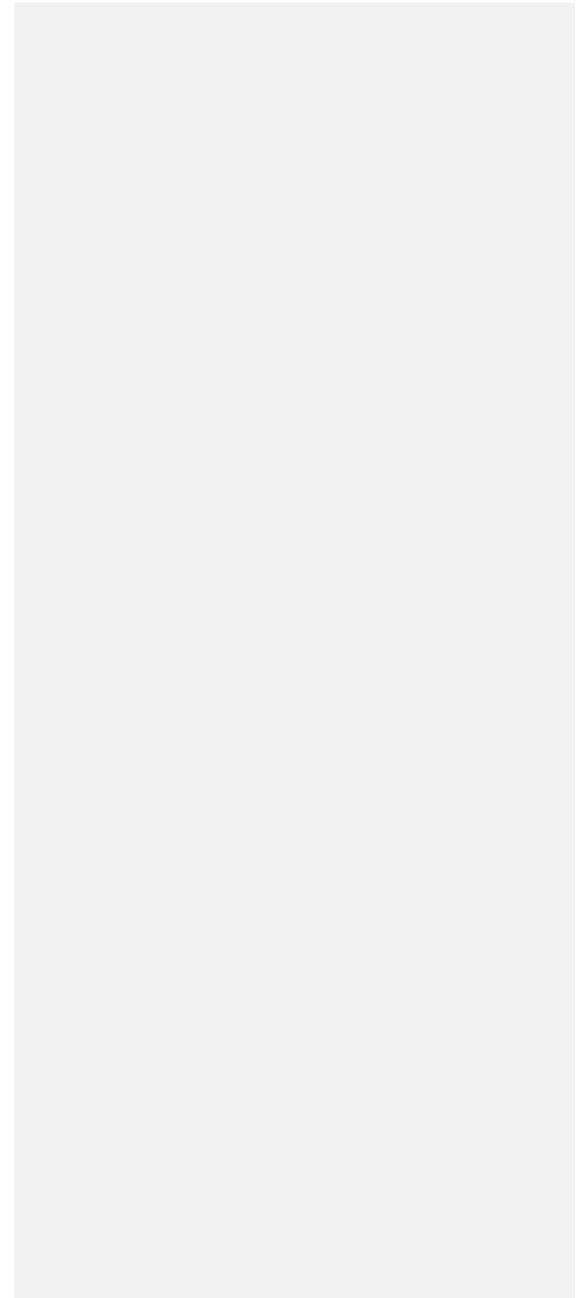


Figure 3.11 Nutrient enrichment reduction opportunities overview map in Flintshire and Wrexham



3.3.21 Inset A.1 is presented as Figure A.1 in Appendix A, which shows the three existing Welsh Water WwTWs (Mold, Buckley and Hope) located in Flintshire that are impacted by the emerging LDP along with potential nature-based solution opportunities that may be available to reduce phosphorus and nitrogen, which need further assessment. Around each WwTW site there are several opportunities to reduce nutrient enrichment into the River Alyn, which is currently achieving a 'moderate' status according to NRW's WFD Cycle 2 overall classification (2018). Around the Mold WwTW there is an opportunity for habitat restoration and channel belts with some priority. For Buckley, there was also an opportunity for habitat restoration and channel belts, along with hedgerow planting with moderate priority. There is also an opportunity along the Black Brook, just downstream of the Buckley WwTW for riparian planting and habitat restoration with moderate priority. For the Hope WwTW there is an opportunity for riparian planting, channel belts and habitat restoration around the site as well as along the River Alyn.

**Commented [A26]:** Needs updating to 2021 data

3.3.22 Inset A.2 is presented as Figure A.2 in Appendix A, which shows the three existing WwTWs (Lavister, Gresford and Holt) in the north-east of Wrexham that are impacted by the emerging LDP along with potential nature-based solution opportunities that may be available to reduce P and other nutrients, which need further assessment. The Pulford Brook, which achieved a 'moderate' overall status for NRW's WFD Cycle 2 overall classification (2018) and currently suffers from P in terms of achieving WFD targets, is approximately 200m north of the Lavister WwTW. There is an opportunity around this site for habitat restoration and channel belts with 'some priority', as well as riparian planting with some priority along the Pulford Brook. The Gresford WwTW works sits adjacent to the River Alyn (Hope to Dee) which also achieved a 'moderate' overall status for NRW's WFD Cycle 2 overall classification (2018) and currently suffers from P in terms of achieving WFD targets. Around this site, there are opportunities for habitat restoration, channel belts, hedgerow planting as well as riparian planting along the River Alyn. The Holt WwTW is approximately 350m from the Rive Dee (Chester Weir to Ceiriog) which achieved a 'moderate' overall status for NRW's WFD Cycle 2 overall classification (2018) and currently suffers from P in terms of achieving WFD targets. There are opportunities around this site, as well as the unnamed drains feeding the River Dee to plant hedgerows, create channel belts as well as restore habitats.

**Commented [A27]:** Needs updating to 2021 data

**Commented [A28]:** Needs updating to 2021 data

**Commented [A29]:** Needs updating to 2021 data

3.3.23 Inset A.3 is presented as Figure A.3 in Appendix A, which shows the existing WwTWs in the centre (Five Fords) and south-east of Wrexham (Overton) that are impacted by the emerging LDP along with potential nature-based solution opportunities that may be available to reduce P and other nutrients, which need further assessment. The Clywedog (Dee to Gwenfro) is 400m downstream of the Five Fords WwTW and receives the storm tank overflow discharges from the works. The Clywedog currently achieves an overall status of 'Moderate' from NRW's WFD Cycle 2 overall classification (2018) and does not suffer from P. However, there is still an opportunity for habitat restoration, channel belts and hedgerow planting between the WwTW and the Clywedog as well as riparian planting along the Clywedog which would ensure it maintains its 'Good' status. The Overton WwTW is 600m east of the River Dee (Chester Weir to Ceiriog) which currently suffers from P in terms of achieving WFD targets and achieved a 'Moderate' overall status in the NRW's WFD Cycle 2 classification (2018). Around this WwTW site and the watercourse there are opportunities for channel belts, habitat restoration and hedgerow planting as well as riparian planting along the River Dee. Around the Penley WwTW there are only a few opportunities for hedgerow planting with some priority and channel belts. The unnamed drains around this

**Commented [A30]:** Needs updating to 2021 data

**Commented [A31]:** The preceding sentence refers to the Clywedog achieving Moderate status, while this refers to Good. Please also update for the 2021 classification.

**Commented [A32]:** Needs updating to 2021 data

site feed to Emral Brook which suffers from P in terms of achieving WFD targets and also achieved a 'Moderate' overall status in the NRW's WFD Cycle 2 classification (2018). Around the Emral Brook there is some priority for riparian planting and channel belts.

**Commented [A33]:** Needs updating to 2021 data

3.3.24 Inset A.4 is presented as Figure A.4 in Appendix A, which shows the Cefn Mawr WwTW in the southwest of Wrexham that are impacted by the emerging LDP along with potential nature-based solution opportunities that may be available to reduce P and other nutrients, which need further assessment. . The Cefn Mawr WwTW is approximately 250m north of the River Dee (Ceiriog to Alwen) which achieved a 'Moderate' overall status in the NRW's WFD Cycle 2 classification (2018) and currently fails under the NRW SAC Phosphorus compliance standards (2019). There are a couple opportunities near to the WwTW for habitat restoration and channel belts, however, the major opportunity is around the River Dee with riparian planting and habitat restoration. Further opportunities exist upstream of Wrexham and they should be considered for wider catchment management, promoting a catchment-based approach.

**Commented [A34]:** Needs updating to 2021 data

3.3.25 Figure 3.12 below provides an overview of potential tree planting and fencing solutions within Flintshire and Wrexham. Figure B.1 to B.4 in Appendix B then focus on the specific areas and associated WWTWs that are impacted by the proposed sites in the two emerging Local Development Plans. These figures are produced based on the information available from Welsh Information for Nature-based Solutions' (WINS) and LIFE Dee River project.

3.3.26 These maps can be used to start discussions on the best way to realise Welsh Government's ambition for new woodland creation to achieve 2,000 hectares of new woodland per annum from 2020, rising to 4,000 hectares per annum as rapidly as possible, as per Policy 15 – National Forest in the Future Wales 2040 National Plan<sup>38</sup>. This target is mostly aimed at meeting climate change mitigation requirements, however as woodlands provide a wide range of other ecosystem services (including pollution removal), other policy aims will be secured through the creation of this new woodland.

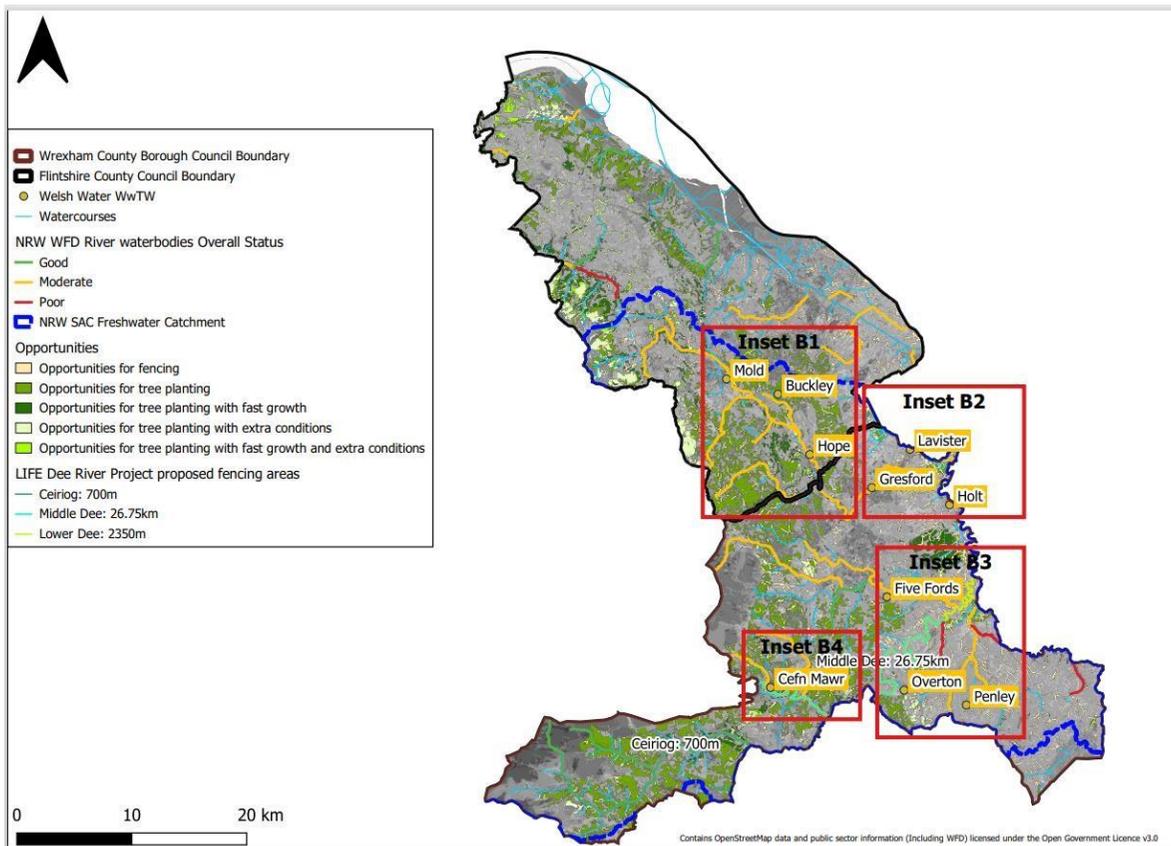
3.3.27 It is also the aspiration of the North East Wales Area Statement to increase woodland cover in North East Wales. Both Wrexham and Flintshire's woodland cover, 9.4% and 9.8% respectively, falls below the Welsh National average of 14%. The Welsh Government Woodland Estate (WGWE) are managed by NRW. The role and purpose of WGWE are:

- North East Wales' area of woodland resource will be bigger in 25 years than it was in 2018
- Management of the WGWE will comply with the United Kingdom Forestry Standard (UKFS) and forest certification will be maintained
- The WGWE will support the well-being of Wales, including through collaboration with others

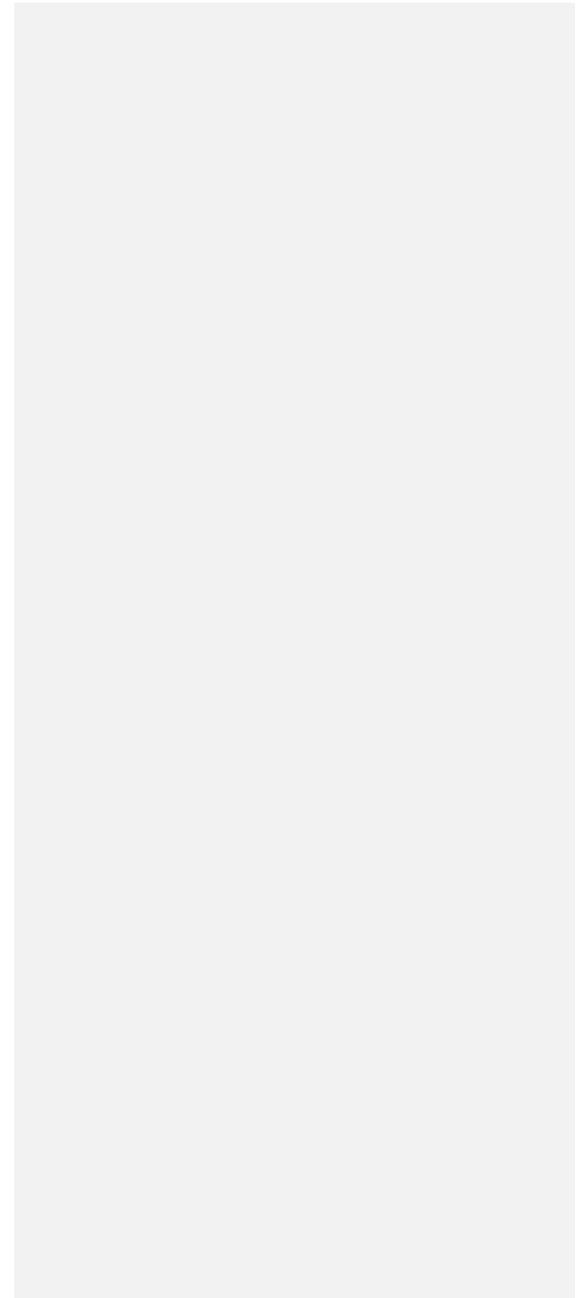
<sup>38</sup> <https://gov.wales/sites/default/files/publications/2021-02/future-wales-the-national-plan-2040.pdf>

- The WGWE should contribute to the prosperity of the people of Wales, with income from the woodland estate being reinvested into ongoing sustainable forest management

3.3.28 Therefore, there is an opportunity to collaborate and coordinate with WGWE in order to identify and implement forests across Flintshire and Wrexham.



Figures 3.12 Tree planting and fencing opportunities overview map in Flintshire and Wrexham



- 3.3.29 These figures may be used to identify additional fencing and tree planting opportunities that can supplement what is currently proposed by the LIFE Dee River Project and other initiatives (e.g., Alyn restoration project) on the impacted river tributaries by the two emerging Local Development Plans. The proposed fencing by the LIFE Dee River Project indicates (see Figure 3.12) that it will include the entire section of River Dee within Wrexham, including River Ceiriog.
- 3.3.30 Inset B.1 is presented as Figure B.1 in Appendix B, which shows several opportunities for fencing and tree planting near to the three WwTW sites (Mold, Buckley and Hope) in Flintshire that are impacted by the emerging LDP. The LIFE Dee Project proposed fencing does not cover this area and so there is an opportunity for a range of stakeholders (Dee LIFE, LPA's, NRW and the Welsh Dee Trust) to collaborate and deliver fencing along the other Dee Freshwater Catchment tributaries in Flintshire, particularly the River Alyn and Black Brook.
- 3.3.31 Inset B2 to Inset B4 are presented as Figure B2 to B4 in Appendix B, which focus on the specific tree planting and fencing opportunities around existing WwTWs in Wrexham that are impacted by the emerging LDP. They show that the LIFE Dee project has proposed fencing all along the River Dee (Chester Weir to Ceiriog) and River Dee (Chester Weir to Ceiriog). The area and length shown are only indicative as the fencing would need to be agreed with the appropriate landowners. However, the figures also show the opportunities for fencing and tree planting around the main tributaries of the River Dee, in particular the Dungrey Brook, Emral Brook and Worthenbury Brook. They show some opportunities for tree planting around Five Fords and Cefn Mawr WwTWs.
- 3.3.32 The nutrient enrichment reduction figures and areas for fencing and tree planting figures above show a range of areas and opportunities across Flintshire and Wrexham. However, in practice, the application of tree planting and hedgerows as well as other intervention measures, delivering a range of benefits are well evidenced. One example of this is the Pontbren case study where surface runoff was reduced by 78% directly relating to improvements in water quality (see Box 3.1).

### Box 3.1: Case Study – Pontbren

Pontbren is a group of 10 neighbouring small farmers located in Powys. The group advocates a return to more traditional farming, based on extensively reared native breeds of sheep. Their changes also include restoring the landscape, planting woodland, shelter belts and hedgerows and employing more sustainable water management by re-establishing traditional farm ponds and wetlands.

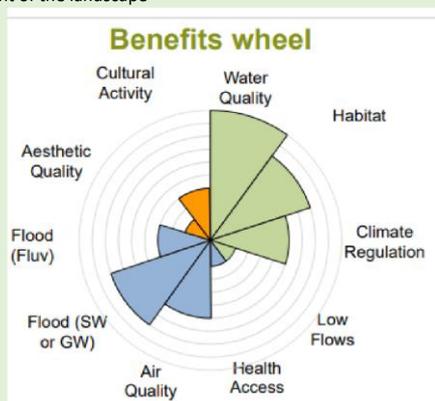
The Welsh Government (WG) provided financial support for the project through destocking payments, and ‘top up’ payments to the Farm Woodland Premium Scheme (FWPS) and Woodland Grant Schemes. This Welsh Government funding was used to match-fund an Enfys Lottery grant, which provided the funding for the main project period.

The main methods to achieve sustainable farming management were:

- Stock reduction
- Environmental enhancement – planting shelter belts, new hedgerows and creating a network of ponds.
- Production of timber and added value wood products, including firewood, woodchip bedding material and locally grown tree seedlings of native provenance.
- Niche marketing of farm produce via a Pontbren producer group, at farmers markets and through a supermarket contract

The project has been very effective in quantifying the effects of sheep grazing and tree planting on soil hydrology and run-off at the plot, field and small catchment scale. Soil infiltration rates were found to be 67 times higher within woodland plots and shelterbelts planted on improved grassland compared with grazed pasture even after only 3 years; this reduced measured surface run-off volumes by an average of 78% compared with the control. These differences were quick to develop becoming apparent within one year of sheep exclusion and tree planting. Removal of grazing pressure reduced run-off volumes by 48%, while the action of initial tree rooting, and growth produced the remaining 30% decrease.

Wider benefits include more sustainable farm management • farm business diversification • improved livestock shelter • more effective integration of agriculture and woodland management • improved water quality • creation of wildlife habitats • future production of timber for on-farm use and added value processing • enhancement of the landscape



### *WwTW capacity and performance enhancement*

3.3.33 Table 3.3 below summarises the current Dry Weather Flow (DWF) and P consent details and P performance details for those existing WwTWs that are impacted by the emerging Wrexham County Borough Council and Flintshire County Council LDPs within the Dee Freshwater Catchment. However, there are several other WwTW's across Flintshire and Wrexham which are not impacted by the emerging LDP or not within the Dee Freshwater Catchment and therefore are not specifically included in this table.

3.3.34 Only three Welsh Water WwTWs (Holt, Overton and Penley) that are impacted by the emerging Wrexham LDPs do not currently have phosphate stripping capacity whereas all Welsh Water WwTWs in Flintshire have phosphate stripping capacity. Table 3.3 also demonstrates that all WwTW are within their 1mg/l discharge permit limit, some at 50% of their permit capacity. However, further enhancements to the treatment processes to reduce P discharge by additional chemical dosing (where this is practical and viable) and/or using advanced treatment technologies can be generally considered across the Dee catchment. This should be done in conjunction with surface water separation to reduce combined sewer overflows and increase WwTW performance through a coordinated and targeted programme of works, to protect the integrity of the SAC and improve overall water quality.

3.3.35 With regards to developments draining to sites with phosphorus removal already included in their discharge permits and with headroom for the development Welsh Water are following the NRW's interim planning advice<sup>39</sup>. It states that:

*“Any development connecting to an existing public wastewater treatment works that has the capacity and associated phosphate stripping to accommodate the additional wastewater and additional phosphate from the proposed development, is unlikely to increase phosphate inputs into a SAC beyond what has already been assessed and permitted by NRW. There is a presumption that all rainwater is kept separated from polluted water and disposed of separately in line with Planning Guidance on rainwater disposal.”*

3.3.36 However, the latest advice that Flintshire County Council and Wrexham County Borough Council has received from NRW for planning applications is that a project level Habitats Regulations Assessment (HRA) would be still required, as the Local Planning Authorities cannot rely on the 2009 Review of Consent information to rule out adverse effects for the new property connections to the existing WwTWs with P stripping capability, even where they have sufficient headroom in the permitted consent and treatment capacity.

3.3.37 Welsh Water's general position returned from our Environmental Information Request on dealing with growth related to the SAC is as follows: -

*“With the agreement of NRW, we are modelling all the SAC rivers in Wales included in the recent phosphorus compliance assessment. Once we have concluded the modelling, we will review our AMP7 (2020-25) investment programme plans to determine if we should swap any of our schemes for phosphorus removal from AMP8 (2025-30) in place of planned AMP7 investment, which would be delayed to AMP8. Importantly the phosphorus compliance data only became available this year for the first time and was not considered when we developed our most recent business plans. Consequently, we do not have the funding to carry out*

<sup>39</sup> <https://naturalresources.wales/guidance-and-advice/business-sectors/planning-and-development/our-role-inplanning-and-development/advice-to-planning-authorities-for-planning-applications-affecting-phosphorus-sensitiveriver-special-areas-of-conservation/?lang=en>

additional investment in AMP7. The new modelling will allow us to examine different investment scenarios in the failing stretches of the Dee and elsewhere and any further investment agreed for the river would be included in our AMP8 programme. Developer funding of our works may be possible to allow us to bring forward planned investment to fund the additional costs of operating our phosphorus removal projects earlier than planned. However, this has to be supported by NRW and that will generally not be possible until we have completed our modelling. The initial calibrated model for the Dee is due for delivery at the end of November next and then there will be a period of discussion and development jointly with NRW.”

“The range of options for increasing WwTW improvements are therefore not likely to come online before 2025 although this can change to some extent if additional developer funding can be channelled to accelerate the works.”

**Table 3.3 Capacity of WwTWs in Dee Freshwater Catchment that are impacted by Flintshire and Wrexham Emerging LDP**

Local Planning Authority (LPA)	Wastewater Treatment Works (WwTW)	Asset ID	2009 AA/ Current Consent – P limit (mg/l)	Consented DWF (m3/day)	Current DWF (Q90 m3/day) – 2020 (1/1/20 to 31/12/20)	Current P performance - last 12 months (mg/l) (Sept 2020 – Sept 2021)	Current P performance - 2020 (mg/l)
Flintshire	Buckley	995	1.00	4061	2431.01	0.39	0.45
	Mold	491	1 (UWW 2)	4125	3624.12	0.32	0.54
	Hope	899	1.00	2237	2043.93	0.41	0.46
Wrexham	Five Fords	675	1.00	27720	21758.85	0.43	0.49
	Gresford	692	1.00	3590	2798.19	0.83	0.78
	Cefn Mawr	701	1.00	1594	1021.10	0.66	0.68
	Holt	721	N/A	210	188.60	N/A	N/A
	Overton	885	N/A	257	106.75	N/A	N/A
	Penley	893	N/A	182	114.17	N/A	N/A
	Lavister	852	1.00	1619	1153.04	0.44	0.50

\*The sites highlighted in yellow currently do not have phosphorus stripping capability.

### Surface Water Separation

3.3.38 All new developments should have separate surface water drainage and foul water drainage systems to serve the new occupants, promoting the use of efficient SuDS techniques. In addition, where existing developments are served by combined sewer systems the opportunities should be taken to separate the surface flows, which will reduce Combined Sewer Overflow discharges into the existing watercourses and associated water quality pollution. It will also reduce the unnecessary loading and treatment costs at the WwTWs. For example, Carmarthenshire and Swansea Councils have been

operating a compensatory surface water removal approach to mitigation for impacts to the Carmarthen Bay and Estuaries, which may potentially provide a Framework to the Dee Catchment.<sup>40</sup>

### *Effectiveness of P reduction measures*

3.3.39 Phosphate removal using appropriately designed SuDS, constructed wetlands and IBZs, is less effective than for other nutrients. A range of values from literature reviews of case studies and actual studies is presented below:

- **Folini** in 2015<sup>41</sup> tested the removal capacity of SuDS in the Salmons Brook Catchment in Enfield and found that the average removal of P was 15.2%, with a peak reduction of 64.1%.
- **Lucke** et al in 2014<sup>42</sup> tested four different field swales and demonstrated a reduction in measured P levels of between 20% and 23% between the inlet and the outlet. SuDS performance depends upon optimum design and maintenance.
- **Bratieres** et al in 2018<sup>43</sup> demonstrated an 85% P removal under optimal conditions using SuDS that occupied at least 2% of the catchment area with a vegetated sandy loam filter media.
- **Penn** et al 2017<sup>44</sup> undertook a review of 45 P removal studies and found that statistically significant effectiveness ranged from 21% to 74% with calcium rich sorption materials proving the most effective.
- **Land** et al in 2016<sup>45</sup> undertook a large-scale review screening 5853 unique records, appraising, 93 articles including 203 constructed wetlands were used for data extraction. Total phosphorus (TP) is highly dependent on the loading rate as well as the area covered. Median removal rates for P were 1.2 g m<sup>-2</sup> year<sup>-1</sup>, removal efficiency for TP was significantly correlated with inlet P concentration, and median TP removal efficiency was 46 %.
- **Davis** et al in 2006<sup>46</sup> This work provides an in-depth analysis on removal of nutrients from a synthetic stormwater runoff by bioretention. Results have indicated good removal of phosphorus (70 to 85%).
- **Ballard** et al in 2015<sup>47</sup> states P removal for bioretention systems designed to FAWB guidelines (after FAWB, 2009) can achieve > 80%.

3.3.40 The above highlights that there is currently limited information to accurately quantify the P reduction amounts due to the limited monitoring data at these case studies although it clearly shows that there are % reduction values for a range of intervention measures. However, the average P removal rates from constructed wetlands can be considered as 1.2 g m<sup>-2</sup> year<sup>-1</sup>. Similarly, average phosphorus leachate rates from semi-natural native woodland planting, as well as grass set-aside

<sup>40</sup> <https://www.carmarthenshire.gov.wales/media/1223334/burry-inlet-draft-spg-2020.pdf>

<sup>41</sup> <https://www.thames21.org.uk/wp-content/uploads/2017/01/Monitoring-of-Sustainable-Drainage-Systems-in-the-Salmons-Brook-Catchment....pdf>

<sup>42</sup> <https://www.mdpi.com/2073-4441/6/7/1887>

<sup>43</sup> <https://www.sciencedirect.com/science/article/abs/pii/S0043135408002534>

<sup>44</sup> <https://www.mdpi.com/2073-4441/9/8/583>

<sup>45</sup> <https://environmentalevidencejournal.biomedcentral.com/articles/10.1186/s13750-016-0060-0>

<sup>46</sup> <https://onlinelibrary.wiley.com/doi/abs/10.2175/106143005X94376>

<sup>47</sup> <https://www.ciria.org/ItemDetail?ProductCode=C753&Category=BOOK&WebsiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91>

and neutral grass can be considered as 0.02 kg/ha/yr<sup>48</sup>. Section 4.3 to 4.5 will later discuss how these values have been used (with 20% safety buffer in associated nutrient budget assessments to account for uncertainty in confidence levels of the assumptions used), to quantify the Category 1 and Category 2 intervention measures in conjunction with P % reduction values that are presented above and other existing tools (e.g. Farmscoper).

3.3.41 The Hereford Interim Phosphate Delivery Plan Stage 2 Report<sup>49</sup> cited as an example that:

*“a hypothetical 100 dwelling development would generate ~12 kg P/year that would require mitigation, thus requiring an ~0.7 ha wetland draining ~17 ha of urban land to offset the additional phosphorus load from the new development. This suggests that the design of SuDS to intercept runoff from land outside of development redline boundary is likely to be needed.”*

3.3.42 Integrated Buffer Zones or Vegetated Filter Strips have been found to be effective in removing phosphorus from agricultural runoff. A study by Zreig et al 2003<sup>50</sup> found that filter length/width had the highest and most significant effect on P removal while inflow rate, vegetation type, and density of vegetative coverage had secondary influences. The P trapping efficiencies of the 2-, 5-, 10-, and 15-m-long filters were 32, 54, 67, and 79%, respectively. While short filters (5 m) are quite effective for removal of sediment, they are not very effective for P removal. For sediment trapping, increasing filter length beyond 15 m is not at all effective in increasing sediment removal but it is expected to further increase P removal. These findings were largely confirmed by the EA evidence base for 3D buffer strips<sup>53</sup> in association with the Forestry Commission. There are of course other environmental benefits such as greater passive cooling and carbon sequestration associated with woodland IBZs.

3.3.43 In terms of effectiveness:

- **WwTW improvements** - would deliver absolute confidence in effectiveness but will not come online before 2025 and would not deliver wider environmental or societal benefits
- **Constructed Wetlands** - whether at WwTWs treating final effluent or in strategic locations are likely to provide the greatest P reduction effectiveness
- **IBZs** – Farmland or riparian located IBZs are likely to be effective at P reduction if strategically located
- **Smaller scale SuDS** – would generally deliver lower levels of P reduction (unless bioretention systems are involved), but the delayed flow would reduce the burden on the sewage system and reducing the need for CSO use and failures where the outfall discharge is to a combined sewer.

Other, smaller wetland schemes distributed around the River Dee catchment may also provide viable mitigation options.

<sup>48</sup> <http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=13635>

<sup>49</sup> <https://www.herefordshire.gov.uk/downloads/file/22153/interim-phosphate-delivery-plan-stage-2-report>

<sup>50</sup> <https://www.proquest.com/docview/197404692?accountid=44866> <sup>53</sup>

3D buffer strips: Designed to deliver more for the environment

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/928121/3D\\_buffer\\_strips\\_designed\\_to\\_deliver\\_more\\_for\\_the\\_environment\\_report.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/928121/3D_buffer_strips_designed_to_deliver_more_for_the_environment_report.pdf)

### 3.4 Legislation / Regulatory Tools and delivery parties

3.4.1 The following are the key pieces of national legislation that can drive implementation of these measures:

- Environment (Wales) Act 2016
- Well-being of Future Generations (Wales) Act 2015
- Planning (Wales) Act 2015
- The Flood and Water Management Act 2010
- The Conservation of Habitats and Species Regulations 2017
- Environmental Permitting (England and Wales) Regulations 2010-2016
- The Water Resources (Control of Agricultural Pollution) (Wales) Regulations 2021
- The Water Resources Act 1991
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017
- Agriculture (Wales) Bill

3.4.2 Table 3.4 below outlines examples of the regulatory tools and powers available to statutory bodies, which can be exercised to implement the proposed actions within the DCPRS.

**Commented [A35]:** For Cat 2 measures only

**Table 3.4 Regulatory tools and powers available to statutory bodies**

Conservation of Habitats and Species Regulations 2017 (Habitats Regulations)	
<p>Regulation 20 of the Habitats Regulations enables NRW to make a management agreement with a person who has an interest in land within or adjacent to a European site. Management agreements may be made for the purpose of the management, conservation, restoration or protection of the site, or any part of it.</p>	<p>Unlike regulation 16 of the Environment (Wales) Act, a management agreement under Regulation 20 can be binding on persons with an interest in such land and can impose obligations upon that person in respect of the use of the land and exercise of rights over the land. A management agreement under regulation 20 is enforceable by NRW under regulation 20(4)(b). A management agreement can provide for the making of payments to either party (refer regulation 22).</p> <p>This tool could be relied upon to deliver reductions in phosphates entering the river through restrictions / controls on certain activities on land within a defined distance of the river. Likewise a management agreement might provide payments for the planting and maintenance of woodland on such land or other land use changes.</p>
<p>Regulation 32 of the Habitats Regulations enables NRW to make bylaws for the protection of a European site.</p>	<p>Regulation 32(3) specifies that such bylaws may prohibit or restrict <i>'the taking of, or interference with, vegetation of any description in the site, or the doing of anything in the site which will interfere with the soil'</i>. Regulation 32(4) extends the prohibition or restrictions of activities referred to in 32(3) within such area surrounding or adjoining a site as appears to NRW necessary for protecting the site. Regulation 32(6) specifies that byelaws can be made so as to relate to either the whole site or to any part of the site, of any surrounding or adjoining area of land.</p> <p>This tool could be relied upon to secure reductions in phosphates entering the river as a result of adjacent land uses.</p>

<b>Environmental Permitting (England and Wales) Regulations 2016</b>	
Regulation 12 of the Environmental Permitting Regulations and the need for an	NRW has an enforcement role to take action where a person causes or knowingly permits a water discharge activity except under, and to the extent authorised by, an environmental permit. Part 4 of the Regulations includes various enforcement and offences powers. Where
environmental permit, and offences under regulation 38.	there are known incidences of unconsented discharges which will be causing deterioration to water quality and NRW can exercise necessary powers in this regard.
Regulation 34 of the Environmental Permitting Regulations. Statutory periodic review of environmental permits.	NRW Regulatory Guidance Series, No EPR 12 sets out how NRW will meet their statutory duty to periodically review environmental permits. Para 1.2 refers to Welsh Assembly Core Guidance which says that "permit reviews are required to check whether permit conditions continue to reflect appropriate standards and remain adequate in light of experience and new knowledge. Reviews should guard against permits becoming obsolete as techniques develop."
<b>Environment (Wales) Act 2016 Regulations</b>	
Regulation 16 – Powers to enter into land management agreements <sup>51</sup>	<p>NRW may make an agreement with a person who has an interest in land in Wales about the management or use of the land (a "land management agreement"), if doing so appears to it to promote the achievement of any objective it has in the exercise of its functions. A land management agreement may, among other things:</p> <ul style="list-style-type: none"> <li>• impose on the person who has an interest in the land obligations in respect of the use of the land;</li> <li>• impose on the person who has an interest in the land restrictions on the exercise of rights over the land;</li> <li>• provide for the carrying out of such work as may be expedient for the purposes of the agreement by any person or persons;</li> <li>• provide for any matter for which a management scheme relating to a site of special scientific interest provides (or could provide);</li> <li>• provide for the making of payments by either party to the other party or to any other person;</li> </ul> <p>contain incidental and consequential provision.</p>
<b>The Water Resources (Control of Agricultural Pollution) (Wales) Regulations 2021</b>	

<sup>51</sup> <https://www.legislation.gov.uk/anaw/2016/3/section/16/enacted>

Regulatory measures to address agricultural pollution in Wales, will apply from 1 April 2021 for an initial set of measurements. The remainder will be phased in over a period of 3 years.	The Regulations focus on those farms where the environmental risk from poor manure management is greatest. In summary, the regulations include the following requirements: • Nutrient management planning; • Sustainable fertiliser applications linked to the requirement of the crop; • Protection of water from pollution related to when, where and how fertilisers are spread; and • Manure and silage storage standards. Natural Resources Wales (NRW) is responsible for assessing compliance and it will do this by inspecting farms and checking records. If a breach of the Regulations is confirmed actions will be taken according to the Natural Resources Wales Enforcement and Prosecution policy and procedures. Possible actions depend on the seriousness of the breach and impact on the environment. They include: • Advice on remedying a minor breach; • Warning letter noting the breach, which may be taken into account in the event of a future breach; • Legal notice; • Formal caution; or • Prosecution
Regulation 46-Breach of any currently in-force provisions of the Regulations	Standard criminal and offence specific responses are: <ul style="list-style-type: none"> <li>• Warning</li> <li>• Formal Caution</li> <li>• Prosecution</li> </ul>

Regulation 12 - Controlling the spreading of nitrogen fertiliser	<input type="checkbox"/> An occupier who intends to spread nitrogen fertiliser must first undertake a field inspection to consider the risk of nitrogen getting into surface water. <input type="checkbox"/> No person may spread nitrogen fertiliser on that land if there is a significant risk of nitrogen getting into surface water taking into account the factors listed under Regulation 12(2). <input type="checkbox"/> No person may spread nitrogen fertiliser if the soil is waterlogged, flooded, snow covered, frozen or has been frozen for more than 12 hours in the previous 24 hours.
Regulation 13- Controlling the spreading of nitrogen fertiliser	<input type="checkbox"/> No person may spread manufactured nitrogen fertiliser within 2 metres of surface water.
Regulation 14 -Control of the spreading of organic manure	<input type="checkbox"/> No person may spread organic manure within 10 metres of surface water (unless using precision spreading equipment in which case no person may spread organic manure within 6 metres of surface water) <input type="checkbox"/> No person may spread organic manure within 50 metres of a borehole, spring or well.
Regulation 16 – Incorporation of manure	<input type="checkbox"/> Any person who applies organic manure onto the surface of bare soil or stubble must ensure that it is incorporated within 24 hours.
Regulation 22 – Closed periods for spreading manufactures nitrogen fertiliser	<input type="checkbox"/> On grassland; from 15 September to 15 January <input type="checkbox"/> On tillage land; from 1 September to 15 January
Regulation 24– Storage of manure and silage	<input type="checkbox"/> Requirements for the storage of manure and silage

Commented [A36]: Not relevant to P

Commented [A37]: Not relevant to P

Commented [A38]: Not relevant to P

Regulation 32– Summary Only Offence	<input type="checkbox"/> A person who proposes to have custody or control of silage or slurry that is to be kept in a new or improved store must give notice at least 14 days before construction begins - (this change applies from 28 April 2021).
<b>Town and Country Planning Act 1990</b>	
Part VII – Enforcement	<input type="checkbox"/> Under Part VII of the Town and Country Planning Act 1990 <sup>52</sup> , Local Planning Authorities have a range of enforcement powers to address breaches of planning control.  <input type="checkbox"/> Local Planning Authorities may need to consider taking enforcement action against unauthorised development or a breach of any conditions imposed as part of a planning permission.  <input type="checkbox"/> Enforcement actions include: <ul style="list-style-type: none"> <li>• Enforcement Notice</li> <li>• Breach of Conditions Notice</li> <li>• Stop Notice</li> <li>• Injunctions</li> </ul>
<b>Flood and Water Management Act 2010</b>	
Schedule 3 – Sustainable Drainage	<input type="checkbox"/> Schedule 3 <sup>53</sup> to the Flood and Water Management Act 2010 (the 2010 Act) establishes SABs in local authorities. The legislation gives those bodies statutory responsibility for approving and in specified circumstances, adopting the approved drainage systems.  <input type="checkbox"/> Under Schedule 3 to the 2010 Act, local authorities as the SuDS Approving Body (the SAB) have a duty to approve SuDS which follow the national statutory Standards for SuDS (SuDS Standards). With the exception of single curtilage sites, the SAB also has a duty to adopt the system  <input type="checkbox"/> Under the terms of the Flood and Water Management Act 2010, the Lead Local Flood Authorities (LLFAs) are responsible for managing local flood risk which includes that from surface water. <sup>54</sup>  <input type="checkbox"/> The responsibility for delivery of the SAB functions rests with the Local Authorities in Wales alongside their duties as LLFA.

<sup>52</sup> <https://www.legislation.gov.uk/ukpga/1990/8/part/VII/enacted>

<sup>53</sup> <https://www.legislation.gov.uk/ukpga/2010/29/schedule/3>

<sup>54</sup> <https://gov.wales/sites/default/files/publications/2019-06/statutory-guidance.pdf>

3.4.3 The following powers outlined in Table 3.5 could be used by Welsh Government to ensure the mechanisms for implementing these P reduction opportunities are effectively delivered.

**Table 3.5 Powers available to Welsh Government**

<b>Environment (Wales) Act 2016 Regulations</b>	
Regulation 12 – Welsh ministers’ directions to implement area statement <sup>55</sup>	The Welsh Minister (WM) may direct a public body to take such steps as appear to them to be reasonably practicable to address the matters specified in an area statement (AS) under Section 11 (3). Each AS must explain why the statement has been prepared and refer to the natural resources in the area, the benefits which the natural resources provided and the priorities, risks and opportunities for the sustainable management of natural resources which need to be addressed.
Regulation 13 – Guidance about implementing area statements <sup>56</sup>	In exercising its functions, a public body must have regard to any guidance given to it by the Welsh Minister about steps that should be taken to address the matters specified in an area statement under Section 11(3).
Regulation 10 – Meaning of public body in sections 11 to 15 <sup>57</sup>	The Welsh Minister may by regulation amend subsection (1) by adding, removing or amending a description of a person and or public body. It is noteworthy that water companies are not a public body according to Regulation 10 and it is reasonable to anticipate that, depending on the measures which might be identified to reduce phosphate levels in SAC rivers, it may be relevant to consider adding Welsh Water to the list of public bodies.
<b>Powers under the Water resources Act 1991</b>	
Section 93 of the Water Resources Act 1991 (“the 1991 Act”) gives the Secretary of State power to designate any area as a water protection zone	The Dee catchment is already designated as a water protection zone <sup>58</sup> . The Welsh Government could amend the existing order to include further controls if it is appropriate, with a view to preventing or controlling the entry of phosphorus into controlled waters and/or to prohibit or restrict activities which the Welsh Ministers consider are likely to result in pollution.
<b>Powers under Conservation of Habitats and Species Regulations 2017</b>	
Regulation 16A(1) is a new duty, introduced in the EU Exit version of the Regulations upon Welsh Ministers to manage the national site network, with a view to contributing to the achievement of the management objectives.	Further details are provided under paragraphs (2) to (6) of regulation 16A. The ‘management objectives’ are to maintain or restore habitats and species to a favourable conservation status and considerations which Welsh Ministers must ‘have regard’ to in complying with regulation 16(A)(1) include the threats of degradation or destruction to which sites are exposed.  Regulation 16(A) therefore provides a driver for the Welsh Ministers to exercise powers under other legislation to support the delivery of strategic solutions to achieve the conservation objectives of SAC rivers.

<sup>55</sup> <https://www.legislation.gov.uk/anaw/2016/3/section/12/enacted>

<sup>56</sup> <https://www.legislation.gov.uk/anaw/2016/3/section/13/enacted>

<sup>57</sup> <https://www.legislation.gov.uk/anaw/2016/3/section/10/enacted>

<sup>58</sup> <https://www.legislation.gov.uk/ukSI/1999/915/made>

<p>Regulation 27 gives Welsh Ministers the power to make a special nature conservation order in respect of operations which appear to Welsh Ministers to be of a kind which, if carried out in certain circumstances or in a particular manner, would be likely to destroy or damage protected features.</p>	<p>This power is one which is anticipated to be targeted and specific. Depending on the nature and location of potential measures identified which might be relied upon to secure phosphate reductions, it is possible that this power might be appropriate at a future time.</p>
--	---

*Welsh Government Legislative Overview*

3.4.4 An overview of the overarching Acts that are relevant to the DCPRS and associated land use planning enforcement activities are outlined below.

**Environment (Wales) Act 2016**

3.4.5 The duty for public authorities in the exercise of functions in relation to sustainable management of natural resources – enables Wales’ resources to be managed in a more proactive, sustainable and joined-up way. It also helps to tackle the challenges we face and is focused on the opportunities our resources provide. This included the provision for Sustainable management of natural resources (SMNR) is defined in the Environment Act as: “using natural resources in a way and at a rate that maintains and enhances the resilience of ecosystems and the benefits they provide. In doing so, meeting the needs of present generations of people without compromising the ability of future generations to meet their needs, and contributing to the achievement of the well-being goals in the Well-being of *Future Generations Act*.” Innovative Nature based Solutions comply with their Natural Resources Policy under Section 9 of the Environment (Wales) Act 2016.

**Well-being of Future Generations (Wales) Act 2015**

3.4.6 In this Act “sustainable development” means the process of improving the economic, social, environmental and cultural well-being of Wales by taking action, in accordance with the sustainable development principle, aimed at achieving the well-being goals. The seven well-being goals (‘the goals’) show the kind of Wales we want to see. Together they provide a shared vision for the public bodies listed in the Act to work towards. The most relevant to this context are A resilient Wales:

- biodiversity and soil - Maintain and enhance the natural environment through managing land appropriately to create healthy functioning ecosystems
- natural green space – support a social resilience and community well-being
- Knowledge of Nature – increased awareness of the importance of a biodiverse natural environment with healthy functioning ecosystems
- Water quality and air quality – support ecological resilience making the environment healthier for wildlife and people
- Using natural resources – be adaptive to a changing environment where there is a need to use resources efficiently

## Planning (Wales) Act 2015

3.4.7 The Planning (Wales) Act 2015 also made a series of changes with the aim of modernising planning enforcement that could be potentially useful when strengthening the existing planning policies and incorporating suitable planning conditions (including their proper enforcement) for implementing suitable onsite and offsite interventions that are related to the DCPRS.

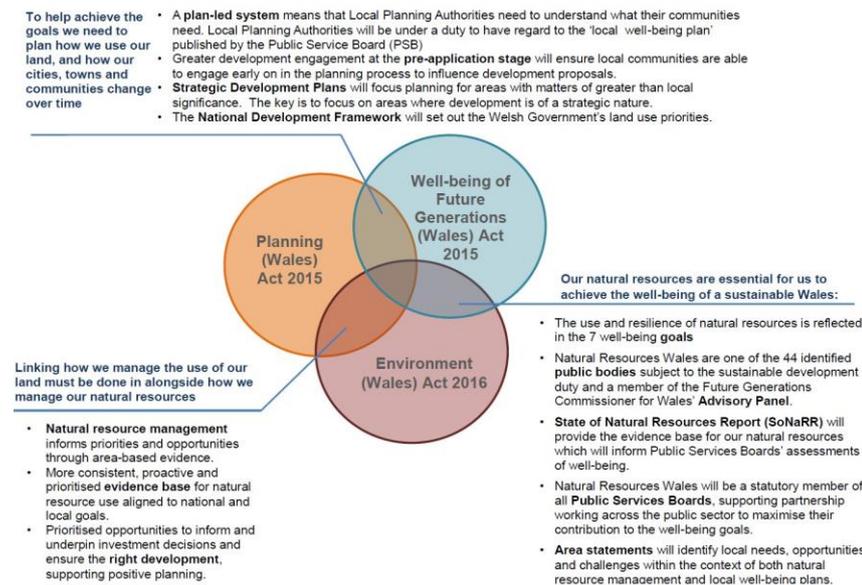


Figure 3.13 Overlap between the three main Wales Acts (note that the National Development Framework is now called Future Wales the national plan 2040)

## The Flood and Water Management Act 2010

3.4.8 [Amendments to the Schedule 3 of the Flood and Water Management Act 2010 \(Schedule 3\)](#), came into effect in Wales on 7 January 2019. A UK Act of Parliament relating to the management of the risk concerning flooding and coastal erosion. The Act aims to reduce the flood risk associated with extreme weather, compounded by climate change. It created the role of Lead Local Flood Authority, which is the local government authority responsible for managing flood risk in the local government area. The Act gave new powers to local authorities, the Welsh Ministers and water companies. It requires new developments to include SuDS features that comply with Welsh national standards<sup>59</sup>, which state that:

'Developers should demonstrate compliance with these standards in submitting planning applications. For major developments, where a drainage strategy document may be required as part of a local validation requirement, this should demonstrate how these standards have been met in

<sup>59</sup> <https://gov.wales/sites/default/files/publications/2019-06/statutory-national-standards-for-sustainable-drainage-systems.pdf>

the site design. It should be noted that a number of planning authorities in Wales have adopted guidance on sustainable drainage which should be taken into account in any development proposal’.

#### **The Water Resources (Control of Agricultural Pollution) (Wales) Regulations 2021<sup>60</sup>**

- 3.4.9 This **Guidance** describes the requirements farmers and land managers in Wales must follow to comply with the Water Resources (Control of Agricultural Pollution) (Wales) Regulations 2021 – (SI 2021/77, W.20) which came into force on 1 April 2021.
- 3.4.10 Natural Resources Wales (NRW) is responsible for enforcing the Regulations. Advice on general nutrient storage and management can be obtained from NRW and the Welsh Government.
- 3.4.11 The Water Resources (Control of Agricultural Pollution) (Wales) Regulations 2021 have been introduced to reduce losses of pollutants from agriculture to the environment by setting rules for certain farming practices. The Regulations also set standards for silage making, storage of silage effluent and for slurry storage.

**Commented [A39]:** Include reference

#### **The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017<sup>61</sup>**

- 3.4.12 This regulation imposes duties on the Secretary of State, Welsh Ministers, the Environment Agency (EA) and Natural Resources Wales (NRW) to carry out certain functions so as to ensure compliance with the EU directives, in particular when deciding whether to grant, vary or revoke certain permits and licences which affect water quality.
- 3.4.13 Part 2 of the regulations requires the identification of river basin districts, and a number of other assessments to be carried out by the EA and NRW to characterise and classify the status of water bodies in those districts, and assess the economic aspects of water use. River basin management plans must be established for each river basin district. In Part 3, which makes provision for certain protected areas, the identification of bodies of water from which drinking water is abstracted is required, and specific measures are specified that must be included in a programme of measures to protect the quality of the water.

#### **Agriculture (Wales) Bill<sup>62</sup>**

- 3.4.14 The Agricultural Bill would be strategic in scope, setting a support framework which can accommodate the development of agriculture and forestry within Wales for the next fifteen to twenty years.
- 3.4.15 The Bill’s policy framework is a response to the legislative framework established by the Well-being of Future Generations (Wales) Act 2015 and the Environment (Wales) Act 2016. It will create a new system of farm payments that “rewards farmers for their response to the climate and nature emergencies” and supports them to produce food sustainably. This is in the form of a proposed Sustainable Farming Scheme that reward farmers appropriately for the production of additional non-market goods (improved soils, clean air, clean water, improved habitat condition, actions to reduce global warming) at levels above those set by regulation through the management of land in

**Commented [A40]:** This is not an Act. Para 3.4.4 states that this section is about Acts. Suggest delete or rehome elsewhere under a different heading

<sup>60</sup> <https://gov.wales/sites/default/files/publications/2021-03/water-resources-control-of-agricultural-pollution-wales-regulations2021-guidance-for-farmers-and-landmanagers.pdf>

<sup>61</sup> <https://www.legislation.gov.uk/uksi/2017/407/part/1/made>

<sup>62</sup> <https://gov.wales/agriculture-wales-bill>

a sustainable way. It will also provide advice and support for farmers and farm businesses. As described in the Agriculture Wales Bill White Paper<sup>63</sup>.

#### Water Resources Act<sup>67</sup>

3.4.16 The Water Resources Act 1991 is an Act of Parliament that regulates water resources, water quality and pollution, and flood defence. The Welsh Ministers have already designated a Water Protection Zone for the Dee catchment, but this could be amended to expand the powers available and enable a greater degree of protection to reduce sources of pollution. Potential powers under a water protection zone are broad ranging and can include additional regulatory requirements, prohibiting and restricting activities and imposing requirements on persons carrying out such activities.

#### Key organisations and parties relevant to the delivery of DCPRS

##### Local Planning Authority

3.4.17 LPAs are 'competent authorities' under the Habitats Regulations and must 'have regard' to the requirements of the Birds and Habitats Directives in exercising any of their functions. LPAs are responsible for ensuring that their decision making is compliant with the requirements of the Habitats Regulations. Part 7 of the Town and Country Planning Act 1990 gives LPAs a range of enforcement powers to address breaches of planning control. A breach of planning control is defined in section 171A of the Town and Country Planning Act 1990 as:

- the carrying out of development without the required planning permission; or
- failing to comply with any condition or limitation subject to which planning permission has been granted.

3.4.18 Any contravention of the limitations on, or conditions belonging to, permitted development rights, under the Town and Country Planning (General Permitted Development) (Wales) Order 2014, constitutes a breach of planning control against which enforcement action may be taken.

3.4.19 There are a number of responsibilities which LPA-s could use to support the delivery of the DCPRS:

- The Town and Country Planning Process and Building Control functions help deliver the requirements of the WFD through careful considerations and consultation around developments, and by avoiding or minimising the adverse effects of any environmental risks on present or future land use<sup>68</sup>.
- Following the implementation of the Flood & Water Management Act 2010 (FWMA), councils in Wales, as the Lead Local Flood Authorities (LLFAs) are responsible for the management of flood risk from surface water, groundwater and ordinary watercourses. Under the Land Drainage Act, LLFAs also lead on ordinary watercourse consenting and enforcement. LPA-s should follow the advice note on the WFD to minimise the impacts on the water environment<sup>69</sup>.
- Local Authorities have a major role to play in promoting water environment benefits through environmental health and pollution control functions.
- As significant land and property owners, local authorities play an important role in protecting and improving the water environment. Local Authority and Natural Resources Wales operational teams should work together to discuss and identify potential opportunities to design and maintain drainage

**Commented [A41]:** May be better to delete the word planning here – some of the responsibilities below are those of the wider LA, not the LPA.

<sup>63</sup> <https://gov.wales/sites/default/files/consultations/2020-12/agriculture-wales-bill-white-paper.pdf> <sup>67</sup> <https://www.legislation.gov.uk/ukpga/1991/57/contents>

schemes on Local Authority sites and land to provide valuable flood management, water quality, ecological and amenity benefits. Further advice on green spaces and buildings can be found in the [Local Authority services and the water environment advice note](#).

- Local [Planning Authorities](#) statutory function as the Sustainable Drainage Approving Body (SAB) should ensure that drainage proposals for all new developments are designed and built in accordance with the national standards for sustainable drainage, published by Welsh Ministers.

**Commented [A42]:** A link may be useful here if available

### Natural Resources Wales

3.4.20 NRW is the Appropriate Nature Conservation Body (ANCB) for Wales and their functions include the management of Wales's forests and woodlands, pollution control, waste regulation, the management of water resources, flood and coastal risk management, fisheries, navigation and safeguarding of protected sites and species. NRW are the "competent authority" responsible for the implementation of the Water Framework Directive. In relation to the Habitats Regulations the "competent authority" is the decision maker under the HRA requirements and can include local authorities, harbour authorities, and other public bodies. They determine whether or not an appropriate assessment is required, whether proposals would have an adverse effect and, if necessary, whether or not derogation tests are met. It is the competent authority's responsibility to carry out the appropriate assessment and the [ANCB-ANCB](#) (NRW) must be consulted by the competent authority during an appropriate assessment to provide advice and assistance on some decisions. Habitats Regulation 63(4) provides for public consultation at the discretion of the competent authority (it is not a statutory requirement). The "appropriate authority" in Wales under the Habitats Regulations are the Welsh Ministers. [Under the HRA requirements, t](#)he competent authority [must inform the appropriate authority before it consents to a plan or project under the derogations set out in Regulations 64 and 68](#).

**Commented [A43]:** With regard to our HRA related roles, we suggest this section is updated with the following text in italics:

*"NRW are the appropriate nature conservation body (ANCB) for all European sites in Wales and hence for all HRAs affecting sites in Wales, regardless of who is the plan or project proponent or competent authority. NRW are also a competent authority responsible for carrying out HRAs and determining applications for a wide range of types of statutory authorisation such as felling licences, abstraction and discharge permits. NRW are also a plan maker and project proponent, for example River Basin Management Plans and Forest Resource Plans".*

We have other responsibilities under the Habs Regs including setting conservation objectives.

This website provides further information with respect to our roles and responsibilities: [Natural Resources Wales / Our roles and responsibilities](#)

**Commented [A44]:** A competent authority only needs to inform the appropriate authority if it is going to consent a plan or project when it has not been able to conclude no adverse effects on integrity, but intends to approve it under the Article 6(4) derogations

### Environment Agency

3.4.21 The Environment Agency (EA) has a range of statutory duties and is a 'competent authority' for the Bathing Water Regulations as well as being 'the Agency' under the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 and thus lead regulator in England.

<sup>68</sup> [20171030 Final Revised WFD Advice Note for Local Authorities \(naturalresources.wales\)](#)

<sup>69</sup> [wfd-docs-eng.pdf \(naturalresources.wales\)](#)

Wrexham County Borough Council and Flintshire County Council fall under Natural Resources Wales as the regulator. However, as part of the River Dee catchment resides in England, the EA has powers and duties relating to environmental protection, flood defence, water resources, fisheries, recreation, conservation and navigation for the SAC in England.

### Natural England

3.4.22 Natural England is the '[Statutory Appropriate](#) Nature Conservation Body' in England with associated roles and responsibilities in the implementation of the Habitats Regulations. Natural England are responsible for setting the conservation objectives for the English part of the SAC.

### Afonydd Cymru

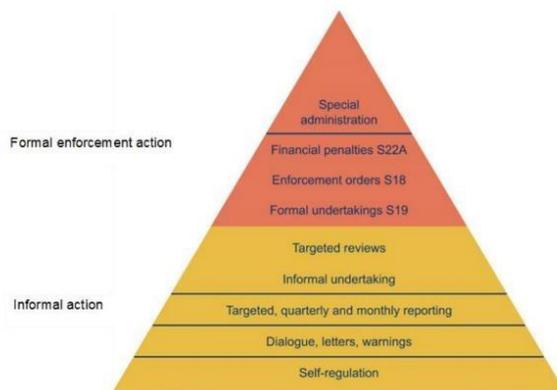
3.4.23 Afonydd Cymru (AC) is the umbrella body that represents the six Rivers Trusts in Wales. They advocate for the Rivers Trust on relevant Welsh Government and NRW working groups championing Wales' thirty-three rivers, and the many lakes and smaller watercourses. Their environment, fish and fisheries and the wide range of diverse species depend on clean water and unspoilt habitats.

### Welsh Dee Trust

3.4.24 The Welsh Dee Trust is one of the 6 trusts represented by Afonydd Cymru and is the trust responsible for the River Dee. The Welsh Dee Trust focuses its work on the practical delivery of interventions that make a difference to water quality and habitats. These interventions include restoring river habitats and planting woodlands along river banks, as well their Water Wise Farming Programme where they work confidentially with farmers to identify new practices and investment needed to keep nutrients and soil in the areas where they benefit the farm business and out of the River Dee. Box 3.2 below shows an example project run by AC, Welsh Dee Trust and Welsh Water.

### Water Utility Companies

3.4.25 Water utility companies are a competent authority for their activities under the Habitats Regulations and 'public bodies' under the Regulations which implement the Water Framework Directive. As such they also have a statutory duty to 'have regard' to the requirements of the Birds and Habitats Directives and to the River Basin Management Plan. Under OFWAT's strategy, OFWAT have made it clear that they will take action if a company fails to comply with its obligations and if there is noncompliance. They use a risk-based approach to regulation which enable them to use enforcement tools to deliver outcomes. Figure 3.14 below outlines the enforcement tools available to Ofwat (taken from Ofwat's approach to enforcement document<sup>64</sup>). The action that Ofwat take will depend on the nature, seriousness and impact of any contravention.



<sup>64</sup> <https://www.ofwat.gov.uk/wp-content/uploads/2015/11/Approach-to-enforcement.pdf>

**Figure 3.14 Ofwat's enforcement tools**

3.4.26 Welsh Water's performance is tightly monitored and regulated by a number of regulators. The roles and responsibilities of Welsh Water's regulators are outlined below:

- The Welsh Government sets the legislative and regulatory framework within which Welsh Water operate by making regulations and issuing statutory guidance. Welsh Government also publishes statutory guidance setting out the strategic priorities that it expects Ofwat to pursue in its regulation of the water industry in Wales.
- NRW brings together the work of the Countryside Council for Wales, Environment Agency Wales and Forestry Commission Wales, as well as some functions of Welsh Government.
- The Environment Agency monitors and enforces compliance with environmental water quality standards. It also ensures the proper use and management of water resources.

#### **National Farmers Union (NFU)**

3.4.27 NFU Cymru is the leading agricultural organisation for farmers in Wales. NFU represents the farming community with over 47000 members and are the UK's largest representative body for agriculture and horticulture with has local representatives across the country, including water pollution specialists, to communicate messages between the farming industry, and the regulators. The farming community will play a crucial role in the implementation of the DCPRS. Alongside population growth, the agricultural sector will change in the future and the NFU vision is to achieve this development together with environmental improvement.

#### **Farmers (including fish farms and cress farms) and land managers.**

3.4.28 The role of farmers (including those involved in fish farms and cress farms) and land managers in the delivery of the ambition target reductions and the overall achievement of the Conservation Objectives should not be underestimated. The willingness of farmers and land managers to sign up to the various delivery mechanisms will be crucial to the extent to which reductions can be achieved without the need for further regulatory control.

#### **Residents**

3.4.29 Whilst residents within the catchment have no 'responsibility' for any of the measures set out within this plan, everyone can 'do their bit'. Reducing water usage in the home and at work will reduce the wastewater load on sewage treatments works and thus help to maximise the benefits that the delivery measures will secure for the SAC. Reporting water pipe leaks to the local water company also helps as prompt repairs reduce the loss of water from the supply network and allows more water to remain in the river for dilution of wastewater from treatment works.

#### *Extra NRW Funding and Catchment Specific Policies*

3.4.30 Potential opportunities for securing extra NRW funds and resources to deliver DCPRS are outlined below, but Section 5.2 provides further detail on this.

**Commented [A45]:** May not be the correct location to include residents and an explanation of how they can 'do their bit' here as part of a section titled '*Key organisations and parties relevant to the delivery of DCPRS*'

3.4.31 The Strategic Review of Charging Programme (SRoC)<sup>65</sup> was set up in 2018 to review how NRW charge for the activities that they regulate and services they provide. It has been put in place to deliver a scheme that continues to apply the right charges to NRW activities through the right mechanisms and allocates the resource in the right place. The purpose of the programme is to undertake a strategic review of NRW's charging scheme that is fair, consistent and enables NRW to implement an appropriate charging model to meet the needs of customers and embed NRW's Sustainable Management of Natural Resources (SMNR) remit and wellbeing goals. The programme will take account of SMNR principles, current charging schemes, all regimes, payment for ecosystem services etc and inform those aspects where NRW would wish to influence change. The programme will seek agreement and development with Welsh Government to embed strategically in Wales. NRW will launch the new Regulatory Charging Scheme in April 2022. There is an opportunity to support NRW when their SRoC Programme presents clear data and evidence to support charge increases or new charge introductions, to deliver properly funded permitting, compliance and enforcement of regulated activities with necessary environmental monitoring and data analysis to support regulatory decision making.

3.4.32 Other potential opportunities to improve current powers, policies, and practices to ensure the delivery of DCPRS may include:

- Expanding Local Planning Authority powers – enforcing land management agreements and securing extra developer contributions to deliver P reduction measures
- Expanding Local Planning Authority powers – enforcing measures to deliver higher standards of water efficiency, rainwater harvesting and re-use.
- Strengthening spatial planning policies to include effective onsite P reduction measures and management plans
- Providing a clear strategic direction for prioritising land use in Wales with focus on agricultural land to promote a nutrient neutrality approach
- Supporting NRW proposals for review of agricultural practice in Wales via the Agriculture (Wales) Bill and Sustainable Farming Scheme (SFS) including the regulatory baseline to ensure compliance across all land managers whether or not in the SFS
- Supporting NRW and other public bodies on proposals to progress green finance options for Wales
- Developing a long-term strategy and action plan to reduce phosphate and other nutrient use

### 3.5 Considerations which will inform the selection of measures to be delivered

3.5.1 Section 3.1 sets out a broad range of *potential* measures which might secure reductions of phosphorus within the catchment. Section 3.2 then identifies the scale of phosphorus reduction which might be achieved from the measures, alongside delivery options. This DCPRS is a 'living document'; the milestones set out in section 5.3 indicate when the details of specific measures to be implemented will be finalised and when such measures will be secured and delivered. This section sets out the factors which will be taken into account in selecting which measures to take forward through the strategy.

---

<sup>65</sup> <https://naturalresources.wales/about-us/what-we-do/how-we-regulate-you/strategic-review-of-charging-2021/?lang=en>

3.5.2 Looking at the DCPRS as a whole, where a reduction in phosphorus might be achieved through a variety of different measures the overall aim of the strategy is to ensure that the measures which are taken forward are selected in light of the following key considerations:

- Effectiveness – Measures for which there is a greater confidence in success will be preferred over those where success is less certain. In considering effectiveness it will also be necessary to take account of the risk of unforeseen consequences.
- Efficiency – Measures which deliver multiple benefits will be preferred over those which only deliver water quality improvements. Examples of wider benefits include:
  - Delivering wider biodiversity benefits and help to achieve or maintain good ecological status under the Water Framework Directive
  - Delivering against other themes of the North West Wales Area Statements:
    - Ways of working
    - Climate and nature emergency
    - Reconnecting people with nature
    - Encouraging a sustainable economy
    - Supporting sustainable land management
    - Opportunities for resilient ecosystems
  - Delivering landscape and local amenity benefits (e.g. increasing the visual characteristics of the river or improving recreational opportunities - where such activities do not undermine the conservation objectives of the SAC)
- Cost effectiveness – measures which deliver the greatest reductions in phosphorus for the least cost will be preferred over measures which deliver more nominal benefits at a greater cost.
- Least onerous – where reductions might be achieved in a number of ways, measures which are the least onerous to those who are affected will be preferred. Fewer larger scale schemes may therefore be preferable to multiple small scale opportunities.

3.5.3 Category 1 measures will be subject to further scrutiny with regards compliance with the Habitats Regulations (refer 4.1).

3.5.4 In applying these considerations, it will be necessary to recognise that delivery options and *how* delivery might be secured (refer section 3.2) will be of relevance. For some measures delivery through the use of statutory tools or powers may exert a strong influence over such considerations when compared to delivery through voluntary agreements.

3.5.5 Whilst the responsibilities for delivery of category 1 and category 2 measures may rest with different partnership bodies (refer 4.1), a joint approach could, in principle, be adopted. For example, if a coordinated strategic approach best meets the considerations listed above whilst delivering reductions beyond what is required by category 1 measures (i.e. delivering additional reductions over and above those required to ensure that development does not result in an overall increase in

phosphorus) delivery partners could choose to work together to deliver both category 1 and 2 measures through a co-ordinated approach.

## 4 How a DCPRS will allow development provided for within the Local Development Plans to avoid adverse effects to the integrity of the River Dee and Bala Lake SAC

### 4.1 Proposed approach to facilitate compliance with requirements of Habitats Regulations

- 4.1.1 The DCPRS is a 'living document' (refer preface). This current version is drafted to facilitate the adoption of the Wrexham and Flintshire Local Development Plans by demonstrating that measures to avoid adverse effects to the integrity of the SAC as a result of planned growth are 'achievable in practice'. As a consequence, this version of the DCPRS identifies measures which could, in principle, be delivered and provides an overview of delivery options along with estimates of the phosphorus reduction which might be achieved.
- 4.1.2 The Local Development Plans includes case specific policy restrictions (policy NE6 in the Wrexham plan and policy EN15 in the Flintshire plan). The policies are clear that development will only be permitted where there is no adverse effect to the integrity of the River Dee and Bala Lake SAC. Adverse effects will be avoided through the delivery of mitigation measures through the DCPRS. The policies serve to constrain the release of development provided for within the Plans in accordance with specific milestones identified in section 5.3 relating to the identification and delivery of necessary measures. These policies recognise that whilst measures are accepted as being achievable in practice at the point at which the plan is adopted, any measures relied upon to avoid adverse effects to site integrity from development provided for by the plan will need to be delivered in a timely manner, before additional wastewater flows associated with new development might adversely affect the river.
- 4.1.3 As set out in section 1.2 the DCPRS has two parallel objectives:
- a) **To facilitate the delivery of development and avoid adverse effects to the SAC from planned growth as a result of the treatment of wastewater (referred to as 'category 1 measures')**
  - b) **To achieve the conservation objectives of the SAC and Water Framework Directive requirements (referred to as 'category 2 measures').**
- 4.1.4 Category 1 measures will be relied upon to avoid adverse effects to the integrity of the SAC in accordance with the Habitats Regulations. The purpose of category 1 measures is to ensure that the delivery of development will not result in any increase in phosphorus within the SAC. The legal tests which apply under the Habitats Regulations are such that category 1 measures *relied* upon to avoid adverse effects will be subject to close scrutiny.
- 4.1.5 In order to avoid adverse effects to the integrity of the SAC the overall suite of category 1 measures will need to deliver sufficient phosphorus reductions to offset the phosphorus loading from the respective Local Development Plans. The measures will be delivered throughout the plan period and delivery of development will be conditional on the measures being delivered in a timely manner according to the milestones set out in 5.3.
- 4.1.6 **The responsibility for identifying and securing the delivery of category 1 measures rests with the local planning authority.** To provide the necessary confidence that adverse effects will be avoided category 1 measures will need to satisfy the following checklist:

**Commented [A46]:** These objectives are now in para 1.3.3.

**Commented [A47]:** The checklist should be updated to reference the need to maintain measures for the lifetime of the development

**Box 4.1: Category 1 measures checklist**

- Measures are effective
- Measures are achievable/implementable
- The expected benefits of such measures are certain and can be quantified
- The measures are deliverable in a timely manner in view of the milestones at 5.3
- Delivery of measures will not compromise the ability to meet the SAC targets in the future (i.e. will not undermine delivery of category 2 measures)

- 4.1.7 The 'category 1' measures relied upon to avoid adverse effects from development provided for within the Local Development Plans will need to be identified, secured and delivered according to the milestones in 5.3. Box 4.1 identifies a checklist against which category 1 measures will be subject to scrutiny and it will be necessary to be satisfied that the expected benefits of such measures are certain and can be quantified.
- 4.1.8 In practice there is often an element of uncertainty in the effectiveness of mitigation measures when delivered a complex natural riverine system. The need for certainty refers to the anticipated benefits which will be attributed to that measure. As such, where there is residual uncertainty regarding the actual phosphorus removal which will be achieved from the delivery of a particular measure it will be necessary to assign an expected benefit on a precautionary basis, by applying a 'safety margin' or 'buffer' to the benefits that are anticipated. In this way over-delivery can be anticipated from the delivery of category 1 measures overall which will offset any instances where a measure fails to achieve the reductions which were anticipated. Furthermore the DCPRS is a live document; the milestones in 5.3 include monitoring of water quality and, in principle, any evidence which identifies a need for additional measures can inform later revisions to the strategy.
- 4.1.9 Category 2 measures are concerned with the achievement of the conservation objectives for the SAC and the Water Framework Directive requirements through delivering an overall reduction in phosphorus (i.e. over and above the category 1 measures). **Responsibility for identifying and securing the delivery of category 2 measures will rest with the anticipated Nutrient Management Board.**

#### 4.2 The legal provisions which support the preparation of the DCPRS

- 4.2.1 Development in the Dee catchment has the potential to compromise the ability of the river to meet its phosphorus targets. As such, development proposals need to be considered against the requirements of the Habitats Regulations through what is referred to as a Habitats Regulations Assessment (HRA). Where a proposal is considered to have a likely significant effect upon the SAC an appropriate assessment is required. Subject to [imperative](#) reasons of over-riding public interest, proposals can only be approved where it can be demonstrated that they will not have an adverse effect on the integrity of the SAC.
- 4.2.2 The HRAs for the Wrexham and Flintshire Local Development Plans have identified that the planned growth within the catchment represents a risk to the SAC. In the absence of mitigation measures, it has not been possible to conclude that there will be no adverse effect to the integrity of the SAC.
- The DCPRS is therefore necessary to provide the confidence that adverse effects to the SAC from the delivery of development provided for within the plans will be avoided.

- 4.2.3 In this regard case law has established some important principles in respect of the reliance on mitigation measures as part of the HRA of a plan (as opposed to a HRA of a project). In the case of a project it is necessary to have the details of proposed mitigation measures clearly established before being able to rely on them to conclude that a project will have no likely significant effect, or no adverse effect on integrity. Plans are different. By definition they are strategic in nature; setting the overall framework within which later projects will be determined. In most cases the specific details of development provided for within a plan will not be available until a later date within the plan period, after it has been adopted.
- 4.2.4 In the case of *Feeney v Oxford City Council*<sup>66</sup>, the Courts have confirmed that it is acceptable in principle to include policies within a Local Plan which are conditional upon certain conditions being met. In respect of the assessment of a land use plans under the Habitats Regulations, the use of a 'safeguard' relating specifically to a particular policy within the Core Strategy was subject to considerable scrutiny. The High Court ruled, that:
- 'There is nothing wrong in approving something in principle which may not happen in the future, if the condition is not satisfied (para 96)...*
- The conditional approval is a permissible and lawful course of action' (para 99)*
- 4.2.5 Furthermore, an approach which potentially relies upon matters being finalised after the adoption of the plan was specifically endorsed by the High Court in the case of *Abbotskerswell v Teignbridge (2014)*<sup>67</sup>. In this case the Inspector '*did not consider that safeguards proposed in the plan – the strategic mitigation strategy, settlement and site mitigation plans – had to be in place in advance of adoption of the Local Plan*'. The Court ruled in para 84 that '*the Inspector was entitled to conclude that the Local Plan met the statutory requirements and was sound*'.
- 4.2.6 Finally, in the case of *NANT v Suffolk Coastal District Council* (2015), the Court of Appeal ruled that 'the important question in a case such as this is not whether mitigation measures were considered at the stage of [Core Strategy] in as much detail as the available information permitted, but whether there was sufficient information at that stage to enable the Council to be duly satisfied that the proposed mitigation measures could be achieved in practice'<sup>68</sup>.
- 4.2.7 In practice therefore, when considering mitigation measures to inform a plan HRA the key question is whether the measures can be relied upon to protect European sites. When considering policy specific, or even allocation specific measures, the emphasis is placed on whether a decision maker can be duly satisfied that the measures can be delivered in practice. The measures might impose additional burdens on the implementation of certain aspects of a plan, or may even render the scale of delivery of certain elements conditional on the delivery of measures and/or further HRA effort.
- 4.2.8 The Habitats Regulations Assessment Handbook<sup>69</sup> provides the following by way of explanatory text regarding the use of a case specific policy restriction.

*'Where the outcome of an appropriate assessment in relation to a particular policy is uncertain because the policy provides for change which could affect a European site, if*

---

<sup>66</sup> *Feeney v Oxford City Council* [2011] EWHC 2699 (Admin)

<sup>67</sup> *Abbotskerswell Parish Council v Teignbridge District Council* [2014] EWHC 4166 (Admin)

<sup>68</sup> *No Adastral New Town v Suffolk Coastal District Council* [2015] EWCA Civ 88

<sup>69</sup> Tyldesley, D. and Chapman, C. (2013) *The Habitats Regulations Assessment Handbook*, September 2021 Edition UK: [DTA Publications Ltd.](#) (Refer section F.10)

*measures were not put in place to prevent such effects, the plan-making body may need to add a case-specific policy restriction.'*

4.2.9 Relying upon the principles which have been established by the UK Courts, the Habitats Regulations Assessment Handbook provides guidance concerning the use of what are referred to as 'case specific policy caveats' or 'case specific policy restrictions' under such circumstances. The guidance states that:

*'To be an appropriate restriction or caveat... enabling the plan-making body to ascertain no adverse effect on the integrity of a European site, the restriction must be –*

- *case-specific;*
- *explicit; and*
- *added to the policy and not merely added to the explanatory text or commentary, or not merely inserted into the implementation or monitoring chapters.'*

4.2.10 The planned development of a strategic approach to the delivery of mitigation measures can therefore be relied upon to avoid adverse effects from the development provided for within a plan. However, in order to have sufficient confidence that adverse effects will be avoided a case specific policy restriction will be required such that the delivery of development provided for by the plan is conditional upon the measures identified within the DCPRS being delivered in a timely manner.

4.2.11 In the case of the DCPRS, policy specific restrictions within the LDPs are such that the delivery of development is conditional upon specified DCPRS delivery milestones being met. This link between the findings of the HRA and the plan policies is necessary to satisfy the requirements of the Habitats Regulations. In the unlikely event that measures to reduce phosphorus within the river are delayed the release of development will be constrained accordingly.

### 4.3 The additional phosphorus contribution from new development

4.3.1 The main purpose of Section 4.3 is to outline the outcome (along with the approach, methodology and key parameters) of the high-level nutrient budget assessment completed as part of the DCPRS, which will inform the identification of the required Category 1 measures to mitigate any surplus P loading arising from the emerging LDP growth. Both Councils have said in their respective letter to the Planning Inspectors that "A proportionate assessment of the overall nutrient budget of the development in each plan will be made (i.e. how much phosphorus the planned development in each plan is likely to produce)". This report however does not replace project specific HRAs or implementation monitoring that must be undertaken to provide the necessary certainty required under the Habitats Regulations. Instead, this report demonstrates that there are existing strategies, policies, mechanisms, and opportunities to ensure Habitats Regulations' compliance.

4.3.2 Therefore, project specific HRAs should be still undertaken to verify the broad assumptions used in this assessment, together with suitable planning policies, conditions, and enforcement activities. The nutrient budget assessment used in this report has adopted a precautionary approach (including suitable sensitivity testing) as described below. This includes an extra 20% allowance as a safety buffer to account for general uncertainties in the assessment and long-term P removal efficacy of offsetting measures, as per Natural England's Stodmarsh Lake Nutrient Neutrality Guidance<sup>70</sup>.

4.3.3 The key principles adopted for this assessment are outlined below:

---

<sup>70</sup> [stodmarsh-nutrient-neutral-methodology-november-2020.pdf \(ashford.gov.uk\)](https://www.ashford.gov.uk/stodmarsh-nutrient-neutral-methodology-november-2020.pdf)

- As per the approach used in Natural England's Stodmarsh Lake Nutrient Neutrality Guidance, only new residential developments and other new commercial/employment developments that involve overnight accommodation (e.g. hotels) or any new tourism attractions that will be connected to a WwTW are included in nutrient budget assessment. This is because that anyone living in the local WwTW catchments assessed in Flintshire and Wrexham also work and uses facilities in these catchments. Therefore, wastewater generated by that person can be calculated using the population increase from new homes and other overnight accommodation, to avoid double counting. However, new tourism attractions and tourism accommodation are exceptions as these land uses attract other people into the local catchments and generate additional wastewater and consequential nutrient loading to the impacted River Dee freshwater catchment. Both LPAs have confirmed that there are no commercial/employment LDP sites that will currently fall into such categories and therefore, only residential allocations are included in the calculations to avoid double counting.
- All approved LDP and windfall sites that are already constructed and connected to the WwTWs are excluded from the nutrient budget calculations. The remaining proposed LDP growth in the current plan period is assessed, along with the potential windfall sites estimates provided by the LPAs (i.e., for each impacted key WwTW site). LPAs have advised that historically such windfall housing sites come forward on brownfield land as small or medium sites. Therefore, extra P loading from wastewater discharge is assessed for these windfall sites, but P loading from surface runoff is excluded as this will also ensure a precautionary approach due to the following reasons:
  - Change of land use from brownfield and agricultural to residential generally reduces P loading
  - New SuDS and blue-green infrastructure will reduce P load
- As per the general approach used in Natural England's Stodmarsh Lake Nutrient Neutrality Guidance, the following parameters are used for estimating the wastewater loading and P loading is calculated based on the existing or proposed P limit on the WwTW discharge consent:
  - Average occupancy rate is 2.4 persons/household
  - Per capita water consumption rate is 110 litres/person/day (as per the amended Buildings Regulations Wales Part G requirement, which came into effect on 1<sup>st</sup> November 2018<sup>71</sup>)
  - Maximum WwTW P discharge is considered as 90% of the permitted Total Phosphorus (TP) limit
- For those WwTWs that currently don't have a P consent the following alternative approach is used:
  - Phosphorus domestic per capita loading in crude sewage based on 2.5g/person/day (Based on Welsh Water's Process Design Specification PS201 v6.1)
  - Phosphorus domestic per capita loading in final effluent assuming 30% removal in treatment works (typically primary treatment process can remove 10-15% of incoming P)

**Commented [A48]:** With regard to previous correspondence from the Inspector, does this include committed sites i.e. those which still need RM / DoC approval?

<sup>71</sup> Welsh Government (2018). The Building Regulations 2010. Amendments to Approved Documents G. Accessed online <https://gov.wales/sites/default/files/publications/2019-05/building-regulations-guidance-part-g-sanitation-hot-water-safety-andwater-efficiency-amendments.pdf>

and secondary treatment may capture up to 20% create biomass in the process according to the available literature<sup>72,73</sup>)

- As mentioned in para 4.3.2 before, the estimated total net P discharge at each WwTW catchment is increased by 20% (i.e., to include a safety buffer to account for general uncertainties in the assessment), to ensure a precautionary approach is adopted when estimating the offsetting mitigation measures.
  - Using the available data and evidence base available when the budget estimate was undertaken P loading from existing and proposed land uses (i.e. runoff component) was assessed as well as the P loading from extra wastewater loading to inform P mitigation options.
  - P leachate rates from the existing land uses are taken from the relevant Water Framework Directive export coefficient for urban and suburban land 2006 Final Report: Updating the estimate of the sources of phosphorus in UK waters – Ref Table 02.01). Existing agricultural areas within Flintshire and Wrexham LDP are more likely to fall within the “Intensive mixed farming (2)”<sup>74</sup> category instead of “Upland and moorland (1)” category, when deriving the appropriate P leachate rate.
- 4.3.4 Wrexham County Borough Council and Flintshire County Council provided a list of housing allocations and future windfall estimates for their respective areas. Their sites were then grouped, depending on their location into the nearest Welsh Water WwTW.
- 4.3.5 Wrexham County Borough Council and Flintshire County Council also provided a description of the existing land use for each housing allocation. This data was checked and verified through the planning application documentation available from the respective online planning portals, google areal maps and the online mapping service (Geo-Portal for Wales)<sup>81</sup>.
- 4.3.6 This data also provided the proposed development details - e.g., developable and public open space (PoS) area, which have been used in conjunction with measured LDP site areas from the GIS layers supplied and additional information supplied by the LPAs – e.g., from the latest planning discussions/documents and planning policies in relation to minimum PoS provision. As described below, this information was then input into the P Budget calculator next to the corresponding land use to determine the average nutrient loss rate (Phosphate kgP/ha/yr) from both existing and developed situations. The effectiveness of SuDS, wetlands and woodlands in mitigating phosphorus are explored further in Section 4.4.
- 4.3.7 A summary of the proposed development within the emerging Flintshire LDP can be found in Table 4.1 below.

---

<sup>72</sup> <https://www.sciencedirect.com/science/article/pii/S2667010020300081>

<sup>73</sup> <https://www.ajol.info/index.php/wsa/article/view/5060>

<sup>74</sup> <http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=13635> <sup>81</sup>  
[Lle - Home \(gov.wales\)](#)

**Table 4.1 Flintshire LDP Housing Allocation Details**

LPA	WwTW	Housing Allocation / Windfall estimate	Site area (ha) - measured from GIS supplied	Assumed PoS/ GI* area (ha)	Remaining Site Area (ha)	Supply in Plan Period	Sub-total in Plan Period/ per WwTW	
Flintshire	Buckley	HN1.1	5.30	0.88	4.42	159	405	
		Windfall estimate	N/A	N/A	N/A	246		
	Mold	HN1.6	10.64	2.63	8.01	246	589	
		HN1.10	3.55	0.66	2.89	105		
		HN1.5	5.75	0.77	4.98	74		
		Windfall estimate	N/A	N/A	N/A	164		
	Hope	HN1.9	3.55	0.76	2.79	80	282	
		HN8.2	0.30	0.00	0.30	0		
		HN1.11	7.73	1.17	6.56	130		
		Windfall estimate	N/A	N/A	N/A	72		
	<b>Total</b>						<b>1276</b>	

**Commented [A49]:** We note from your response to the Inspector (17/12/2022) that HN1.5 and HN1.11 benefit from planning permission and are under construction, and do not require any further applications. Does this table therefore need to be updated?

\*Public open Space / Green Infrastructure

4.3.8 A summary of the proposed development within the emerging Wrexham LDP can be found in Table 4.2 below.

**Table 4.2 Wrexham LDP Housing Allocations**

LPA	WwTW	Housing Allocation / Windfall estimate	Site area (ha) - measured from GIS supplied	Assumed PoS/ GI* area (ha)	Remaining Site Area (ha)	Supply in Plan Period	Sub-total in Plan Period/ per WwTW
Wrexham	Five Fords	KSS1	67.69	2.00	65.69	400	4092
		KSS2	92.64	19.94	72.70	1580	
		1	21.76	7.56	14.20	375	
		2	0.58	0.00	0.58	25	
		3	0.60	0.00	0.60	0	
		4	0.76	0.00	0.76	0	

		6	5.99	0.90	5.09	180	
LPA	WwTW	Housing Allocation / Windfall estimate	Site area (ha) - measured from GIS supplied	Assumed PoS/ GI* area (ha)	Remaining Site Area (ha)	Supply in Plan Period	Sub-total in Plan Period/ per WwTW
		11	1.71	0.13	1.58	25	
		12	4.96	0.90	4.07	112	
		13	13.27	1.20	12.07	240	
		18	3.25	0.40	2.85	79	
		Windfall estimate	N/A	N/A	N/A	1076	
	Gresford	7	3.22	0.48	2.74	96	669
		8	1.23	0.04	1.19	8	
		9	2.06	0.00	2.06	51	
		10	15.68	2.45	13.23	362	
		Windfall estimate	N/A	N/A	N/A	152	
	Cefn Mawr	5	1.45	0.26	1.19	51	142
		Windfall estimate	N/A	N/A	N/A	91	
	Holt	14	1.74	0.18	1.56	35	80
		Windfall estimate	N/A	N/A	N/A	45**	
	Overton	15	1.95	0.20	1.75	40	86
		Windfall estimate	N/A	N/A	N/A	46**	
	Penley	16	1.01	0.00	1.01	15	60
		Windfall estimate	N/A	N/A	N/A	45**	
	Lavister	17	6.29	1.16	5.13	132	193
		Windfall estimate	N/A	N/A	N/A	61	
<b>Total</b>						<b>5322</b>	

\*Public open Space / Green Infrastructure

\*\* Some of these windfall units may well fall within other small WwTWs in Wrexham that discharge into the Dee Freshwater Catchment. Currently a total of remaining 135 windfall sites in the LPD-LDP have been equally distributed amongst Holt, Overton and Penley WwTWs, representing a worst-case estimate at these locations for P budgeting purpose

4.3.9 A summary of the main existing land types and nutrient loss rates used for both Mid and High P values can be found in table 4.3 below. As mentioned before, the Mid P value and High P Value is derived from the P leachate rates outlined in Table 02.01 in the Department for Environmental Food and Rural Affairs (DEFRA) Updating the Estimate of the Sources of P in UK Waters report. The Mid P value is the average value of the “upland and moorland land use (1)” and the “intensive farming land use (2)”. The High P value is based on the “intensive farming land use (2)” only as it gives a higher P leachate rate. Both values are used in the P budget estimates for sensitivity checking purpose while ensuring a sufficiently precautionary approach is used at this initial LPD stage assessment. The use of mid P value provides the conservative value, but project Level HRAs can indeed chose the high P value if the current agricultural use can justify this.

**Table 4.3 Existing Land Types and Nutrient Loss Rates**

Land Type	Mid Phosphorus Value (kg P/ha/yr)	High Phosphorus Value (kg P/ha/yr)
Arable Cereals (e.g. setaside)	0.75	0.9
Improved grassland	0.55	0.8
All other grass types (e.g permanent pasture, neutral, calcareous, acid)	0.02	0.02
All woodland types	0.02	0.02
Suburban/rural/industrial/urban development	0.83	0.83

4.3.10 As per table 02.01 in the above DEFRA report, the phosphorus leachate rate from the proposed urban development areas is 0.83 kg/ha/yr for both land use classes. The average phosphorus leachate rate from proposed semi-natural native woodland planting and all other grass types is 0.02 kg/ha/yr for both land classes. Therefore, these values are the same for both the mid and high phosphorus values in Table 4.3 above.

4.3.11 Phosphorus leachate rate from all proposed PoS areas is taken as 0.14 kg/ha/yr as per Natural England’s Stodmarsh Nutrient Neutrality Methodology document<sup>75</sup>. However, the 0.5ha minimum size to qualify as PoS is not considered for the DCPRS, to better reflect the generally smaller scale nature of Flintshire and Wrexham LDP sites, as well as the wetter climate in Wales than in the typically drier South-eastern parts of England helping to maintain higher baseflows within SuDS

<sup>75</sup> Natural England (2020). Advice on Nutrient Neutrality for New Development in the Stour Catchment in Relation to Stodmarsh Designated Sites – For Local Planning Authorities.

measures within the PoS, which would also help effectively mitigating P loading irrespective of the size.

4.3.12 As per Policy CF2: Provision of New Open Space in Wrexham's Deposit Plan Document<sup>76</sup>,

Developments of 10 or more dwellings must include provision for public open space, which should include minimum of 0.25ha per 50 dwellings (50sqm per dwelling). The open space must be accessible and integral to the proposed development and useable for both formal and /or informal play and recreation. The quantity, quality and location of the open space contribution required will be determined in accordance with standards set out in the most up to date open space study.

4.3.13 The nutrient budget summary presented in Table 4.4 below is broken down into two categories:

- Option 1 – Discharging at maximum P consent limit at WwTW. This is the legal limit (normally expressed in mg/l) specified in the existing discharge permit at a WwTW under the Environmental Permitting Regulations so that Welsh Water can discharge into an existing watercourse
- Option 2 – Maintaining current P performance at WwTW. This is the average value of P within the sampled wastewater discharge at a WwTW

4.3.14 The Option 1 outlines the nutrient budgets using the existing P permit limit values for the impacted WwTWs, giving the maximum P budget from the emerging ~~LDP-LDP~~ growth in Flintshire and Wrexham. Whereas Option 2 outlines a reduced P budget with maintaining the current P performance previously shown in Table 3.3 at each WwTW. Therefore, Option 2 gives a reduced P budget to offset than Option 1 if Welsh Water can maintain the current P performance at these impacted WwTWs. However, Welsh Water currently have no legal obligation to maintain the P performance at the same level unless the existing permit is tightened by NRW to reflect this. Therefore, Option 1 should be considered as a precautionary basis at the current LDP HRA and DCPRS preparation stage until Welsh Water and NRW have fully confirmed that Option 2 is viable and enforceable at each impacted WwTW.

4.3.15 Both options shown in Table 4.4 also show Total Phosphorus (TP) load from:

- Combined land use and WwTW discharge impacts
- Only WwTW discharge impact

As mentioned before in para 4.3.9, both Mid P and High P values shown in Table 4.3 are used to check sensitivity of land use runoff impacts in the TP budget. Similarly, exclusion of land use impacts in the assessment shows the greater significance of WwTW discharge in the overall TP budget, to inform shaping the required mitigation measures presented later in Section 4.4 and Section 4.5.

4.3.16 As per Table 4.4, the discharge from WwTW is clearly the main driver behind the net phosphorus load for each WwTW catchment as the land use P loading generally tends to be offset due to the change in land use from agricultural to residential. The higher P leachate rates for land use has also shown a slight reduction in the net phosphorus budget for offsetting when compared to the mid P leachate rates.

---

<sup>76</sup> [http://wrexhamldp.wrexham.gov.uk/events/32115/4207408\\_accessible.pdf](http://wrexhamldp.wrexham.gov.uk/events/32115/4207408_accessible.pdf)

**Table 4.4 Nutrient budgets summary with existing P permit maximum values and maintaining current P performance at WwTWs**

LPA	WwTW	Option 1 - Discharging at maximum P consent limit at WwTW			Option 2 - Maintaining current P performance at WwTW		
		Both Land Use and WwTW discharge impacts considered		Only WwTW discharge considered TP (kg/yr)	Both Land Use and WwTW discharge impacts considered		Only WwTW discharge considered TP (kg/yr)
		Mid P Value TP (kg/yr)	High P Value TP (kg/yr)		Mid P Value TP (kg/yr)	High P Value TP (kg/yr)	
Flintshire	Buckley	43.2	41.61	42.15	22.13	20.54	21.07
	Mold	63.25	57.96	61.3	32.61	27.31	30.65
	Hope	30.39	27.94	29.76	15.51	13.05	14.88
Wrexham	Five Fords	417.56	381.82	425.85	204.64	168.9	212.92
	Gresford	69.01	65.61	69.62	55.09	51.68	55.7
	Cefn Mawr	14.56	14.56	14.78	10.13	10.13	10.34
	Holt	N/A	N/A	N/A	150.46 (can be reduced to 9.87 with P stripping of 1mg/l)	150.46 (can be reduced to 9.87 with P stripping of 1mg/l)	148.92 (can be reduced to 8.33 with P stripping of 1mg/l)
	Overton	N/A	N/A	N/A	159.41 (can be reduced to 10.68 with P stripping of 1mg/l)	159.41 (can be reduced to 10.68 with P stripping of 1mg/l)	157.68 (can be reduced to 8.95 with P stripping of 1mg/l)

Penley	N/A	N/A	N/A	110.48 (can be reduced to 7.23 with P stripping of 1mg/l)	110.48 (can be reduced to 7.23 with P stripping of 1mg/l)	109.50 (can be reduced to 6.24 with P stripping of 1mg/l)
Lavister	19.73	18.6	20.09	9.69	8.55	10.04

\*The sites highlighted in yellow currently do not have phosphorus stripping capability

4.3.17 The P budgets presented in Table 4.4 are then used in Section 4.4 later to quantify the P offsetting mitigation options to deliver the emerging LDP growth. Whereas Table 4.5 below presents the lowest estimated nutrient budgets for each WwTW catchment, using a tighter BATNEEC (Best Available Technology Not Entailing Excessive Costs) P Consents (0.30mg/l) for all WwTWs. Again, this can be used to assess the potential P offsetting requirements, if Welsh Water can implement BATNEEC measures at some WwTWs as part of future AMP periods to achieve a tightened P consent than those considered under Option 1 and Option 2 above. This would be relevant at some WwTW locations where BATNEEC measures could be potentially viable and more cost effective in the longterm to address P issues.

4.3.18 Therefore, Table 4.4 and 4.5 should be used to develop a holistic strategy under DCPRS for delivering both Wrexham and Flintshire’s emerging LDPs, which will consider long-term growth till 2028 and 2030 respectively, spanning AMP7 and AMP8 periods. They provide a range of P budgets, depending on the adopted P discharge limit at these WwTWs and the parameters used to calculate the land use P loading. However, for the LDP HRA purpose, it is recommended that the worst-case P budget is considered for the initial mitigation planning as a precautionary basis. Whereas the nutrient budget assessments associated with project level HRAs or later versions of this DCPRS, can provide lower P budgets if appropriate to reflect the confirmed WwTW discharge option, as more refined assessments are undertaken in close consultation with Welsh Water and developers.

**Table 4.5 Nutrient budgets summary with tighter BATNEEC P limits at WwTWs**

LPA	WwTW	Maintaining current P performance at WwTW		
		Both Land Use and WwTW discharge impacts considered		Only WwTW discharge considered
		Mid P Value TP (kg/yr)	High P Value TP (kg/yr)	TP (kg/yr)
Flintshire	Buckley	13.7	12.11	12.64
	Mold	20.35	15.06	18.39
	Hope	9.56	7.1	8.93
Wrexham	Five Fords	119.47	83.73	127.75
	Gresford	20.27	16.87	20.89

Cefn Mawr	4.22	4.22	4.43
Holt	4.04	4.04	2.5
Overton	4.41	4.41	2.68
Penley	2.85	2.85	1.87
Lavister	5.67	4.54	6.03

\*The sites highlighted in yellow currently do not have phosphorus stripping capability

4.3.19 Table 4.6 below presents a range of category 1 and category 2 intervention measures which could be implemented to mitigate the TP budgets outlined in Table 4.4 and Table 4.5 above. Each intervention measure provides a breakdown of the advantages and disadvantages, the feasibility and effectiveness of the measure as well as the potential delivery partners and funding opportunities. Section 4.4 (category 1) and Section 4.5 (category 2) further discuss these intervention measures in the context of Flintshire and Wrexham requirements and opportunities.

4.3.20 For all the intervention measures presented in Table 4.6, water attenuation is an assumed benefit, water quality improvement is the qualified benefit and additional benefits are also noted.

**Table 4.6 Intervention Measures Matrix**

Intervention	Description	Category	Advantages	Disadvantages	Feasibility (including cost and capacity)	Effectiveness	Delivery Partners	Other benefits	Potential funding opportunities
<b>Reduction of Agricultural P at source</b>	<input type="checkbox"/> Changing farming practices	C2	<ul style="list-style-type: none"> <li>Reduces pressure on traditional WwTW and naturebased solutions and will reduce expenditure on P removal and increase the sustainability of soil</li> <li>Associated pre-treated sludge biosolid spreading by DCWW as a single accredited stakeholder</li> </ul>	<ul style="list-style-type: none"> <li>Many different small stakeholders requiring large changes in historical practices and may be difficult to manage and monitor <a href="#">and maintain for the lifetime of the impact</a></li> <li>Strategic interface with DCWW potentially helpful as one major stakeholder</li> </ul>	Low	High	<ul style="list-style-type: none"> <li>Welsh Government</li> <li>NRW</li> </ul>	<input type="checkbox"/> Increase biodiversity in watercourses, habitats from a reduction in nutrient enrichment and in soil	<ul style="list-style-type: none"> <li>Welsh Government</li> <li>Food accreditation schemes</li> <li>Welsh Government Farm Business Grant</li> </ul>
<b>Farming Source Control</b>	<input type="checkbox"/> Farm improvement works to prevent P entering watercourses, which can include <a href="#">fencing</a> .	C2	<ul style="list-style-type: none"> <li>Easy to do and increases the value of the farm</li> <li>Existing grants scheme may benefit from promotion</li> </ul>	<input type="checkbox"/> Many different small stakeholders may be difficult to manage and monitor and ensure maintained with certainty	High	High	<ul style="list-style-type: none"> <li>NFU Cymru</li> <li>River Dee LIFE project</li> <li>Dwr Cymru Welsh Water</li> </ul>	<input type="checkbox"/> Increase biodiversity in watercourses, habitats from a reduction in nutrient enrichment and in soil	<ul style="list-style-type: none"> <li>Welsh Government Farm Business Grant Scheme post 2024</li> <li>Glastir Small Grant Scheme</li> </ul>
<b>Surface Water Separation</b>	<input type="checkbox"/> Separate surface water drainage inputs to combined sewer flows from both new and existing developments	C1 & C2	<ul style="list-style-type: none"> <li>Business as usual for new developments (i.e., presumption that all new development should have separate drainage systems)</li> <li>Would lead to reduced Combined Sewer Overflow (CSO) discharges into watercourses and reduced WwTW P loading and water pollution and treatment costs</li> <li>Similar compensatory surface water removal approach already in place for Carmarthen Bay and Estuaries European Marine site</li> </ul>	<ul style="list-style-type: none"> <li>Separation of surface drainage from existing combined systems in urban areas can be typically costly</li> <li>Limited reduction in phosphorous concentration unless effective SuDS are also incorporated to treat the polluted stormwater</li> <li>Opportunities may be generally limited – Category 1 qualification may also depend on whether new development is on a combined system without DCWW fully funded plans otherwise to improve or is paying to retrofit scheme opportunities elsewhere in the catchment where fully funded plans currently don't exist</li> <li>Long- term Effectiveness can depend on existing operating practices at WwTW</li> </ul>	High	High	<ul style="list-style-type: none"> <li>Developers</li> <li>Flintshire County Council</li> <li>Wrexham County Council</li> <li>Dwr Cymru Welsh Water</li> <li>Wales Green Infrastructure Forum</li> </ul>	<input type="checkbox"/> Efficiency and increased capacity at WwTW	<ul style="list-style-type: none"> <li>Developer led for new developments</li> <li>Welsh Water/ Ofwat funding for addressing issues with existing CSOs/combined sewer systems</li> </ul>
<b>Enhanced Wastewater Treatment Works</b>	<input type="checkbox"/> Increased Phosphate stripping capacity	C1 & C2	<ul style="list-style-type: none"> <li>Increase headroom for new development that is mains connected</li> <li>Clear delivery mechanisms with Welsh Water</li> <li>Opportunity to explore developer contributions to accelerate delivery</li> </ul>	<ul style="list-style-type: none"> <li>Requires long term investment and budgeting</li> <li>Requires generally a long lead-in time to deliver</li> <li>May transfer issues to biosolid spreading, which require extra mitigation control</li> <li><a href="#">Discharge of other substances, which may impact on WQ e.g. aluminium?</a></li> <li><a href="#">Need to be satisfied that using this measure to allow development does not compromise the ability to restore the SAC</a></li> </ul>	Medium	High	<ul style="list-style-type: none"> <li>Dwr Cymru Welsh Water</li> <li>Developers</li> <li>NRW</li> <li>NFU Cymru</li> </ul>	<input type="checkbox"/> None	<ul style="list-style-type: none"> <li>Developers</li> <li>Welsh Water</li> <li>Welsh Government</li> </ul>
<b>SuDS Source control</b>	<input type="checkbox"/> Permeable paving	C1 & C2	<ul style="list-style-type: none"> <li>Reduce peak flows and enhance water quality treatment</li> <li>Dual use of landscape</li> <li>Prevents ponding</li> <li>Can be used for high density developments</li> </ul>	<ul style="list-style-type: none"> <li>Not compatible with large sediment loads</li> <li>Low traffic volume areas only</li> <li>Maintenance to minimise silt clogging <a href="#">for lifetime of impact</a></li> </ul>	Medium	High	<ul style="list-style-type: none"> <li>Developers</li> <li>Flintshire County Council</li> <li>Wrexham County Council</li> </ul>	<input type="checkbox"/> None	<input type="checkbox"/> Developer led for new developments
	<input type="checkbox"/> Green roofs	C1 & C2	<ul style="list-style-type: none"> <li>Reduce peak flows and enhance water quality treatment</li> <li>Reduce storm water overloading in combined systems and CSO spillages</li> <li>Mimic predevelopment state of hydraulics and hydrology</li> <li>Can be applied in high density developments</li> <li>Can be retrofitted (reliant on-site specifics)</li> <li>No additional land take</li> </ul>	<ul style="list-style-type: none"> <li>Cost (compared to conventional roof)</li> <li>Not appropriate for steep roofs</li> <li>Opportunities for retrofitting may be limited by roof structure (strength, pitch etc)</li> <li>Maintenance of roof vegetation</li> <li>Limited impact on P removal as they mainly receive unpolluted roof drainage</li> <li>Any subsequent damage to waterproof membrane likely to be more critical since water is encouraged to remain on the roof</li> </ul>	Medium	Medium	<ul style="list-style-type: none"> <li>Developers</li> <li>Flintshire County Council</li> <li>Wrexham County Council</li> <li>Dwr Cymru Welsh Water</li> </ul>	<ul style="list-style-type: none"> <li>Biodiversity</li> <li>Thermal attenuation</li> <li>Climate resilience</li> <li>Water efficiency</li> <li>Noise attenuation</li> <li>Air quality improvements</li> <li>Amenity</li> <li>Visual</li> <li>Increase life span of roofs</li> <li>Health and wellbeing if accessible</li> </ul>	<ul style="list-style-type: none"> <li>Developer led for new developments will help deliver BNG</li> <li>Business Improvement Districts for retrofits</li> </ul>

**Commented [A50]:** How would it be ensured that fencing is maintained for the lifetime of the development?

			<ul style="list-style-type: none"> <li>Can provide a return on investment from energy savings and public use if accessible</li> </ul>						
<b>Swales</b>	<input type="checkbox"/> Shallow, broad and vegetated channels designed to store and/or convey runoff and remove pollutants.	C1	<ul style="list-style-type: none"> <li>Easy to incorporate into landscaping</li> <li>Good removal of urban pollutants</li> <li>Reduces runoff rates and volumes</li> <li>Low capital cost</li> <li>Maintenance can be incorporated into general landscape management</li> <li>Pollution and blockages are visible and easily dealt with</li> </ul>	<ul style="list-style-type: none"> <li>Not suitable for steep areas or areas with roadside parking</li> <li>Limits opportunities to use trees for landscaping</li> <li>Risks of blockages in connecting pipe work</li> </ul>	Medium	Medium	<input type="checkbox"/> Developers	<ul style="list-style-type: none"> <li>Biodiversity</li> <li>Amenity</li> <li>Visually appealing</li> <li>Passive cooling</li> </ul>	<ul style="list-style-type: none"> <li>Living Streets Cymru</li> <li>Active Travel and Safe Routes in Communities (SRIC) schemes</li> </ul>

Intervention	Description	Category	Advantages	Disadvantages	Feasibility (including cost and capacity)	Effectiveness	Delivery Partners	Other benefits	Potential funding opportunities
<b>Conveyance channels</b>	<input type="checkbox"/> Channels and Rills are open surface water channels with hard edges that can be planted with vegetation	C1	<ul style="list-style-type: none"> <li>Effective in water &amp; pollution treatment</li> <li>Can act as pre-treatment to remove silt before water is conveyed into further SuDS features</li> <li>Easy to construct</li> </ul>	<input type="checkbox"/> Incorrect planting can cause silt build up Need to give careful consideration to crossings	Medium	Medium (design dependant)	<ul style="list-style-type: none"> <li>Flintshire County Council</li> <li>Wrexham County Council</li> <li>Local Highways Agencies</li> <li>The Welsh Government</li> </ul>	<ul style="list-style-type: none"> <li>Biodiversity</li> <li>Amenity</li> <li>Visually appealing</li> <li>Passive cooling</li> </ul>	<ul style="list-style-type: none"> <li>Living Streets Cymru</li> <li>Active Travel and Safe Routes in Communities (SRIC) schemes</li> </ul>
<b>Filtration</b>	<input type="checkbox"/> Filter strips which are gently sloping areas of grass including street trees that water flows over, can include geocellular structures	C1	<ul style="list-style-type: none"> <li>Well suited to implementation adjacent to large impervious areas with heavy trafficking</li> <li>Encourages evaporation and can promote infiltration and interception</li> <li>Easy to construct and low construction cost</li> <li>Effective pre-treatment option</li> </ul>	<ul style="list-style-type: none"> <li>Not suitable for steep sites</li> <li>Not suitable for draining hotspot runoff or for locations where risk of groundwater contamination, unless infiltration is prevented</li> <li>No significant attenuation or reduction of extreme event flows</li> </ul>	Medium	Medium	<ul style="list-style-type: none"> <li>National Surface Water Management and SuDS Group</li> <li>Dwr Cymru Welsh Water</li> <li>Wales Green Infrastructure Forum</li> </ul>	<ul style="list-style-type: none"> <li>Biodiversity</li> <li>Amenity</li> <li>Visually appealing</li> <li>Health and wellbeing</li> <li>Can encourage active transport</li> </ul>	<ul style="list-style-type: none"> <li>Living Streets Cymru</li> <li>Active Travel and Safe Routes in Communities (SRIC) schemes</li> </ul>
	<input type="checkbox"/> Bioretention shallow landscaped areas with engineered soils, enhanced vegetation and filtration, which can also include trees	C1	<ul style="list-style-type: none"> <li>Very effective in removing urban pollutants</li> <li>Can reduce volume and rate of runoff</li> <li>Flexible layout to fit into landscape</li> <li>Well-suited for installation in highly impervious areas</li> <li>Good retrofit capability</li> </ul>	<ul style="list-style-type: none"> <li>Requires landscaping and management</li> <li>Susceptible to clogging if surrounding landscape is not managed</li> <li>Not suitable for areas with steep slope</li> </ul>	Medium	High		<ul style="list-style-type: none"> <li>Biodiversity</li> <li>Amenity</li> <li>Visually appealing</li> </ul>	<ul style="list-style-type: none"> <li>Developer led for new developments will help deliver BNG</li> <li>Welsh Water</li> </ul>
<b>Infiltration</b>	<ul style="list-style-type: none"> <li>Rain gardens</li> <li>Infiltration trenches and basins</li> <li>Soakaways</li> </ul>	C1	<ul style="list-style-type: none"> <li>Rain gardens – small and easy to retrofit. minimal land take, easy to maintain, flexible layout to fit into landscape, can be installed in impervious areas if designed correctly</li> <li>Can reduce rate of run off and some volume reduction</li> </ul> <input type="checkbox"/>	<ul style="list-style-type: none"> <li>Rain gardens - As they are often small, their impact can be limited</li> <li>Requires landscaping and management</li> <li>Susceptible to clogging if surrounding landscape is not managed</li> <li>Not suitable for areas with steep slopes or impermeable soils</li> </ul>	Medium	Medium	<ul style="list-style-type: none"> <li>Developers</li> <li>Flintshire County Council</li> </ul>	<ul style="list-style-type: none"> <li>Biodiversity</li> <li>Amenity</li> <li>Visually appealing</li> </ul>	<input type="checkbox"/> Developer led for new developments will help deliver BNG

<b>Retention</b>	<input type="checkbox"/> Retention ponds	C1	<ul style="list-style-type: none"> <li>• Can cater for all storms</li> <li>• Good removal capability of urban pollutants</li> <li>• Can be used where groundwater is vulnerable, if lined</li> </ul>	<ul style="list-style-type: none"> <li>• No reduction in runoff volume</li> <li>• Anaerobic conditions can occur without regular inflow</li> <li>• Land take may limit use in high density sites</li> <li>• May not be suitable for steep sites, due to requirement for high embankments</li> <li>• Colonisation by invasive species could increase maintenance</li> <li>• Perceived health &amp; safety risks may result in fencing and isolation of the pond</li> </ul>	Medium	High	<ul style="list-style-type: none"> <li>• Wrexham County Council</li> <li>• Local Highways Agencies</li> <li>• The Welsh Government</li> <li>• National Surface Water Management and SuDS Group</li> <li>• Dwr Cymru Welsh Water</li> </ul>	<ul style="list-style-type: none"> <li>• Biodiversity</li> <li>• Thermal attenuation</li> <li>• Climate resilience</li> <li>• Amenity</li> <li>• Visually appealing</li> <li>• Recreation</li> </ul>	<input type="checkbox"/> Developer led for new developments will help deliver BNG
<b>Detention</b>	<input type="checkbox"/> Detention basins, shallow vegetated areas which retain water at times	C1	<ul style="list-style-type: none"> <li>• Can cater for a wide range of rainfall events</li> <li>• Can be used where groundwater is vulnerable, if lined.</li> <li>• Simple to design and construct</li> <li>• Potential for dual land use</li> <li>• Easy to maintain</li> <li>• Safe and visible capture of accidental spillages.</li> </ul>	<input type="checkbox"/> Little reduction in runoff volume Detention depths may be constrained by system inlet and outlet levels	Medium	Medium	<ul style="list-style-type: none"> <li>• Wales Green Infrastructure Forum</li> </ul>	<ul style="list-style-type: none"> <li>• Biodiversity</li> <li>• Amenity</li> <li>• Visually appealing</li> <li>• Health and wellbeing can double up as play and recreation areas</li> </ul>	<input type="checkbox"/> Developer led for new developments will help deliver BNG
<b>Constructed Wetlands</b>	<input type="checkbox"/> Wetland Creation designed and maintained specifically for maximising P reduction from both storm and foul water discharges.	C1 & C2	<ul style="list-style-type: none"> <li>• Good removal capability for pollutants</li> <li>• Can trap large volumes of sediments</li> <li>• If lined, can be used where groundwater is vulnerable</li> <li>• Large wider environmental benefits</li> </ul>	<ul style="list-style-type: none"> <li>• Land take is high</li> <li>• Requires maintaining sufficient baseflows in dry periods</li> <li>• Limited depth range for flow attenuation</li> <li>• May release nutrients during non-growing season, which must be mitigated by good design and maintenance</li> <li>• Little reduction in runoff volume</li> <li>• Less effective for steep sites and will require significant earthworks</li> <li>• Colonisation by invasive species could increase maintenance</li> </ul>	Medium	High	<ul style="list-style-type: none"> <li>• Developers</li> <li>• Flintshire County Council</li> <li>• Wrexham County Council</li> <li>• Welsh Rivers Trust</li> <li>• Dwr Cymru Welsh Water</li> <li>• Dee Life</li> <li>• Welsh Dee Trust</li> </ul>	<ul style="list-style-type: none"> <li>• Biodiversity</li> <li>• Thermal attenuation</li> <li>• Climate resilience</li> <li>• Amenity</li> <li>• Visually appealing</li> <li>• Recreation</li> </ul>	<ul style="list-style-type: none"> <li>• Developer led for new developments will help deliver BNG</li> <li>• Welsh Water</li> <li>• Welsh Government</li> <li>• Heritage Lottery Fund</li> </ul>
<b>Intervention</b>	<b>Description</b>	<b>Category</b>	<b>Advantages</b>	<b>Disadvantages</b>	<b>Feasibility (including cost and capacity)</b>	<b>Effectiveness</b>	<b>Delivery Partners</b>	<b>Other benefits</b>	<b>Potential funding opportunities</b>
	<input type="checkbox"/> Can provide for tertiary treatment after effective primary and secondary foul treatment processes			<ul style="list-style-type: none"> <li>• Performance vulnerable to high sediment inflows.</li> <li>• P will be bound in sludge which may require disposal and will require extra pre-treatment with solar drying and well managed biosolid spreading to satisfy crop need</li> </ul>			<ul style="list-style-type: none"> <li>• NFU Cymru</li> <li>• Local Nature Partnership for North East Wales</li> <li>• United Utilities</li> </ul>		
<b>Integrated Buffer Zones and/or Tree Planting</b>	<ul style="list-style-type: none"> <li>• Grassland including floodplain grassland</li> <li>• Beetle banks</li> <li>• Woodland</li> <li>• Hedgerows</li> </ul>	C1 & C2	<ul style="list-style-type: none"> <li>• Good capability for capture of pollutants</li> <li>• Large wider environmental benefits</li> </ul>	<input type="checkbox"/> Reduced productive area under agriculture May release nutrients during non-growing season	Medium	High	<ul style="list-style-type: none"> <li>• Developers</li> <li>• Flintshire County Council</li> <li>• Wrexham County Council</li> <li>• Welsh Rivers Trust</li> <li>• Welsh Dee Trust</li> <li>• Dwr Cymru Welsh Water</li> <li>• Dee Life</li> <li>• NFU Cymru</li> <li>• Cities for Trees</li> <li>• Local Nature Partnership for North East Wales</li> <li>• United Utilities</li> <li>• Salmon and Trout Conservation'</li> </ul>	<ul style="list-style-type: none"> <li>• Biodiversity</li> <li>• Climate resilience</li> <li>• Air quality</li> <li>• Health and Wellbeing</li> <li>• Educational</li> <li>• Pest control</li> <li>• Biodiversity</li> <li>• Noise attenuation</li> <li>• Air quality</li> <li>• Amenity</li> <li>• Visual</li> <li>• Health and wellbeing</li> </ul>	<ul style="list-style-type: none"> <li>• Developer led for new developments will help deliver BNG</li> <li>• Section 106</li> <li>• Welsh Water</li> <li>• Welsh Government</li> <li>• Welsh Dee Trust</li> <li>• Glastir Small Grant Scheme</li> <li>• Heritage Lottery Fund <input type="checkbox"/></li> <li>• Wrexham Tree and Woodland Strategy</li> <li>• Scottish Power</li> <li>• United Utilities</li> <li>• British Gas</li> </ul>

\*water attenuation is an assumed benefit, water quality improvement is the qualified benefit, additional benefits are also noted

#### 4.4 Category 1 measures (to demonstrate compliance for plan HRA)

- 4.4.1 Section 1.3.3 stated that the main objective of Category 1 measures is to facilitate the delivery of new development within Flintshire and Wrexham and to avoid adverse effects to the River Dee and Bala Lake SAC from the planned LDP growth. This section explores the extent and opportunities for Phosphate reduction interventions by drawing upon the potential local solutions with respect to the P budget offsetting associated with new development, by building on the information presented in the previous sections.
- 4.4.2 The main purpose of this section is to illustrate that there are several potential Category 1 measures, which could be implemented in principle within Flintshire and Wrexham, to mitigate the surplus P budget scenarios presented in Section 4.3 from all emerging LDP residential growth. This section outlines the potential options and demonstrates that there is currently an excess of opportunities that allows for flexibility in delivery.
- 4.4.3 Based on a high-level desktop analysis, this section aims to:
- quantify the likely magnitude of effective potential intervention measures to satisfy the worst-case P budget as well as best-case P budget, to demonstrate confidence in deliverability;
  - identify potential preliminary location opportunities; and
  - identify the key delivery partners and their roles and responsibilities for the implementation and maintenance of the identified Category 1 measures.
- 4.4.4 These are not yet confirmed but potential interventions and programmes will be evolved as this strategy is updated in tandem with the progression of Councils' LDPs, once formally adopted. The delivery of preferred Category 1 measures will also be addressed by a subsequent action plan that will be prepared by the Councils, in consultation with the proposed Nutrient Management Board.
- 4.4.5 As explained in Section 4.3, the estimated P budgets for all scenarios include a 20% safety buffer in the assessment, which will provide the necessary certainty required to demonstrate the HRA compliance and conclude no adverse impact on the SAC integrity, due to extra P loading from the emerging LDP growth.
- 4.4.6 The proposed developments should be generally designed and constructed in a way to minimise their P (and all other potential pollutants) loading to the sewerage system, existing watercourses and ultimately the SAC catchment. To achieve this, it is fundamental to follow the waste hierarchy for foul water management and SuDS train decision hierarchy for surface water management as a key principle. This should include creating water efficient developments, minimising infiltration and surface water flow inputs into foul and combined surface water systems and integrating effective source control (pollution prevention and volume control) measures, in line with source-pathway-receptor model.
- 4.4.7 The potential Category 1 interventions are summarised in Table 4.6 in Section 4.3 before, and it is important that the selected Category 1 interventions do not 'use up' or compromise measures required to restore and maintain the SAC in a favourable condition.
- 4.4.8 The specific Category 1 measures that have been explored are discussed below according to the following groups:
- Enhanced WWTWs and Wetlands;

- SuDS and woodlands; and
- Surface water separation.

#### *Enhanced Wastewater Treatment Works and Wetlands*

- 4.4.9 The estimated surplus phosphorus resulting from extra WwTW discharges (as presented in Table 4.4) requires specific interventions to intercept and reduce P to avoid adverse effects on the River Dee. Enhancements to the existing WwTWs and construction of new wetlands to provide further tertiary treatment are considered as potential Category 1 measures to ensure sufficient P removal from WwTW discharge. Construction of additional strategically located and well-designed wetlands to remove P from agricultural land can also be considered as a potential Category 1 measure. However, this will not form a part of the regulated WwTW system and will require separate clear maintenance arrangements (either by Welsh Water or Councils) in perpetuity are in place to ensure their long-term efficacy.
- 4.4.10 NRW is also likely to have a regulatory role in implementation of these Category 1 measures. Therefore, proposals would need to be assessed on a technical level as well as policy and legal perspective.
- 4.4.11 Table 4.7 below shows the area of new offline wetlands required to reduce the *estimated* surplus phosphorus for the following two options:
- Option 1: Discharging at maximum current P consent limit of 1 mg/l confirmed by Welsh Water (see Table 3.3) - this may be mainly done with minimal WwTW upgrades at most locations
  - Option 2: Maintaining current P performance provided by Welsh Water (see Table 3.3) – this may be done with extra chemical dosing and WwTW upgrades to provide enhanced treatment for the additional loading
- 4.4.12 The median phosphorus removal rate from a proposed wetland is 1.2g m<sup>-2</sup> year<sup>-1</sup>, as highlighted in the P effectiveness measures<sup>77</sup>, section 3.3.32. Wetland performance and design guidance also available from:
- Natural England's Stodmarsh Lake Nutrient Neutrality Guidance  
<https://www.ashford.gov.uk/media/13dgnfyu/stodmarsh-nutrient-neutral-methodologynovember-2020.pdf>
  - Wildfowl and Wetlands Trust's Constructed Farm Wetlands Guide  
[https://www.wwt.org.uk/uploads/documents/1429707026\\_WWTConstructedFarmWetlands150422.pdf](https://www.wwt.org.uk/uploads/documents/1429707026_WWTConstructedFarmWetlands150422.pdf)
  - And Northern Ireland Environment Agency's and Scottish Environment Protection Agency's Constructed Farm Wetlands Design Manual for Scotland and Northern Ireland  
<https://www.sepa.org.uk/media/131412/constructed-farm-wetlands-manual.pdf>

<sup>77</sup> Welsh Government (2018). [How effective are created or restored freshwater wetlands for nitrogen and phosphorus removal? A systematic review | Environmental Evidence | Full Text \(biomedcentral.com\)](https://www.welsh.gov.uk/~/media/13dgnfyu/stodmarsh-nutrient-neutral-methodologynovember-2020.pdf)

4.4.13 The above information sources suggest that a median P removal rate of  $1.2\text{g m}^{-2}\text{ year}^{-1}$  (in conjunction with the extra 20% safety buffer applied in nutrient budgets assessment as explained in para 4.3.2 and 4.4.5) is justifiable for the suitably designed and managed

constructed wetlands to inform the LDP HRA and preliminary stages of this DCPRS preparation. However, different bespoke values (whether higher or lower) can be used as needed for project level HRAs and subsequent design stages of these wetlands using site specific surveys and data (e.g., soils, land use, hydrology and geomorphology). The opportunity to exceed wetland median P removal rate is also encouraged by good design and maintenance.

4.4.14 The sludge and silt disposal from these wetlands will also require careful management to avoid reintroducing any accumulated P to the wider catchment. Potential measures to address this may include:

- additional pre-treatment (e.g. solar drying)
- spreading biosolids in the agricultural fields to meet the actual crop need (in consultation with NRW, Welsh Water and local farmers)
- incorporation of further downstream **Category 2 measures** (e.g. integrated buffer zones, channel belts, hedgerows)

**Commented [A51]:** Cat 2 measures wouldn't be implemented to allow Cat 1 measures to succeed; should this read 'Cat 1 measures' ?

**Table 4.7 New wetlands area requirement - with existing P permit maximum values and maintaining current P performance at WwTWs**

LPA	WwTW	OPTION 1: Discharging at maximum current P consent limit at WwTWs			OPTION 2: Maintaining current P performance at WwTWs		
		Both Land Use and WwTW discharge impacts considered		Only WwTW discharge considered	Both Land Use and WwTW discharge impacts considered		Only WwTW discharge considered
		Mid P Value Wetland Area (ha)	High P Value Wetland Area (ha)	Indicative Wetland Area (ha)	Mid P Value Wetland Area (ha)	High P Value Wetland Area (ha)	Indicative Wetland Area (ha)
Flintshire	Buckley	3.60	3.47	3.51	1.84	1.71	1.76
	Mold	5.27	4.83	5.11	2.72	2.28	2.55
	Hope	2.53	2.33	2.48	1.29	1.09	1.24
Wrexham	Five Fords	34.8	31.82	35.49	17.05	14.07	17.74
	Gresford	5.75	5.47	5.80	4.59	4.31	4.64
	Cefn Mawr	1.21	1.21	1.23	0.84	0.84	0.86
	Holt	N/A	N/A	N/A	12.54 (can be reduced to 0.82 with P stripping of 1mg/l)	12.54 (can be reduced to 0.82 with P stripping of 1mg/l)	12.41 (can be reduced to 0.69 with P stripping of 1mg/l)
	Overton	N/A	N/A	N/A	13.28 (can be reduced to 0.89 with P stripping of 1mg/l)	13.28 (can be reduced to 0.89 with P stripping of 1mg/l)	13.14 (can be reduced to 0.75 with P stripping of 1mg/l)

Penley	N/A	N/A	N/A	9.21 (can be reduced to 0.60 with P stripping of 1mg/l)	9.21 (can be reduced to 0.60 with P stripping of 1mg/l)	9.13 (can be reduced to 0.52 with P stripping of 1mg/l)
Lavister	1.64	1.55	1.67	0.81	0.71	0.84

\*The sites highlighted in yellow currently do not have phosphorus stripping capability.

\*\* The values in red and green show the largest and smallest wetland area requirement respectively under each option for the sensitivity checking purposes

4.4.15 The maximum indicative total wetland area requirement (using red values in Table 4.7) within each LPA for each option would be as follows:

- Flintshire: Option 1 - 11.4 ha, Option 2 - 5.85 ha
- Wrexham: Option 1 – 79.22 ha\*\*\*, Option 2- 59.11 ha

\*\*\*includes 35.03 ha of wetlands associated under Option 2 with Holt, Overton & Penley WwTWs assuming P stripping of 1 mg/l is not viable

4.4.16 Table 4.7 above indicates that Option 2 would reduce the new wetland area requirement by approximately 50% (at Buckley, Mold, Hope, Five Fords and Lavister WwTWs) when compared with Option 1; Also, by 20%-30% (at Gresford and Cefn Mawr WwTWs) where a P consent of 1mg/l is currently in place. These WwTWs have sufficient treatment capacity and DWF volume headroom in the existing discharge consent. Therefore, increased chemical dosing and minor upgrading of WwTWs to maintain the current P performance (in conjunction with new wetlands) is recommended as effective Category 1 measures in the short to medium term, to deliver the emerging LDP growth. However, the feasibility of chemical dosing may not be applicable at each WwTW and/or in the long term and alternative options should be explored with DCWW.

4.4.17 As mentioned before, Option 2 can only be certain, if existing WwTW discharge permits are reduced to the current P performance values shown in Table 3.3 and this is yet to be discussed and agreed with Welsh Water and NRW. Therefore, the worst-case Option 1 has been first used to identify potential wetlands provision within each LPA, and if this is not viable in certain locations (e.g., Five Fords) then Option 2 will be explored. Similarly, possibility of P stripping at Holt, Overton & Penley WwTWs is yet to be discussed with Welsh Water. Therefore, the worst-case wetland provision has been first used to identify potential wetland locations. Further discussion on potential wetland areas is given towards the end of this section.

4.4.18 These Category 1 measures could be delivered by DCWW (subject to extra developer and OFWAT funds being made available). Wetlands on third party land that deliver P reduction may be delivered by LPAs or developers, in collaboration with DCWW, who would ultimately retain operational responsibility for all regulated works associated with the impacted WwTW site. As mentioned above, LPAs should undertake further discussion with DCWW, developers

and NRW to confirm the preferred option (including funding and maintenance needs) for each WwTW catchment.

- 4.4.19 Holt, Overton and Penley WwTWs currently do not have a P consent or sufficient P stripping capability. This also means large wetland areas (12ha to 18ha/per WwTW catchment) would be required under Option 2 for these locations to offset P loading, although the new growth is relatively small (60 to 90 new houses/per WwTW catchment). These WwTWs have sufficient DWF volume headroom in the existing discharge permit - see Table 3.3, which shows that observed DWF is significantly below the consented DWF limit. Therefore, introducing a new P consent of 1mg/l and upgrading these smaller WwTWs (in conjunction with new wetlands) are likely to be the most effective Category 1 measures at these locations, in the short to medium term if this is viable, following further discussion with DCWW.
- 4.4.20 Again, these Category 1 measures could be delivered by Welsh Water (subject to further discussions and extra developer and OFWAT funds plus sufficient land to add extra treatment process streams are being made available). However, wetlands on third party land that mainly treat agricultural storm runoff would be more likely to be delivered by Councils and developers, rather than Welsh Water.
- 4.4.21 Another short-term Category 1 measure (e.g., until the necessary major Category 1 upgrades are in place at Holt, Overton and Penley WwTWs) would be Wrexham County Borough Council to avoid or limit granting any windfall planning approvals within these catchments. This is because the windfall estimates currently included at each of these WwTW locations make > 50% of their currently estimated emerging new growth.
- 4.4.22 Table 4.8 below shows the area of new wetlands required to offset the estimated TP values in Table 4.5, which applies a tighter BATNEEC P Consent of 0.30mg/l for all WwTWs as Option 3. This can reduce the new wetland area requirement by approximately 70% at WwTWs that currently have a P discharge consent when compared to Option 1 in Table 4.7. Similarly, new wetland area can be reduced by 98% to 99% at Holt, Overton and Penley WwTW catchments when compared to Option 2 in Table 4.7.
- 4.4.23 Therefore, Option 3 contains effective Category 1 measures at all WwTW locations, in the medium to long term, allowing sufficient time for Welsh Water and Councils to secure funds, implement and maintain the necessary upgrade works, in line with the LDP timeframes up to 2030. This falls within AMP7 (2020-2025) and AMP8 (2025-2030), and therefore it could be possible to implement BATNEEC measures at some key WwTW locations (e.g. Five Fords) in AMP 8 period if this is not feasible in AMP7.

**Commented [A52]:** Is it accurate to describe an avoidance measure as a Cat 1 measure

**Table 4.8 New constructed wetlands area requirement - with Tighter BATNEEC P Consent (0.30mg/l) for all WwTWs**

LPA	WwTW	OPTION 3: Applying BATNEEC P consent at WwTWs	
		Both Land Use and WwTW discharge impacts considered	Only WwTW discharge considered

		Mid P Value Wetland Area (ha)	High P Value Wetland Area (ha)	Wetland Area (ha)
Flintshire	Buckley	1.14	1.01	1.05
	Mold	1.7	1.25	1.53
	Hope	0.8	0.59	0.74
Wrexham	Five Fords	9.96	6.98	10.65
	Gresford	1.69	1.41	1.74
	Cefn Mawr	0.35	0.35	0.37
	Holt	0.34	0.34	0.21
	Overton	0.37	0.37	0.22
LPA	WwTW	<b>OPTION 3: Applying BATNEEC P consent at WwTWs</b>		
		<b>Both Land Use and WwTW discharge impacts considered</b>		<b>Only WwTW discharge considered</b>
		Mid P Value Wetland Area (ha)	High P Value Wetland Area (ha)	Wetland Area (ha)
	Penley	0.24	0.24	0.16
	Lavister	0.47	0.38	0.5

\*The sites highlighted in yellow currently do not have phosphorus stripping capability.

\*\* The values in red and green show the largest and smallest wetland area requirement respectively for the sensitivity checking purposes

4.4.24 Figures C.1 to C.4 in Appendix C show potential preliminary example locations for illustrative purposes only at this early stage of DCPRS preparation. These preliminary wetland locations will need further investigation to confirm their suitability and deliverability. Similarly, there would be suitable alternative areas, which are yet to be identified.

4.4.25 The currently shown illustrative locations in Figures C.1 to C.4 would aim to satisfy the maximum wetland requirements associated with worst-case Option 1 to deliver the residential growth in the Flintshire LDP (2021- 2030) and Wrexham LDP (2021-2028) within the impacted Dee Freshwater SAC catchment. However, sufficient land is not always available adjacent to some WwTW sites (e.g. Five Fords) to fully offset the required P budget under Option 1 or Option 2. In such situations, Category 1 wetlands could be provided

further downstream at strategic locations (potentially integrated with other Category 1 and Category 2 measures such as woodlands/integrated buffer zones/hedgerows) to offset the equivalent P budget from agricultural runoff on suitable land owned by the Council for the purpose of mitigation measures (subject to incorporating necessary legal agreements for maintenance in perpetuity), to facilitate the development as well as maximise wider environmental benefits.

- 4.4.26 In summary, all these preliminary wetland locations shown in these figures would be subject to determine their technical feasibility, viability, deliverability and longevity, including maintenance, ownerships and replacement, if applicable. No detailed discussions have taken place with DCWW ~~or~~ the relevant landowners. However, considering the land constraints associated with suitable wetland provision for Option 1, Option 2 or Option 3 is likely to provide a more deliverable and practical solution for Five Fords, but for other WwTW locations all three options could be potentially explored with DCWW, NRW, LPAs and developers. In general, most likely wetland options to take forward to deliver emerging LDP growth would be a combination of Option 1 and Option 2 (in the short to medium term) and Option 3 (in the medium to long term). In terms of maintaining these Category 1 measures in perpetuity the two main parties involved would be Welsh Water and Councils. As discussed in the Section 4.5, Category 2 measures can also supplement Category 1 to maximise the wider catchment benefits and improve the condition of SAC.

Commented [A53]: Subject to what?

#### *SuDS and Woodlands*

- 4.4.27 Approaches to manage surface water that take account of water quantity (flooding), water quality (pollution), biodiversity (wildlife and plants), and amenity are collectively referred to as Sustainable Drainage Systems (SuDS). More information on SuDS can be found from Susdrain (<https://www.susdrain.org/>)
- 4.4.28 Section 3.2.30 highlighted that SuDS and woodland planting can also effectively remove P from storm runoff. However, one current limitation is that there is relatively limited largescale long-term monitoring to accurately quantify their P reduction values – for example, in terms of kg/ha/year or g/ha/year as per the wetlands.
- 4.4.29 To investigate this further, the potential reduction of P loading and wetland area requirement by providing effectively designed SuDS and woodlands within the proposed development sites has been tested for Mold and Five Fords WwTW catchments.
- 4.4.30 The methodology adopted and outcome of this preliminary test is described below.
- 4.4.31 Section 3.3.32 reported P removal efficiency can vary for different SuDS measures. For example, by 20% for swales, 46% for wetlands and up to 85% for bioretention and filtration SuDS). Therefore, it was assumed that the proposed SuDS can deliver an average of 50% P removal from the estimated total from the proposed land use P load due to storm runoff from urban areas (0.83 kg/ha/year) and PoS (0.14 kg/ha/year).
- 4.4.32 An average P leachate rate of 0.02 kg/ha/yr has been assumed for the proposed seminatural native woodland planting as per Table 4.3. Approximately 10% of the total PoS in the development sites was assumed as being woodland planting.
- 4.4.33 Table 4.9 below summarises the estimated total P load and associated reduced wetland area requirement, for Option 1 and Option 2 at these two WwTW catchments for the following scenarios:

Commented [A54]: % error could be included

- without the additional P removal impact of assumed SuDS and woodland Category 1 onsite measures
- with the additional P removal impact of assumed SuDS and woodland Category 1 onsite measures

4.4.34 The % reduction in P load and wetland area requirement is also shown in italics/brackets for both Option 1 and Option 2.

4.4.35 In these test calculations, the High P value for the relevant existing land use categories shown in Table 4.3 have been used.

**Table 4.9 New wetlands area requirement - SuDS and woodland planting Test**

LPA	WwTW	OPTION 1: Discharging at maximum current P consent limit at WwTWs				OPTION 2: Maintaining current P performance at WwTWs			
		Without SuDS and Woodlands		With SuDS and Woodlands		Without SuDS and Woodlands		With SuDS and Woodlands	
		P Load (kg/yr)	Wetland Area (ha)	P Load (kg/yr)	Wetland Area (ha)	P Load (kg/yr)	Wetland Area (ha)	P Load (kg/yr)	Wetland Area (ha)
Flintshire	Mold	57.96	4.83	49.68 <i>(14%)</i>	4.14 <i>(14%)</i>	27.31	2.28	19.04 <i>(30%)</i>	1.59 <i>(30%)</i>
Wrexham	Five Fords	381.82	31.82	289.76 <i>(24%)</i>	24.15 <i>(24%)</i>	168.9	14.07	76.83 <i>(55%)</i>	6.40 <i>(55%)</i>

4.4.36 In summary, the above test results show that incorporation of effectively designed SuDS measures and woodland planting is also a good Category 1 measure, which can further reduce the new offsite wetland area requirement to offset the surplus P loading arising from the WwTW discharge with Option 1, Option 2, and Option 3, improving their viability and deliverability. They also promote the SuDS source control and treatment hierarchy, and source-pathway-receptor model principles through integrated site designs, driving overall sustainability and place making. The delivery of these onsite Category 1 measures will primarily rest with the developers and their maintenance in perpetuity will rest with the Councils and DCWW. The delivery mechanism may be in the form of commuted sums from developers and maintenance funding from DCWW.

### *Surface Water Separation*

- 4.4.37 Surface water inputs to combined sewer systems can cause sewer flooding and pollute existing watercourses with dilute untreated storm sewage from Combined Sewer Overflow (CSO) spills, during moderate to heavy rainfall events. They also put extra pressure on the WwTWs as surface water runoff goes through the same treatment process as the foul water. This uses up capacity to treat foul water and causes variability in sewage concentrations that can affect treatment performance.
- 4.4.38 The removal of surface water from the existing developments into combined sewer systems can help removing P load and pollution in the watercourses and ultimately the River Dee by ensuring more foul flows receive full treatment and reducing the amount of dilute untreated sewage being discharge via CSOs. It will also drive efficiency and provide extra capacity at the WwTWs.
- 4.4.39 Dilute untreated sewage from CSOs can be very damaging in urban watercourses, but the quantification of CSO spills and estimating P load is difficult and will often require suitable hydraulic network modelling, monitoring and calibration by Welsh Water.
- 4.4.40 Surface water removal schemes estimate reductions of pollution due to new development by reducing the overall flow through the WwTWs (including a suitable betterment factor as a safety buffer). For example, the compensatory surface water removal scheme that is already in place for the Carmarthen Bay and Estuaries European Marine site (see Section 3.2.29) takes this approach to estimate the water credits. Therefore, a similar model can be adopted in the Dee Freshwater Catchment by Welsh Water, NRW and Councils where existing properties are connected to the combined sewer systems. The estimated water credits (litres/second) gained by completely removing the surface water flows from the public sewers can be then used to allow the foul flows from the equivalent number of new properties to the WwTW, which will ensure that there is no detriment in P loading to the rivers. DCWW should confirm that the Flow to Full Treatment (FFT) at WwTW is reduced and the P loading is reduced proportionally (linear). SuDS must also be used to dispose the separated surface water.
- 4.4.41 Removal of surface water contribution allows more hydraulic headroom at the WwTW and reduces the number of untreated spills to the watercourse via CSOs in wet conditions. However, there needs to be headroom in the Dry Weather Flow (DWF) permit to be able to increase the foul flow element. If this is exceeded, tighter discharge permits will need to be imposed.
- 4.4.42 In summary, surface water separation can be a useful short to medium term Category 1 measure (i.e., in conjunction with the other Category 1 measures described above) if a suitable scheme can be implemented to progressively removing surface water inputs from existing properties and connecting the equivalent foul flows from the new properties, while incorporating suitable SuDS measures to treat the separated storm water. This can be done when new planning applications come on brownfield sites as well as encouraging existing property and business owners by offering suitable incentives to do so.

#### 4.5 Category 2 measures (to deliver overall reductions in phosphorus)

4.5.1 Category 2 measures are aimed at the delivery of wider reductions in P to meet NRW Phosphorus targets for the SAC. Some of the P reduction interventions proposed can be both Category 1 and Category 2 measures. For example, a constructed wetland can be specifically designed to enhance tertiary treatment at a WwTW or a particular SuDS scheme encouraging source control can remove P from new developments prior to entering a watercourse thus reducing the overall P loading, or interventions can be strategically located to reduce P from wider existing problem areas. The responsibility for identifying and securing the delivery of Category 2 measures, which have been discussed in this section, rests with a number of bodies who have the ability to secure funding, along with their statutory duties to meet their targets outlined in the sections below. The overarching responsibility for delivering Category 1 measures will rest with the Councils, in collaboration with key stakeholders (e.g., DCWW and developers) as already discussed in Section 4.4.

4.5.2 The overarching role of the anticipated Nutrient Management Board, supported by a Stakeholder Group and a Technical Officers Group would be to ensure that these opportunities are directed towards those strategic opportunity areas presented within this evolving strategy and to support and manage implementation. Using the information presented within this Strategy, the proposed Dee Catchment Phosphorus Reduction Action Plan (DCPRAP) would

be developed so that it would set out specific targets (actions, numbers and sizes of interventions proposed and dates for implementation) roles and responsibilities.

4.5.3 Table 4.6 provides a list of potential interventions, including their advantages, disadvantages, delivery partners and funders. The following sections provide greater detail as to the existing funding and opportunities that can be applied to the River Dee SAC and present the potential risks to delivery and mitigation measures.

4.5.4 As previously presented in Section 3, around 80 per cent of Welsh land is managed for farming in some way and for the River Dee, the Reasons for Not Achieving Good Status are largely due to agriculture, rural land management and WwTW. For WwTW, this is largely due to their inability to completely remove P from effluent before discharging into the surrounding waterbodies. Dŵr Cymru Welsh Water (DCWW) is currently undertaking source apportionment modelling in the Dee catchment - the results should be available at the end of 2021.

4.5.5 In summary the major wider P contributing issues come from:

- Wastewater Treatment Works
- Combined sewer overflows
- Spreading of manures to land
- Inorganic (nitrate and phosphate) fertiliser application
- Soil compaction (increasing run-off )
- Runoff from road verges, hard standings, field entrances, eroding arable topsoils
- Soil denitrification

**Commented [A55]:** Are the 'opportunities' the same as the Measures?

**Commented [A56]:** Need to explain what these are

- Pesticide spraying
- Livestock waste storage and management
- Erosion and poaching by livestock
- Faecal pollution
- Soil erosion (carrying soil and other biosolids into adjacent water courses)
- Effluent discharges from private wastewater treatment systems

4.5.6 Of the interventions presented in Table 4.6, and described in Section 3, the following are viable Category 2 measures according to their effectiveness broadly – i.e., from ‘most effective and evidenced’ to ‘least effective and evidenced’. It should be noted that some of these measures are also Category 1 measures.

- Reduction of Agricultural P at source and Farming Source Control
- Enhanced Wastewater Treatment Works
- Wetlands
- Improved P uptake through tree planting
- Surface Water Separation (including SuDS Source Control)
- Integrated Buffer Zones

4.5.7 The role, efficacy and available guidance on wetlands have already been discussed in Section 4.4 (under C1 measures) and therefore not repeated here. As highlighted before, wetlands can also be used as C2 measures to remove P from agricultural runoff and existing development areas across the catchment where good opportunities exist, and effective designs and maintenance regimes can be delivered.

4.5.8 All members of the Nutrient Management Board, Stakeholder Group and the Technical Officers [Group](#) will have a role in delivering a range of existing schemes, policies, and guidance that can be used to support the objectives of this strategy. Some of these opportunities include funding within their direct control. The organisations presented below are the ones with regulatory powers, available funding, existing P reduction programmes and experienced members that could best support the objectives of the strategy as NMB members and delivery partners.

#### **Dŵr Cymru Welsh Water (DCWW)**

4.5.9 DCWW Category 1 measures are described in Section 4.4. While the LPAs can work with water companies to augment current WwTWs to increase P reduction and support new development as a Category 1 measure, additional improvements to existing WwTWs across the River Dee catchment can be made to further remove P and improve the overall condition of the SAC. Monitoring of these improvements would deliver confidence in their effectiveness. For those WwTWs for which funding is not currently allocated, this is a

measure unlikely to be resolved until the end of the current AMP cycle, post 2025. However, the AMP7 (2020 – 2025) proposals have been defined by investigations on inland waters that are failing European Union Water Framework Directive (WFD) requirements and the AMP7 quality programme will make significant headway on improving the performance of wastewater assets, in line with Welsh Water 2050 vision. Positioning for AMP8 funding will commence in 2023, this strategy should be used to support the business case for investing in the Dee, with current and future funds demonstrating feasibility with the large number of experienced delivery partners.

4.5.10 Much of DCWW's AMP7 wastewater investment programme is driven by the **National Environment Programme** set out by NRW (and the equivalent WINEP defined by the EA). Key components of the AMP 7 £288 million programme include increasing the 'flow receiving full treatment' at five sites and upgrading storm tanks at 13 WwTWs, detailed locational information not yet known.

4.5.11 There is also a suite of dedicated **AMP7 capital expenditure** items which contribute to the delivery of each of the relevant Strategic Responses funding resources set aside to target environmental water quality improvements such as:

- **£6m** for Supporting ecosystems and biodiversity - Investigations and schemes to reduce impact on watercourses.
- **£56m** Using nature to reduce flood risk and pollution, removing 22,000 roof equivalents of surface water from the existing sewerage system through RainScape. (AMP6, AMP7, AMP8 and beyond), RainScape has already successfully delivered SuDS schemes in Cardiff, Newport and Llanelli and is a template upon which Welsh Water could target other urban and peri-urban areas. RainScape is one of the projects delivered by the
- **Storm Overflow Assessment Framework (SOAF)** that seeks to prevent the number and duration of CSOs storm overflows using innovative and sustainable green infrastructure led SuDS approach. This meets the Welsh Government policies set out in its statutory Natural Resources Policy under Section 9 of the Environment (Wales) Act 2016. This is a risk-based approach where CSOs are categorised according to overflows environmental impact, public visibility and spill frequency and those of either high or medium significance under the criteria, require event duration monitoring (EDM). There is a 5 stage assessment process:
  - Stage 1: overflows will be identified for investigation based on spill frequency triggers;
  - Stage 2: where hydraulic capacity is identified as the cause of trigger exceedance during the first stage of the investigation, the level of environmental impact will be quantified;
  - Stage 3: improvement options are assessed including analysis of the costs and benefits;
  - Stage 4: a decision is made based on the cost benefit results;
  - Stage 5: delivery of the most cost beneficial solution (subject to appropriate funding and prioritisation) to reduce environmental impact and/or reduce the frequency of discharges.

- **£356m** Clean rivers and beaches- 418km of river improved towards good ecological status, through delivery of National Environment Programme NEP requirements in AMP7.
  - **Making Time for Nature 2020**<sup>78</sup> is DCWW plan for maintaining and enhancing biodiversity in which they commit to using Nature based Solutions to improve Water Quality in rivers.
- 4.5.12 For AMP 8, based on 'traditional', end-of-pipe solutions, the cost of the NEP4, is currently estimated at £350m. However, the aim is to deliver innovative approaches, based on secure science, and the '**Sustainable Management of Natural Resources**' principles which achieve the required outcomes for river water quality, while also maximising wider catchment benefits. The actual level and nature of investment required in AMP8 will depend on the results of the environmental studies and modelling carried out in AMP7, together with the outcome of the SMNR pilots<sup>79</sup>.
- 4.5.13 Welsh Water also have funding schemes in addition to RainScape, WFD Fund, Environment Fund and Watersource Funding<sup>80</sup> to support these solutions. There are numerous successful pilot studies for these funding that could be targeted at strategic areas on the River Dee.
- 4.5.14 For examples the Watersource scheme offers free independent farm advice that includes pollution prevention advice on:
- Identifying risk areas in fields e.g. sinkholes
  - Slurry and Silage Storage
  - Clean/dirty water separation
  - Efficient nutrient use
  - SSAFO (Silage, Slurry and Agricultural Fuel Oil) Compliance
  - Spreading/Timing
  - Reducing costs
- 4.5.15 In addition to providing free advice, Welsh Water also undertake biosolids spreading for which they are accredited under the UK Biosolids Assurance Scheme (BAS) to provide food chain and consumer reassurance that BAS Certified Biosolids can be safely and sustainably recycled to agricultural land. BAS has posted a position statement relating to how BAS will comply with the Water Resources (Control of Agricultural Pollution) (Wales) Regulations 2021 BAS Standard Position Statement.
- 4.5.16 These are considerable funding levels, expertise and evidence that can be applied and targeted via the NMB.

<sup>78</sup> <https://corporate.dwrwymru.com/en/community/environment>

<sup>79</sup> <https://naturalresources.wales/about-us/area-statements/north-west-wales-area-statement/supporting-sustainable-land-management/?lang=en>

<sup>80</sup> <https://corporate.dwrwymru.com/en/community/environment/our-projects>

## Welsh Government

4.5.17 The Welsh Government also have numerous schemes and guidance to reduce the level of nutrients at source including considerable guidance on SuDS design<sup>81</sup>. These measures have considerable potential to reduce impacts at source. The Welsh Government would likely be a key NMB member there are significant opportunities to strategically direct this funding towards P reductions across the Dee.

4.5.18 Welsh Government has dedicated £1.5 million to help farmers improve water quality and £11.5m of capital funding will be used to directly support farm businesses to improve nutrient management infrastructure<sup>82</sup>.

- **The Farm Business Grant (FBG)**<sup>83</sup> – Yard Coverings, is a Capital grant scheme available to farmers in Wales. The minimum application is for £1000 the maximum of £12,000. The aims of the scheme are:
  - To support improvements in on-farm nutrient management
  - To improve existing on-farm infrastructure through the separation of rain/clean water from dirty water, animal slurry, animal manure or silage effluent
  - To support separation of rainwater and slurry from existing livestock feeding areas, livestock gathering areas, manure storage areas, slurry stores and silage stores.
- **The Sustainable Production Grant**<sup>84</sup> - The grant scheme (£12,000 – £50,000) offers 40% funding for covered slurry storage and management equipment.
- **The Woodland Investment Grant (TWIG)**<sup>85</sup> Scheme is open to applications from landowners and those with full management control of land. The scheme provides grants to enhance and expand existing woodlands and create new woodlands in accordance with the UK Forestry Standard, which have the potential to become part of the National Forest in the future. This means woodlands that are well-managed, accessible to people and give local communities the opportunity to get involved.
  - The grant provides 100% funding.
  - The maximum grant award per application is up to £250,000 and the minimum is £10,000.
  - The capital budget for the latest window is £2.5 million, plus revenue budget of £250k.

4.5.19 As the maximum water quality benefits are derived from woodland buffers over 15m this scheme has significant potential to deliver highly functioning Integrated Buffer Zones.

4.5.20 The Welsh government has allocated over £5m to a series of projects across 2020-2021, working with partner organisations to improve water quality across Wales, including:

---

<sup>81</sup> <https://gov.wales/sites/default/files/publications/2019-06/statutory-guidance.pdf>

<sup>82</sup> <https://gov.wales/nearly-ps10m-help-improve-water-quality-wales>

<sup>83</sup> [Farm Business Grant | Sub-topic | GOV.WALES](#)

<sup>84</sup> <https://gov.wales/sustainable-production-grant>

<sup>85</sup> <https://gov.wales/national-forest-wales-woodland-investment-grant-rules-booklet-html>

- **Nature Recovery Action Plan** (£1.115m) –NRW will work with partners including Afonydd Cymru on measures for salmon and trout in Welsh waterways to restore fish habitat and improve breeding distribution;
- **Glastir Small Grant Scheme** (£1.5m) – match funding for a specific grant focusing on improving water quality farms within our strategic catchment area have a good chance of being selected for tree, shrub and hedge planting and pond creation<sup>86</sup>; while the current application window is closed this has been a very successful grant and it is likely that this will reopen or be replaced by another Sustainable Farming Scheme grant.
- **Natural Flood Management Programme** (£1m) – contribution to a dedicated scheme at catchment level combined with water quality improvement measures, to achieve both reduction in flood risk and improving water quality;
- **Research & Development (R&D) Projects** (£1m) – the project will develop effective innovative solutions to minimise the long-term impact of metal mine water discharges, improve the ecological status of Welsh rivers and support a healthy farming industry. This includes innovative projects such as Coleg Sir Gar’s Gelli Aur Sustainable Farming Centre (See box 4.1). Similar, opportunities for undertaking new R&D projects (e.g. monitoring the efficacy of P reduction measures or identifying innovative C1 and C2 delivery approaches) could also be explored.

**Box 4.1: Gelli Aur Sustainable Farming Centre**

The Gelli Aur Sustainable Farming Centre aims to become a knowledge centre for the farming community, developing alternative systems for water and slurry management suitable for on farm use. The project will be led by Coleg Sir Gar in collaboration with NRW, Welsh Water, AHDB, Farming Connect, the farming unions and Power & Water, a Swansea based company specialising in electrochemical-based water treatments. This new project will innovatively reduce farm waste and help safeguard the environment and address the agricultural industry’s impact on the environment by developing a dewatering and purification system to manage slurry on farms. With the intensification of the dairy industry, slurry management is becoming an increasing issue for farmers and the environment.

The project will apply innovative and proven concept technology to reduce air and water pollution to reduce the overall volume of slurry by up to 80%. A de-watering and purification system is used to filter slurry, transforming the water to a suitable quality for recycling or discharging to a clean watercourse. The system will also utilise nutrients from the slurry to produce good quality fertiliser. The aim is to significantly reduce the risk of air and water pollution at the same time as maximising the recycling nutrient value. This development process will considerably reduce storage of slurry on farms as well as handling costs. Efficiently extracting nutrients from manures could save on the cost of commercial fertilisers and reduce serious environmental impact.

<http://www.slurryprojectwales.co.uk/index.php/en/>

<sup>86</sup> <https://gov.wales/sites/default/files/publications/2020-08/glastir-small-grants-water-maps-showing-likelihood-ofselection.pdf>

4.5.21 The Welsh government has developed detailed guidance for farmers and land managers<sup>87</sup> to support the implementation of the requirements of The Water Resources (Control of Agricultural Pollution) (Wales) Regulations 2021 which have been introduced to reduce losses of pollutants from agriculture to the environment by setting rules for certain farming practices. While they are targeted at nitrogen, the Regulations also set standards for silage making, storage of silage effluent and for slurry storage systems which will have a regulatory effect on P. It has a staged roll out from 2021 to 2024 that could significantly reduce P at source.

□ **Requirements from 1 April 2021:**

- Storage of silage;
- Notifying Natural Resources Wales (NRW) of the construction of any new substantially enlarged or reconstructed silo or slurry storage system;
- Controlling the spreading of nitrogen fertiliser at high risk times and high risk areas;
- Incorporating organic manures into bare soil or stubble; and
- Closed periods for spreading manufactured nitrogen fertiliser.

□ **Requirements from 1 January 2023:**

- Risk Maps;
- Storage of organic manure; ○ Temporary field sites; ○ Nitrogen Limits – whole holding and field; ○ Import/Export of manure; ○ Nutrient Management Planning (NMP) and recording; and
- Nutrient applications restricted to crop limits.

□ **Requirements from 1 August 2024**

- Closed periods for spreading nitrogen fertiliser (includes slurry and other organic manures);
- Storage capacity for Slurry; and
- The storage period.

#### Local Planning Authorities

4.5.22 As previously highlighted in Section 3.1, the opportunistic retrofitting SuDS nibbling approach in urban and peri-urban areas can reduce flooding and pollution and deliver a wider positive impact. Therefore, a SuDS opportunity area plan in each LPA area, which identifies potential suitable locations would increase the uptake for nature-based solutions. There are also opportunities to combine the wetland and Integrated Buffer Zones encompassing nature-

<sup>87</sup> <https://gov.wales/sites/default/files/publications/2021-03/water-resources-control-of-agricultural-pollution-walesregulations-2021-guidance-for-farmers-and-landmanagers.pdf>

based solutions, with delivery of Biodiversity Net Gain via the following LPA led schemes. There are a suite of guidance and strategies from the LPAs that would contribute:

- **Wrexham Tree and Woodland Strategy 2016–2026**<sup>88</sup> is a Strategy for the Sustainable Management, Protection and Enhancement of Wrexham County Borough’s Tree Population. The Strategy sets out ambitious targets to increase the urban tree cover in the County Borough by 20% across the ten year plan, to help in terms of climate change, pollution, flooding and biodiversity. This will be achieved by ensuring the correct policies are in place in terms of planning and local development, targeted work will be undertaken to improve the wards with the lowest tree cover and the opportunity for grant aid will be utilised.
- **Flintshire Deposit Local Development Plan 2015–2030 Green Infrastructure Assessment (2019)**<sup>89</sup> supports the emerging Local Development Plan and provides an assessment of the green infrastructure across Flintshire.
- **Flintshire Urban Tree and Woodland Plan 2018–2030** In line with the principles of the Well-being of Future Generations (Wales) Act 2015 and the Environment (Wales) Act 2016 Flintshire County Council have developed a fifteen year plan to increase urban canopy cover from 14.5% to 18% or more by 2033.<sup>90</sup>
- **Flintshire pre application SuDS planning advice**<sup>91</sup> outlines the requirements provided by Welsh Government for the sole purpose of submitting information to the SuDS Approving Body (SAB) in accordance with the legislation detailed in the planning advice document and other relevant items of primary and subordinate legislation.
- **The North Wales Flood Risk Management Group (NWFRMG) North Wales SuDS Guide (2021)**. The guide provides a comprehensive single source of reference for developers, designers, planners, and prospective owners by clearly setting out the expectations, requirements and processes involved with SuDS approval and adoption across the North Wales region.
- **Bionet** is the Local Nature Partnership for North East Wales, coordinated by Flintshire County Council, it covers the Counties of Conwy, Denbighshire, Flintshire and Wrexham. They are partnership of organisations and individuals who work to conserve, protect and enhance the biodiversity of North East Wales for current and future generations<sup>99</sup>. In the search for nature based interventions they could be valuable stakeholders. They have a Nature Recovery Plan and online resources where they aim to:
  - Show environmental assets ○ Show conservation opportunities ○ Display the change being delivered through the work of the partnership.
  - Provide an important link between national and regional policy and legislation and local action. It has been developed alongside and to compliment work of the National Nature

<sup>88</sup> [http://old.wrexham.gov.uk/assets/pdfs/env\\_services/trees/tree\\_and\\_woodland\\_strategy.pdf](http://old.wrexham.gov.uk/assets/pdfs/env_services/trees/tree_and_woodland_strategy.pdf)

<sup>89</sup> <https://www.flintshire.gov.uk/en/PDFFiles/Planning/Evidence-Base-Documents/Background-Papers/LDP-EBD-BP2Background-Paper-LDP02-Green-Infrastructure.pdf>

<sup>90</sup> <https://www.flintshire.gov.uk/en/PDFFiles/Countryside--Coast/Tree/Tree-Plan.pdf>

<sup>91</sup> <https://www.flintshire.gov.uk/en/PDFFiles/Planning/SuDS/SuDS-Application-for-Pre-Application-Advice.pdf> <sup>99</sup> <https://www.bionetwales.co.uk/>

Recovery Action Plan, Natural Resources Wales Area Statements, Local Authority Section 6 Biodiversity Plans and the SoNaRR report.

- Focus on 3 key habitats initially. We will expand our data over time to include additional habitats and local important species and species groups.

#### 4.5.23 The 3 key habitats and plans are:

- **Woodland** Wales is one of the least wooded countries in Europe with woodland providing only 14.8% of land cover **compared** to an EU average of 38%, improvements plan to
  - Map woodland habitat and related projects across North East Wales
  - Increase the extent of native broadleaf, mixed woodland and trees under favourable management
  - Increase native broadleaf and mixed woodland, canopy cover, connectivity and resilience in North East Wales
- **Grasslands** makes up nearly two thirds of the land cover in Wales. However most of this is agriculturally improved (reseeded, fertilised or drained), with only 9% attributed to semi-natural grassland. [pP](#)lan to:
  - Map grassland habitat and related projects across North East Wales
  - Increase the extent of grasslands under favourable management
  - Increase grassland extent and resilience in North East Wales
- **Rivers, Ponds and Wetlands** Despite water quality in rivers generally improving over the last 25 years, only 1 in 6 freshwater habitat types are considered in favourable conservation status, Bionet plans aim to:
  - Map our wetland habitat and related projects across North East Wales
  - Increase the extent of rivers, ponds and wetland habitats under favourable management
  - Increase wetland extent and resilience in North East Wales

4.5.24 There are a suite of maps that can be used to explore locational opportunities for P reductions. One example is Bionet's interactive map which shows their existing woodlands, where there may be an opportunity to extend existing woodlands and where Bionet are already making a difference. Figure 4.1 shows an example of the current woodland habitats in Flintshire and Wrexham, further detail can be found on the Bionet website.<sup>92</sup>

---

<sup>92</sup> [https://www.bionetwales.co.uk/recovery\\_plan/woodland/](https://www.bionetwales.co.uk/recovery_plan/woodland/)

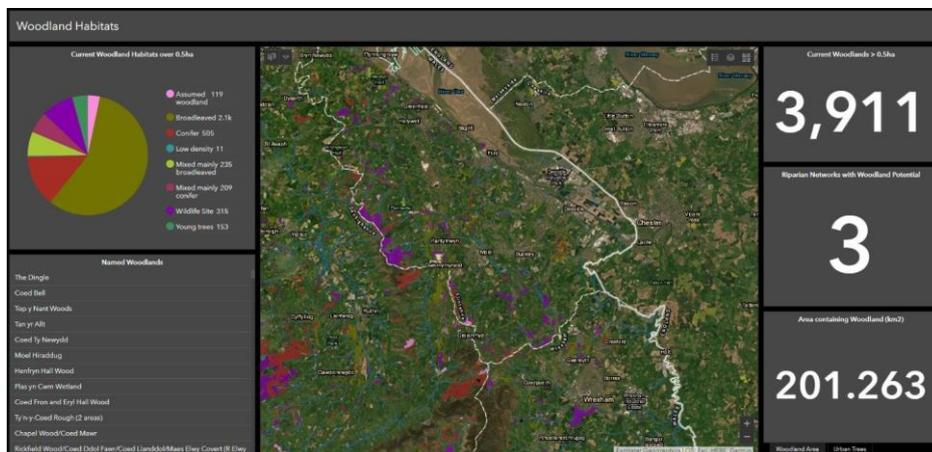


Figure 4.1 Bionet Woodland Opportunities

## NRW

4.5.25 NRW has a suite of projects and plans and works in partnership to deliver P reductions across the River Dee. Examples include:

- **Dee Water Protection Zone**<sup>93</sup> - The River Dee catchment from Snowdonia to the weir in Chester is designated under the Water Resources Act 1991 as a Water Protection Zone. This means that a consent is required where certain substances are used or stored at specific sites anywhere within this part of north east Wales.
- **The Life Dee River Project**<sup>94</sup> - This is a £6.8 m project to transform the River Dee and its catchment by restoring the river and its surroundings back to their natural state. Funding is already established and can be targeted with support of the NMB of which they will be a member. This will bring many benefits to the environment, most notably improving the numbers of salmon, lamprey and freshwater pearl mussels and the conservation status of the *Ranunculion fluitantis* and *Callitriche-Batrachion* vegetation habitat (3260) in the Afon Dyfrdwy a Llyn Tegid / River Dee and Bala Lake SAC by:
  - removing the constraints to fish migration and wider ecological connectivity, removing (partially or fully) five weirs and improving fish passage at a further six weirs in the SAC
  - restoring or improving natural riverine physical processes, features and habitats in at least 55 km of river. Proposals are to carry out over 6 km of habitat improvement in the river including the addition of more than 4,000 tonnes of gravel, 4,500 tonnes of

<sup>93</sup> <https://naturalresources.wales/guidance-and-advice/environmental-topics/water-management-and-quality/waterquality/dee-water-protection-zone/?lang=en>

<sup>94</sup> <https://naturalresources.wales/about-us/our-projects/nature-projects/life-dee-river-project/?lang=en>

boulders, and 1,000 tonnes of woody material. At least 35 km of land along the river bank will be restored through managed grazing, fencing and planting, and 2 km of bank protection and historic artificial embankments will be removed or breached.

- improving agricultural and forestry land management practices to reduce the input of nutrients and sediment entering the SAC by installing two river crossings and blocking 21 forest drain culverts which will reduce pollution risk in 600ha of forestry in the SAC catchment and working closely with farmers, we will help improve agricultural practices to reduce the input of nutrients, chemicals and sediment entering the SAC, aiming to facilitate implementation of interventions that reduce nutrient and sediment inputs in at least 20% of targeted farms
- initiating conservation management for the critically-endangered freshwater pearl mussel captive rearing and release of at least 3,000 juvenile FWPM in suitable locations in the SAC
- establishing and building long-term positive relationships with key stakeholders during and beyond the life of the project
- **Salmon and sea trout plan of action for Wales 2020:** areas for action is an NRW led plan to improve salmonid populations, the following elements support improvements in water quality:
  - Tackling Physical habitat constraints in the freshwater environment via Fish Habitat Restoration Plans
  - Safeguarding water quality and quantity
- 4.5.26 **NRW Water Quality Improvement Projects (£802,000)** – NRW will work with partners on 15 smaller scale projects to tackle areas affected by increased levels of pollutants, such as phosphorus and improve marine biodiversity; and
- 4.5.27 NRW are also working with a large number of groups and forums that work directly for improved water quality on the River Dee including:
  - **River Dee Liaison Panel** made up representatives of key sectors. This provides an open forum for co-deliverers to discuss and influence the development of the RBMPs and assist with implementation.
  - **Wales Land Management Forum** agriculture sub group is tasked with undertaking root cause analysis to achieve a common understanding of the causes of agricultural pollution and the ways in which these are currently addressed through the investigation, agreement, reporting and delivery on potential solutions, taking an integrated approach, working across organisations. Their main areas of focus are:
    - A robust regulatory regime
    - Developing a voluntary, farmer-led approach to nutrient management
    - Ensuring better advice and guidance is provided and can be taken up by farmers
    - Improving the range of investment opportunities
    - Identifying and promoting innovation

- **Wales Water Management Forum** purpose is to provide an opportunity for membership organisations to share evidence and explore opportunities for working together collaboratively towards the sustainable management of water in Wales.
- **Wales Fisheries Forum** represents a range of stakeholders with an interest in the freshwater and diadromous fisheries resources of Wales and the work of NRW and others to maintain, improve and develop migratory and freshwater fisheries in Wales.
- **National Surface Water Management and SuDS Group Members**<sup>95</sup> objectives are:
  - To provide a source of expertise in the field of surface water management;
  - Encourage collaborative working and identify where benefits can be maximised;
  - To ensure that environmental protection and eco-systems services are at the heart of delivery;
  - To support LLFAs in the implementation of SuDS and in the development of Flood Risk Management Plans;
  - Provide advice and signpost stakeholders to support the development of the relevant skills and expertise to manage surface water and construct SuDS;
  - To provide advice and expertise to Welsh Government when requested in order to support the development of emerging policy;
  - To develop a resource base for stakeholders and the public to inform them of best practice in relation to managing surface water and the use of SuDS;
  - To encourage the reuse of water where possible; and
  - To promote a better understanding of SuDS and Water Sensitive Urban Design, including the social, economic and environmental benefits that can be derived.

#### Key documents

4.5.28 There are a number of key documents that capture key stakeholders and measures surrounding improvement on the River Dee, key elements have been summarised within this document, but these should be points of reference for the NMB. (links embedded in the document). There are a suite of proposed measures within the Draft River Basin Management Plans that propose a programme of measures to support water quality improvements in the SAC.<sup>96</sup>

**Commented [A57]:** Could list stakeholders and measures

<sup>95</sup> <https://www.sudswales.com/about/working-group-members/>

<sup>96</sup> Water Framework Directive - Objective Setting for RBMPs  
<https://cvfoethnaturiolcymru.sharefile.eu/share/view/s36b7d5e559c64e95b600229e08251809>



### Rivers Trust of Wales (Welsh Rivers Trust) Afonydd Cymru

4.5.29 The Rivers Trust of Wales, Afonydd Cymru<sup>97</sup>, formed in 2008 as an umbrella organisation to represent member Rivers Trusts across Wales, they represent the regional Rivers Trusts with Natural Resources Wales and Welsh Government and they champion Wales' thirty-three rivers, and the many lakes and smaller watercourses. Their aims are to:

- Restore all Welsh rivers to good ecological status
- Build an expanded and more effective Rivers Trust movement in Wales with a long-term, sustainable funding base
- Eliminate the current high levels of water pollution
- Influence relevant legislation, policy and practice and challenge to protect and enhance Wales' freshwater environment
- Gain greater public awareness of rivers and the work of the Rivers Trust movement

4.5.30 They have a number of projects working with partners and directly with farmers across a number of catchments in West Wales:

- **River Restoration Project** running a nationwide Fisheries Habitat Restoration Project. Working with Natural Resources Wales, regional Rivers Trusts, and dedicated volunteers to carry out surveys of certain river catchments. Surveys on the Dee are currently being undertaken. An extensive report is generated from each catchment survey, including analysis of existing data, which highlight all fisheries habitat improvement opportunities:
  - Barriers to migration / Habitat fragmentation (weirs, trash dams, perched culverts),
  - Riparian management opportunities (fencing, tree planting, soil management, invasive weeds, erosion, stock access / poaching, rubbish, revetment), etc.

4.5.31 This information feeds into a GIS database and a document detailing the key survey results and proposals for restoration. The generated reports, GIS data and collected survey information are informing future fisheries habitat restoration works nationwide and will be valuable for opportunity mapping and success monitoring.

4.5.32 They have a nutrient and soil management project that has skills, lessons learned and partnerships that could be applied to the Dee, this is the:

<sup>97</sup> <http://afonyddcymru.org/>

- **AC DC: The Nutrient and Soil Management Project**, West Wales which seeks to improve water quality by offering advice and financial support to farmers. This joint project with Welsh Water and has been modelled on the successful work by the farm team of the Wye and Usk Foundation, bringing together pragmatic and cost-effective actions to achieve improvements to water quality. Farm advisers visit farms and aim to advise on workable solutions and possibly offer grant funding (subject to availability) and support for any of the following:
  - fencing and alternative water for stock - to improve stock management & reduce the risk of stock exposure to waterborne diseases by improving the bank stability & water quality.
  - manage run off from yards- how to reduce the risk of yard run off via drainage improvements including manure, slurry and pesticide management.
  - run off risk maps- assess organic matter, soil structure and nutrient levels, helping to maintain good sward health & reduce waterlogging.

#### **The Welsh Dee Trust<sup>98</sup>**

4.5.33 The Welsh Dee Trust objectives are to protect, conserve, promote and enhance the River Dee and all its indigenous species of fish, animals, birds and plants. The Trust will, where appropriate, seek the rehabilitation of any species that is threatened or endangered. The Trust will, through education, increase the knowledge of the public of the need for and importance of a healthy river environment. The Trust will also highlight the need for proper water management. They have delivered a multitude of projects to restore the River Dee catchment including restoring over 50km of river habitat, removing 15 barriers to fish migration, and working with over 200 farms to reduce pollution. They create a community led approach to eliminating sources of pollution. They will be important delivery partners and they have a number of relevant active campaigns:

- **Restoring River Habitat** - Rivers and streams are highly variable, changing environments and no two sections of a river are ever the same. This variation provides the diversity that is necessary for the wildlife of the river to thrive. Welsh Dee Trust focuses on restoring the natural processes that generate these wide varieties of habitat. This will involve planting woodlands on the riverbank, pinning deadwood into the river, restoring floodplains and removing man-made barriers to fish migration. This work can improve the habitat and allow all river wildlife to thrive.
- **Water Wise** - 'Work with the agricultural industry to reduce the loss of pollutants into watercourses' Farming is the largest land use within the catchment of the River Dee and the backbone of the rural community. Everyday farms are working with soil and nutrients to provide us with the food we eat. Unfortunately, these are also two of the biggest pollutants damaging the water environment. Through the Water Wise Farming Programme, The Welsh Dee Trust work confidentially with busy farmers to identify new practices and investment needed to keep nutrients and soil in the areas where they benefit the farm business and out of the River Dee.

---

<sup>98</sup> <https://www.welshdeetrust.com/>

- **It shouldn't be in the Dee** - 'Work with the agricultural industry to reduce the loss of pollutants into watercourses' Farming is the largest land use within the catchment of the River Dee and the backbone of the rural community. They acknowledge the many sources and pathways of pollution in the Dee and are working with newly engaged communities to eliminate the sources of pollution. This may take the form of better maintenance of private sewage treatment works, labelling of clean water drains or the creation of wetlands to capture pollutants before they enter the river. Through this approach, they believe they can exponentially grow the number of people working towards a clean River Dee.
- **A Catchment Based Approach** - The River Dee provides opportunities and challenges for a wide range of organisations. Each of these organisations has its own priorities and strengths. Two catchment-based partnerships help coordinate work between the various organisations. Welsh Dee Trust hosts the Middle Dee Partnership and is a member of the Tidal Dee partnership. This work is vital to make sure organisations are not duplicating work, different priorities are engaged and the best value for money is being achieved in managing the River Dee. The Middle Dee Catchment Partnership has also produced a Story map [Middle Dee Catchment Mapping Portal \(arcgis.com\)](https://arcgis.com), which offers a flavour of past and present projects and potential for future work, including the characteristics, issues and opportunities in the Dee Catchment. It also gives the opportunity for the public and stakeholders to submit potential project ideas for the inclusion within the Middle Dee Catchment Action Plan.
- **The River Alyn** extremes of flow elevate levels of P and effect salmonid recruitment in the river. In conjunction with the Wrexham & District Anglers, restoration of targeted sections of the river was undertaken using groynes to redirect flow, with revetments to manage erosion. Through the Woodlands for Water Project, North Wales Wildlife Trust and the Welsh Dee Trust are working with farmers to restore fragmented habitats, reduce rural diffuse pollution and improve freshwater biodiversity within the catchment. In April the Welsh Dee Trust and the North Wales Wildlife Trust joined the Salmon and Trout Conservation's SmartRivers programme which is a monitoring project that uses invertebrate samples to monitor water quality alongside the rivers capability to support healthy populations of wild fish, these are valuable delivery partners in achieving P reduction. A scheme of fencing has been delivered as part of the previous work, approximately 2km of River Alyn upstream of the confluence with Black brook and there has been work on farms in the area, but Welsh Dee Trust is not in a position to share the details due to the confidentiality reasons.

4.5.34 Farm advisors from the Welsh Dee Trust and Reaseheath College work with the local farming community to improve farming practices and reduce their impact on water quality. A number of techniques were first piloted in two sub-catchments; Alwen (Upper Dee) and Alyn (Middle Dee), but farm advice has also been concentrated in the Aldford Brook, Wych and Worthenbury Brooks and Emral Brook sub-catchments. Over 100 farms have been engaged in these sub catchments and provided with advice including Water Management Plans, soil testing and Nutrient Management Plans. This included Emral Brook Diffuse pollution project (see case study box 4.2 below).

**Box 4.2: Case Study: Emral Brook Project**

The Emral Brook project is addressing diffuse pollution from agriculture by working with farmers and landowners to highlight issues on their farm, provide individual Water Management Plans and deliver interventions to make improvements. It was a two-year partnership project funded by NRW, United Utilities, DCWW, Woodland Trust and in partnership with Welsh Dee Trust, Dee Valley Water and Reaseheath College. The Emral brook catchment is predominantly rural with livestock farming, especially dairy the main land use. Situated south of Wrexham, it is a tributary to the middle River Dee. Classified as moderate in 2015, it has failing to meet good status with phosphate the main issue. Twenty-eight farms received detailed plans covering approximately two thirds of the catchment. Seven key issues were noted. Farmer engagement was extremely positive with six successful Glastir Small Grant applications submitted totalling £23,113 and partnership funding to help with key on farm improvements totalling £36,000. Planned on farm improvements include: livestock fencing, relocation of gateways and water troughs, sediment traps, cover crops, new guttering/downpipes and tree planting.

**Delivery Risks and Mitigation**

4.5.35 As has been presented there is an enormous amount of funding, guidance, delivery partners, existing projects and plans with regulatory oversight on the River Dee. The key is to engage the appropriate parties and direct them towards the most effective interventions. The Case Study in Box 4.3 below presents the potential difficulties in implementing strategic approaches and recommends policies to address them, these recommendations could be applied to the action plan for the NMB. Table 4.10 below presents the key risks to delivery and suggested mitigation for the required wider P reductions.

**Commented [A58]:** We suggest 'significant' might be a better word

**Table 4.10 Delivery Risk Summaries and Mitigation**

Risk	Mitigation
Too many stakeholders	<input type="checkbox"/> Nutrient Management Board will facilitate and co-ordinate delivery of measures across multiple stakeholders with clear roles and responsibilities, actions, targets and monitoring within the Dee Catchment Phosphate Reduction Action Plan.
Lack of evidence re P removal capacity of naturebased solutions	<ul style="list-style-type: none"><li>• Monitoring of each feature is unlikely to be practical, a number of selected interventions could be monitored and consolidated monitoring of failing stretches of watercourses should be undertaken. As a live document there should be a continued review of efficiencies of nature-based solutions and the DCPRS should be reviewed and updated biannually, as required.</li><li>• Collaboration with additional delivery partners is likely to be required, for example, universities and colleges, laboratories etc. to collate, analyse, assess and report to effectiveness of nature-based solutions at P removal.</li></ul>

Lack of funding and opportunity uptake from landowners	<input type="checkbox"/> Where appropriate and relevant to NMB members, they could prepare an opportunity pack directed at their stakeholders which pulls together the available funding, support and guidance and directs stakeholders to the technical support that can help with funding applications and delivery advice.
Failure to implement and maintain	<input type="checkbox"/> Bespoke delivery and management plans for will be required for the implementation and maintenance of the Dee Catchment Phosphate Reduction Action Plan (DCPRAP) to ensure that all appropriate parties are consulted so that a bottom up and top down approach can be delivered, promoting engagement and ownership at all levels. Maintenance of different interventions could be via LPAs, farmers, DCWW or Wildlife Trusts etc. Legally binding maintenance plans would be drawn up and monitoring of schemes will be undertaken, as part of the DCPRAP. Release of development will be conditional on milestones within wider DCPRS being met.

**Box 4.3: A participatory approach for comparing stakeholders' evaluation of P loss mitigation options in a high ecological status river catchment Micha et al 2018**

Fifteen P mitigation options were shortlisted based on agronomic and environmental data from a casestudy agricultural catchment and presented to a group of experts and farmers. Results showed significant disparities between perceived effectiveness by farmers and expert groups. The measures ranked as 1st by each group and by FARMSCOPE are:

- **Experts: Avoid fertilizer application in high risk areas**
- **Farmers: Reduce effects of poaching around drinking points/gateways**
- **FARMSCOPE: Loosen compacted soils**

Overall, farmers and FARMSCOPE agreed on the most and least effective measures, with disparities appearing only for 4 measures (NMP, fertilizer injection, avoid fertilizer application in high risk areas and moving drinking troughs regularly). FARMSCOPE did not consider these options as effective as the fertilizers rates were already low, while farmers did not find injection and moving drinking troughs effective probably because of lack of understanding of their P transfer mitigation mechanism (based on interviews with farmers). Experts identified effectiveness at catchment scale, whilst farmers identified field scale effectiveness. In summary, four main policy recommendations arise from the discussion in this study:

- **Design bottom-up participatory tools that accommodate farmers' social and cultural norms;**
- **Approach farmers to seek their participation in policy design rather than expect them to engage in voluntary schemes;**
- **Reinforce links between researchers and advisors to provide the latter with more powerful knowledge transfer tools; and**
- **Enhance the direct interaction between researchers and farmers to achieve two-way exchange of opinions.**

**Opportunity Locations**

4.5.36 Figures D.1 to D.4 in Appendix D show potential preliminary example locations of Category 2 measures (for illustrative purposes only at this early stage of DCPRS preparation.) These preliminary locations will need further investigation to confirm their suitability and deliverability in conjunction with the Nutrient Management Board and stakeholders. Similarly, there may be suitable alternative locations, which are yet to be identified.

4.5.37 These areas have been identified using data from NRW's Welsh Information for Nature Based Solutions (WINS). The category 2 opportunities in Figures D.1 to D.4 were based on the opportunities identified on the WINS website and then refined based on existing land ownership boundaries for Wrexham County Borough Council and Flintshire County Council as well as identifying appropriate locations adjacent to and downstream of each WWTW, which are affected by the emerging Local Development Plans.

#### **Effectiveness Testing**

4.5.38 Defra-developed and supported FARMSCOOPER model<sup>99</sup> (FARM Scale Optimisation of Pollutant Emission Reductions) was used to undertake a preliminary assessment of the P reduction extent of some Category 2 measures, as explained in Box 4.4 and Box 4.5 below. It is acknowledged that there are general limitations of applying FARMSCOOPER model in assessing the typical losses of phosphate from different farm types encountered within catchments and to model the reductions in losses due to intervention measures. However, this gives an initial indication and starting point to assess some Category 2 measures.

---

<sup>99</sup> <https://adas.co.uk/services/farmscoper/>

#### Box 4.4: Woodland planting, habitat restoration and fencing - adjacent to Buckley WwTW

This preliminary assessment investigates the effectiveness of incorporating new woodland planting and habitat restoration areas within Flintshire County Council owned land, adjoining to existing Buckley WwTW. Wat's Dyke also runs through an area of farmland and woodland to the southeast of Buckley WwTW.



Existing site: Overall site area is 15.68ha within Flintshire County Council ownership (pink hatched area), which contains 1.89ha of existing woodland and 13.79ha of unconstrained arable farmland (assumed 95% winter and spring barley with 5% rotational grassland). Flintshire County Council's owned land is shown by the area hatched in pink.

Proposed measures: New onsite woodland planting area of 6.69ha (green), onsite habitat restoration area of 0.56ha (purple) and fencing off the southern portion of the site (orange) between Wat's Dyke and the unnamed watercourse. Proposed measures were assumed to deliver wider benefits (as a C2 measure) in this test, but they can be treated as C1 measures instead to facilitate the LDP as there are

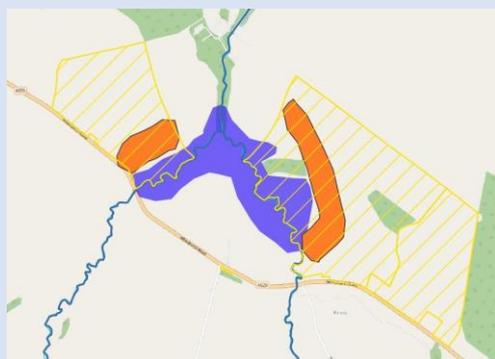
completely within Council's land.

The estimated annual rainfall is between 900 and 1200mm. The FARMSCOOPER model was first tested to determine the individual effectiveness of proposed woodland planting, habitat restoration and fencing. This showed that woodland planting, habitat restoration and fencing can reduce the annual P load by 17% (from 11.25kg to 9.33kg), 4.4% (from 11.25kg to 10.76kg), and 2.8% (from 11.25kg to 10.93kg) respectively. The fencing test assumed that only 20% of the site was deemed to be fenced off from the watercourses on site, which would stop any livestock South of Wat's Dyke from accessing the dyke or the unnamed watercourse on the southern boundary of the site. This was because it was considered that animals could still access the watercourse (Wat's Dyke) to the north of the fencing area. The model was then run with all three intervention measures in place simultaneously, which showed that they can reduce the annual P load by 20.2% (from 11.25kg to 8.97kg).

The responsibility for delivery and maintenance of the above measures (whether C1 or C2) would be by Flintshire County Council, however there is potential for DCWW adoption. There is also opportunity for riparian planting (yellow) outside the Flintshire County Council owned land along the unnamed watercourse, but this measure was not modelled in this test. Since this is outside the Council owned land it should be treated as a C2 measure, and the delivery and maintenance responsibility would be discussed in liaison with the current landowners and the delivery potential partners discussed in this strategy. The Woodland Investment Grant, Natural Flood Management programme, or one of the other funding opportunities presented etc. (see para 4.518) could provide potential funding sources to implement these measures. These would be investigated further at scheme feasibility stage.

#### Box 4.5: Riparian planting integrated buffer zone – Whitchurch Road at Pandy

This case study investigates effectiveness of incorporating new riparian planting as an integrated buffer zone between the proposed wetland area and existing farmland that borders the Emral Brook and an unnamed tributary.



**Existing site:** Overall site area is 61.19ha, which contains 1.31ha of existing woodland and 59.88ha of unconstrained arable farmland (assumed 90% winter and spring barley with 10% rotational grassland). Wrexham County Borough Council's owned land is shown by the area hatched in yellow.

**Proposed measures:** New onsite riparian planting area of 8.42ha (orange) in Wrexham County Borough Council's owned land (hatched in yellow) that will be located outside the wetland opportunity area of 17.1ha (blue).

**Estimated annual rainfall:** Between 900 and 1200mm

The FARMSCOPER model was tested to determine the effectiveness of riparian planting opportunity area within the Wrexham County Borough Council's owned land. It was assumed that 85% of the site will be intercepted by the riparian planting buffer strips as the remaining 15% of the site will directly drain to the existing watercourses via the wetland opportunity areas. This test showed that riparian planting can reduce the annual P load by 22.1% (from 32.49kg to 25.3kg).

Proposed riparian planting were assumed to deliver wider benefits (as a C2 measure) in this test, but they can also be designed as C1 measure to facilitate the LDP as they are completely within Council's land.

The wetland area is not included in FARMSCOPER model in this test as the wetland P removal efficiency has already been discussed in the previous sections and is largely agreed upon. The wetland area is partially within the Council's owned land, which also means P removal benefits derived from this area could be delivered to avoid impacts from new development and reduce P loading burdens for water quality treatment (as a C1 measure). This example is presented here for illustration purposes to demonstrate how C1 and C2 benefits can be potentially drawn through a combined scheme facilitated by Council's landownership. The lead delivery partner for such a combined scheme would be the Councils, with potential for co delivery and adoption by DCWW alternatively to accelerate the process it may be that the Councils' retain ownership including the maintenance responsibility for in perpetuity through suitable legal agreements. Funding could be sought from a range of potential sources, to be presented within the feasibility of any such scheme.

#### Summary of Category 2 Opportunities and Effectiveness

4.5.39 Section 3.2.30 and Section 4.4 indicated that the Median removal rates for P for wetlands is  $1.2 \text{ g m}^{-2} \text{ year}^{-1}$  with a removal efficiency of 46 %. Preliminary analysis demonstrated that other nature based potential Category 2 interventions that involve habitat restorations, tree planting and integrated buffer zones (supported by fencing) can reduce P by up to 20%, but further testing across the catchment scale will be required to confirm this.

4.5.40 The enhancements to other existing WwTWs across the Dee Freshwater catchment that are not currently impacted by Flintshire and Wrexham growth may provide even higher efficiency

rates (e.g., by introducing P stripping for those WwTWs that P consents are currently not in place and further tightening the existing P consents at other locations). However, their delivery is currently unknown (e.g. due to funding limitations and growth priorities) and therefore it will need detailed consultation with Welsh Water, NRW and LPAs, as part of the Dee Catchment Phosphate Reduction Action Plan.

4.5.41 Reduction of Agricultural P at source and Farming Source Control should also provide high P removal rates although their delivery and long-term maintenance are currently uncertain.

This piece of work has identified potential Category 2 opportunity options (Figures D.1 to D.4) for P reduction and there are resources such as the predictive Agricultural Land Classification Map which can support further locational modelling<sup>100</sup>. There are many funding sources and guidance to support targeted activities. While locational information on existing works and negotiations are generally subject to confidentiality agreements, such as those being undertaken by The Welsh Dee Trust, bottom-up stakeholder involvement combined with the top-down approach re strategies such as this and subsequent modelling will maximise these opportunities and monitor their effectiveness to support ongoing P removal in the long-term.

## 5 Implementation and Delivery

### 5.1 The need for developer contributions

#### *Introduction*

5.1.1 A Developer Contributor Scheme (DCS) is a key requirement of the DCPRS in demonstrating how mitigation required to facilitate LDP growth can be calculated and secured by planning.

5.1.2 The DCS has not been produced yet but it will be required prior to plan adoption. For the benefit of the LDP examination and Habitats Regulations, this section will demonstrate how the DCS could work in practice and demonstrate that the mechanisms (LDP policy and planning tools – planning obligations) are already in place, and much of the technical work for the DCS has been completed.

5.1.3 The DCS provides a strategic approach to mitigation that facilitates the delivery of new development within the catchment (bespoke solutions are supported, see below). It will be the mechanism by which measures required to facilitate LDP growth, Category 1 mitigation measures, are delivered by the LDP<sup>101</sup> (note the responsibility for Category 2 mitigation does not fall on development but on a range of stakeholders see section 4.4).

---

<sup>100</sup> <http://lle.gov.wales/map/alc2>

<sup>101</sup> Note, that developers are not obliged to use the DCS, but may choose their own solution, see section 5.2.1 below for further information.

5.1.4 The DCS will be relevant to all residential development which leads to a net increase in phosphorus load being discharged into the River Dee and Bala Lake SAC and its tributaries. It will essentially set a charge on development for mitigation required to address the additional phosphorus load, will contain the detailed mitigation costs, mitigation calculations and phosphorus budget and will then explain the principles by which obligation charges will be calculated and apportioned to development. Contributions will be apportioned in a fair, equitable and consistent manner on the basis of the phosphorus load associated with each development proposal.

#### *Approach to a Developer Contribution Scheme*

- 5.1.5 The Council will set out the approach to securing mitigation in a Developers Contribution Scheme (DCS) which will be prepared for LDP adoption with Supplementary Planning Guidance if appropriate. This section sets out how the DCS would work. In essence the intention for the DCS is to match the phosphorus mitigation costs proportionately to each development based on the phosphorus the proposal generates.
- 5.1.6 The DCS will set out its scope, identify deliverable mitigation measures with costs and explain how payment contributions are calculated and apportioned to development. The DCS would be a material consideration when assessing development proposals.
- 5.1.7 The DCS will be prepared with key stakeholders, as one of the measures within the Dee Catchment Phosphate Reduction Strategy and will be delivered alongside other wider measures within the remit of the Nutrient Management Board.
- 5.1.8 Wrexham and Flintshire Councils will prepare ~~its~~ their own DCS but will share much of the same background information e.g. mitigation measures can be drawn from the River Dee catchment, costs and calculation method/charges. There are benefits for the DCSs to be prepared collectively by Flintshire and Wrexham but the timing may not be favourable. Therefore, both Councils commit to working collaboratively to prepare their respective DCSs and once issued, to collate funding and deliver mitigation measures collectively where appropriate.
- 5.1.9 The purpose of the DCS is to provide a strategic approach to mitigation that facilitates the delivery of new development within the catchment, specifically for this DCS the catchment within Wrexham Borough Council and Flintshire Council. The DCS does not preclude the local authority deciding to assess a particular individual planning application independently. Equally, when making an application, a developer could ask the authority to assess the application separately from the DCS. The Councils remain committed to considering any bespoke mitigation proposals put forward on a case by case basis. Consequently, it is not intended that the DCS is publicly consulted on, it is an agreed way forward but is not the only option available to developers.
- 5.1.10 The DCS will be a living document that evolves iteratively as the evidence base changes, for example, new Category 1 mitigation measures can be added as they emerge, or there is further evidence on the condition of the River Dee and mitigation costs are updated. The DCS can be relatively quickly updated to reflect the most up to date evidence base.

### *Roles and Responsibilities*

- 5.1.11 Whilst responsibility for the wider phosphorus reductions lies with a range of stakeholders, the responsibility for the DCS lies with the local planning authorities in which the DCS applies. At present the two lead authorities are Flintshire County Council and Wrexham County Borough Council.
- 5.1.12 NRW, will be consulted in preparing the DCS in their role as an appropriate nature conservation body advising on Habitats Regulations. Advice from NRW will be sought on specific technical aspects of the DCS e.g. developing guidance around use of calculating phosphorus savings from mitigation measures, and use of a phosphorus calculator if this was a chosen option.

### *Policy Drivers*

- 5.1.13 The emerging Local Development Plans are 2013-2029 is currently in examination. When adopted, strategic policy SP5 Planning Obligations is the relevant policy hook. This overarching strategic policy supports the principles of planning obligations and explicitly lists a number of potential obligations but also explicitly states that the policy is not limited to the list. The policy can be used to deliver measures required to reduce phosphorus arising from waste water discharges associated with development.
- 5.1.14 Furthermore, LDP policy NE6 (Wrexham) and EN15 (Flintshire) explicitly requires development creating wastewater discharges to identify and implement mitigation measures to demonstrate there is no increase in phosphorus levels in the SAC. The policies are explicit that mitigation will involve developer contributions/community infrastructure levy funds. The policies also provides scope for alternative arrangements outside of the DCS provided the integrity of the River Dee and Bala Lake SAC can be protected and the approach is agreed with the Council in consultation with NRW.

**Commented [A59]:** Reference for Flintshire policy?

### *Planning Obligations*

- 5.1.15 A developer contribution is made by a landowner or developer to ensure that where planning permission is granted for new development any impact on the environment is in accordance with appropriate regulatory obligations and the infrastructure (e.g. transport and schools) necessary to support the development is provided. By securing these contributions, Planning Authorities can help to improve the quality and sustainability of individual development schemes and their acceptability to local communities.
- 5.1.16 Developer contributions are normally secured through a “planning obligation”. This is a legal commitment by the developer to secure a contribution (in cash or in kind) to address community, infrastructure or environmental improvement needs associated with development. It may be a bilateral agreement between the Local Planning Authority and the developer, or simply a unilateral undertaking by the developer to provide the same. These are a proper and recognised part of the planning system and are normally entered into under Section 106 of the Town and Country Planning Act 1990 (as amended).
- 5.1.17 Planning obligations can be used to secure benefits on the development site itself or on other suitable sites close to the proposed development (as long as they are directly related to the development). Developers may be requested to make a payment of money to the relevant Local Planning Authority, to be spent on agreed benefits or for the maintenance of them.

5.1.18 Historically, planning obligations have tended to be used to secure infrastructure improvements only from a limited number of sites. However in respect of the impacts on the River Dee the DCS provides a strategic approach to off-setting the negative effects of development and includes a mechanism for gaining contributions from all new development which connects to mains drainage, and non-mains development where considered to be appropriate.

5.1.19 Developer contributions can reasonably be secured in respect of:

- Actual implementation of measures (i.e. costs to actually do the work);
- Staff resource to oversee and co-ordinate implementation;
- Compensation to landowners where measures involve a change of use;  The long term (in perpetuity) maintenance and management of mitigation;  Monitoring the effectiveness of mitigation measures.

5.1.20 In principle, planning obligations could be used to fund improvements of waste water treatment works ([where this did not compromise the restoration of the SAC](#)), particularly if development came forward before planned upgrades to waste water treatment works, however, further discussions are needed with the statutory water undertaker, Dwr Cymru/Welsh Water and NRW as regulator, before any commitment was made to this effect.

5.1.21 Regulation 123 of the Community Infrastructure Levy (CIL) Regulation prevents the imposition of planning obligations for “infrastructure”, if five or more separate planning obligations which provide for the funding or provision of that type of infrastructure have been entered into on or after 6th April 2010. However, the measures to be funded through the Developer Contribution Scheme are “environmental protection measures”, and fall outside the definition of infrastructure (S 216 (1) Planning Act 2008) so are not subject to pooling restrictions.

#### *Grampian Condition*

5.1.22 Grampian Conditions provide a means by which mitigation can be secured. [↗ ↖ A](#) Grampian Condition prohibits development authorised by the planning permission or other aspects linked to the planning permission (in the case of residential use, occupation of the development) until a specified action has been taken (in this case the provision of an avoidance and mitigation package). Such conditions should not be used where there are no prospects at all of the action in question being performed within the time-limit imposed by the permission, which is not envisaged in this case.

#### *Development Affected*

5.1.23 In principle any development adding phosphorus load to the River Dee and Bala Lake SAC will require mitigation e.g. tourism, agricultural development and overnight accommodation, however it would not be appropriate for the DCS to provide for every circumstance. Initially the DCS will focus on the strategic issue for the LDP examination, residential development. In time it may be appropriate to expand the DCS to cover other types of non-strategic development responding to local circumstances and pressures. In the meantime, non-residential development will be treated on a case by case basis at the planning application

stage, and the DCS may provide a solution to such development depending on the specific circumstances of each case.

5.1.24 Consequently the DCS will provide mitigation for development that would lead to an increase in phosphorus entering the SAC river environment. This is likely to consist mainly of residential development connecting to public or private sewers discharging into the catchment of the River Dee and Bala Lake SAC where treatment works currently do not have the facility to remove additional phosphorus and /or planned investment to upgrade treatment works to remove phosphorus from effluent are not aligned with timing of development need [\(or are needed to restore the SAC\)](#).

5.1.25 Development where connection to the mains network is not a viable option will continue to be addressed on a case by case basis and follow NRW guidance on such matters<sup>102</sup>; the DCS may provide a solution to such development depending on the specific circumstances of each case.

#### *Developer Contributions and Wastewater Treatment Works Environmental Permits*

5.1.26 The DCS will be available for all residential development in Wrexham County Borough and Flintshire regardless of which wastewater treatment works serves the development, the phosphorus budget (section 4) accounts for the spatial distribution of growth and the various treatment works permits.

5.1.27 Wastewater Treatment Works with permit conditions limiting phosphorus discharge (e.g. the four main treatment works serving Wrexham County Borough) already have facilities to reduce phosphorus content of effluent to comply with those conditions. The DCS is only addressing the extra costs of mitigation above what is already permitted that DCWW are currently not planning to do under their normal AMP improvement schemes.

5.1.28 Where development connects to a public sewer where the associated wastewater treatment works does not currently have phosphorus stripping technology, the additional phosphorus load from development requires mitigation.

5.1.29 Development not served by treatment works will be considered in light of NRW advice<sup>103</sup>, in principle proposals can still benefit from the DCS.

5.1.30 Should phosphorus limit conditions for wastewater treatment works permits be tightened by NRW in the future, the amount of mitigation required from development can be reduced so the DCS would be updated.

#### *How are Planning Obligations Calculated?*

##### *Step 1 – Phosphorus Budget*

5.1.31 The starting point for the DCS is to establish a phosphorus budget (quantity of phosphorus that development would add to the River Dee and Bala Lake SAC) for the LDP; this is already

<sup>102</sup> <https://naturalresources.wales/guidance-and-advice/business-sectors/planning-and-development/ourrole-in-planning-and-development/advice-to-planning-authorities-for-planning-applications-affectingphosphorus-sensitive-river-special-areas-of-conservation/?lang=en>

<sup>103</sup> <https://naturalresources.wales/guidance-and-advice/business-sectors/planning-and-development/ourrole-in-planning-and-development/advice-to-planning-authorities-for-planning-applications-affectingphosphorus-sensitive-river-special-areas-of-conservation/?lang=en>

**Commented [A60]:** If the conditions were tightened for the improvement of the SAC only, there would be no benefit to allow reduction from development. The tightening of conditions would need to go further to allow this

contained in section 4 of this document. In summary, the budget considers all residential development (allocations, windfalls and LDP commitments without approved drainage conditions), accounts for the spatial distribution of growth and calculates the total increase in phosphorus from new development.

**Commented [A61]:** Does it include LDP commitments that still need Reserved Matters approval?

#### Step 2 – Phosphorus Mitigation

- 5.1.32 Based on this budget, this document (also section 4) confirms that potential Category 1 mitigation options are available in practice and can be delivered in the plan period. The range of mitigation options include but are not limited to; source control, SuDS, swales, infiltration, retention, buffer zones and tree planting (see section 4.3).
- 5.1.33 The Councils will draw from these potential Category 1 measures to provide a package of detailed mitigation measures for delivery via the DCS. An estimate will be produced of the potential phosphorus reduction predicted for each intervention. The package of selected interventions will provide the level of phosphorus reduction needed to balance the increase in phosphorus expected from planned LDP development and achieve neutrality or, where possible, betterment.
- 5.1.34 The measures in the DCS will be fully costed and include actual implementation of measures (i.e. costs to actually do the work), staff resource to oversee and co-ordinate implementation, compensation to land owners where measures involve a change of use, land acquisition costs (if required), monitoring of effectiveness of measures and the long term (in perpetuity) maintenance and management of mitigation. It will be for the DCS to expand on the range of costs associated with mitigation.
- 5.1.35 Consequently, the DCS will determine a total cost for delivery of the phosphorus reduction interventions necessary to achieve phosphorus neutrality required for the planned LDP housing growth. With a phosphorus budget and a cost for the mitigation measures, the DCS can express the costs in a figure similar to £/phosphorus kg mitigated.

**Commented [A62]:** 4.4?

#### Step 3 – apportion mitigation cost to development

- 5.1.36 We now need a mechanism by which the phosphorus load from development can be calculated so the cost of mitigation can be apportioned according to how much phosphorus the proposal generates for example:
- 5.1.37 Contribution (£) = P load to river (Kg phosphorus) arising from a development x £/kg phosphorus mitigation required for the development (from step 2)
- 5.1.38 There are examples from other Local Authorities in England dealing with phosphorus and nitrate pollution showing how costs of mitigation could be apportioned to development. It will be a matter for the DCS to determine which approach is most appropriate for development coming forward in the County Borough. The point now is to demonstrate that appropriating costs to development is practicable, the examples are:
- North West Leicestershire District Council (River Mease) have a DCS that assigns mitigation costs based on the number of dwellings and size of dwellings (number of bedrooms)<sup>104</sup>. The LPA agreed standard assumptions with, in this case Environment

**Commented [A63]:** Wrexham & Flintshire

<sup>104</sup> [https://www.nwleics.gov.uk/pages/developments\\_within\\_the\\_catchment\\_area\\_of\\_the\\_river\\_mease\\_special\\_area\\_of\\_conservation](https://www.nwleics.gov.uk/pages/developments_within_the_catchment_area_of_the_river_mease_special_area_of_conservation)

Agency/Natural England, on the levels of phosphorus arising from residential housing (similar to section 4 of this document);

- Havant Borough Council requires developers to complete a phosphorus calculator for their proposal<sup>105</sup> calculating the phosphorus load unique to the site. The phosphorus calculator would be a standard template for all development and approved by the Council in consultation with NRW.

5.1.39 The former approach is simple to understand and apply across all residential development regardless of site size or site specific issues. A charge based on dwellings and bedrooms gives developers certainty about the level of charge that can be expected. The charges would be set out in a table similar to this:

Size of Dwelling	Average Occupancy	DCS Contribution
1 bed	X	£
2 bed	X	£
3 bed	X	£
4 bed +	x	£

5.1.40 The Havant approach is more responsive to site specific circumstances i.e. there could be site-specific issues where mitigation is lower/higher or harder/easier to achieve than with a simplified model such as that used in the River Mease. But the Havant option could be more complex for a developer who would need to supply a phosphorus budget calculation for the site (though the concept of a phosphorus calculator on a catchment basis is currently being considered by NRW).

5.1.41 In both options, the Council reviews the submitted appropriate assessments and confirms whether there is a phosphorus budget for the scheme (checks records of permissions granted against the phosphorus mitigation budget). The LPA consult NRW on the appropriate assessment and must have regard to NRW's advice in determining the application.

#### *Phosphorus Budget Monitoring*

5.1.42 It will be necessary to manage and monitor phosphorus budgets during the course of the LDP to ensure sufficient mitigation is still available. For many reasons additional phosphorus budgeting could be required e.g. permissions are allocated a budget but permissions are not commenced/completed, housing delivery exceeds LDP delivery schedule or more information is known about the effectiveness of mitigation measures. Monitoring will give advance notice if there is a need to release additional mitigation measures in an updated DCS. It might be appropriate to manage mitigation in development 'windows' matching the LDP delivery schedule, this is a matter to be determined in preparing the DCS.

#### *Bespoke Solution*

5.1.43 The purpose of the DCS is to provide a strategic approach to mitigation that facilitates the delivery of new development within the catchment. The DCS does not preclude the local authority deciding to assess a particular individual planning application independently. Equally,

<sup>105</sup> <https://www.havant.gov.uk/nutrient-neutrality-what-developers-need-know>

when making an application, a developer could ask the authority to assess the application separately from the DCS. The planning authorities remain committed to considering any bespoke mitigation proposals put forward on a case by case basis.

#### *Contributions from non-residential development*

5.1.44 The contributions from non-residential development will be calculated on a case by case basis in light of the estimated increased phosphorus loading to the river. In turn this is calculated from the estimated volume of wastewater to mains associated with the nature and scale of the development being proposed whereby:

$$\text{Contribution (£)} = \text{P load to river* (mg/day)} \times \text{TBC}$$

#### *Timing and Phasing of Mitigation*

5.1.45 For the DCS to mitigate the negative effects of development, it is important that the reduction measures are implemented in a timely manner which reflects the rate at which development comes forward ([i.e. the need to be in place and operating before the impact occurs](#)). In the case of larger scale development, phased payment can be negotiated with the LPA on a case by case basis as appropriate.

5.1.46 Note, the delivery of mitigation could constrain the timely delivery of development, however, there are short term options. While these may not be sustainable solutions, they could provide a stopgap solution subject to ensuring the longer-term solutions are delivered and are effective.

5.1.47 Planning obligation funding will be pooled to deliver any of the mitigations within the DCS range of measures. The LPA will allocate funding to the measures in order to ensure sites can be delivered in phase with the occupation of the proposals.

#### *Uncertainty and the Precautionary Principle*

5.1.48 Strategic approaches to phosphorus mitigation to facilitate local development plans at a strategic level is fraught with uncertainties. Furthermore, due to the nature of the available measures, the complexities of working within a dynamic riverine ecosystem, estimates of phosphorus reductions are based on the best available information and expert judgement.

5.1.49 While phosphorus reduction values for each measure will be estimated by relevant experts, a degree of uncertainty is still unavoidable. If the DCS is to ensure effective mitigation and compliance with the Habitats Regulations these uncertainties can be addressed in the following ways:

1. Relevant experts taking a precautionary approach to the estimated reductions that will be associated with each measure, such that achieving a greater reduction than anticipated is more likely than achieving less.
2. Secondly, whilst being reasonable, the estimates of phosphorus load from new development remain precautionary in light of recent monitoring data of actual effluent quality.
3. Thirdly, where feasible, ongoing monitoring of measures to best assess the actual reductions achieved upon implementation is an integral part of the DCPRS, together with monitoring of the final effluent to calculate the actual P load associated with the

additional flow. The DCPRS is a live document; the milestones include actual improvements to water quality from mitigation, any evidence which identifies a failure in the mitigation measures to achieve the planned phosphorus reduction from development can inform later revisions to the strategy to provide additional measures.

## 5.2 Additional sources of funding

- 5.2.1 Whilst Category 1 measures are intended to mitigate for the increase in phosphorus from the development allocated in the Local Development Plan, Category 2 measures delivered throughout the freshwater Dee catchment are required to achieve the conservation objectives for the River Dee and Bala Lake SAC and thereby restore and maintain it in favourable condition. Category 2 measures will be delivered by public bodies and stakeholders and require funding for both resource (revenue) and physical interventions (capital).
- 5.2.2 Funding sources are usually allocated on an annual basis and it is therefore not possible to detail the amounts of funding available from a specific source or the amount allocated to Category 2 measures from that fund. It can be assumed however that all sources of funding detailed in this section are significant amounts or will be of significant benefit. The details of the funding are based on previous years of funding being available, known funding for the next one to three years and expected funding beyond this.
- 5.2.3 The sources of funding below have been listed in two sections: (i) Revenue (resource) and Capital (physical interventions) and (ii) Revenue only. Both sections are listed separately for Natural Resources Wales and 'other stakeholders'.

### *Revenue and Capital*

- 5.2.4 The following section details funding available for physical catchment measures and the resource required to bring about their implementation in the freshwater Dee catchment.

#### **Natural Resources Wales**

**Welsh Government Grant In Aid** – this funding is available to deliver measures in Sites of Special Scientific Interest (SSSI) and Special Areas of Conservation (SAC) in order to move the designated species and habitats closer to 'favourable' status. In 2021, this funding was an annual Biodiversity & Ecosystem Fund and from 2022 will become a 'multiyear' fund.

**Welsh Government Strategic Allocated Funding** – provides funding for a five-year plan for the improvement of fish and fish habitat in Wales. This fund is being used in the Dee catchment and is in the second year of five. The work undertaken includes catchment measures which reduce nutrient input to watercourses.

**Alternative Mitigation** funding is available as a result of the construction of Celyn Reservoir and the loss of fish habitat that resulted. The work undertaken to improve fish habitat includes measures to reduce nutrient input to watercourses.

<p><b>European Sustainable Fisheries Funding</b> – this is available for annual ad-hoc bids for specific projects and includes catchment measures to reduce nutrient input to watercourses.</p>
<p>EU funding was granted for the <b>LIFEDeeRiver Project</b> to deliver the restoration of freshwater features in River Dee and Bala Lake/Afon Dyfrdwy a Llyn Tegid SAC. This project is funded until the end of 2024 and includes reducing nutrient input to the watercourses through providing advice and guidance to farmers and catchment measures.</p>
<p><b>Welsh Government Water Quality Capital Fund</b> – this is used to fund improvements in water quality such as reducing nutrients for Water Framework Directive (WFD) targets and in 2021, £1.8m was available for such work.</p>

#### Other Stakeholders

<p><b>Dwr Cymru Welsh Water (DCWW)</b> receive funding via their customer bills through a five-year program called Asset Management Plan. This multi-million-pound funding includes improvements to sewage treatment works and storm overflows resulting in a reduced amount of phosphorus entering the watercourses. The drivers for this can include WFD and Habitats Directive (SAC) targets.</p>
<p><b>DCWW</b> have made available the Environment Fund which aims to provide financial support to projects that will benefit and enhance biodiversity at or near DCWW sites. <b>DCWW</b> are also enabling third party funded wetlands whereby effluent at DCWW sewage treatment works is directed to a wetland to garner additional polishing for P removal. Note – this is currently in England only</p>
<p><b>Hafren Dyfrdwy</b> will be exploring whether there are wider catchment management opportunities that can pursued across our whole water supply area in the Wrexham area / Dee catchment. This may lead to measures which reduce phosphorus input.</p>
<p><b>United Utilities</b> are currently investigating sources of turbidity in the Dee catchment in order to improve the quality of water upstream of their abstraction points. By improving turbidity, there would be a decrease in suspended solids in the watercourses and this in turn would reduce the amount of phosphorus present. The output of this investigation will help form the approach for AMP8, utilising the recommendations coming from the investigation to look to develop in partnership with NRW and EA a delivery plan to work with land managers and owners in AMP 8 (2025-2030) to reduce turbidity in the River Dee.</p>
<p><b>Welsh Government</b> continues to provide multi million pounds of funding to farmers in Wales to deliver positive environmental outcomes, including reducing nutrients entering watercourses. Funding is also provided to Farming Connect who provide advice and guidance to farmers on reducing nutrient run-off.</p>
<p><b>Denbighshire County Council</b> have received funding for the appointment of a catchment officer until May 2023. This role includes the delivery of water quality improvement opportunities in the Dee.</p>
<p><b>Wrexham County Borough Council</b> receive funding through Welsh Governments Local Places for Nature. Any projects must demonstrate a benefit for biodiversity. However, this funding is not</p>

**Third Sector Organisations** (e.g. members of the Middle Dee Partnership) may receive funding from stakeholders listed above and may also seek funding from other funding sources that exist. For example, Landfill Tax Communities Scheme includes a focus on biodiversity and such schemes could result in reduced inputs of nutrients to watercourses. It is not possible to predict future bids for funds from such organisations, what funding will be available in future years or eligibility criteria, but it is worth noting that such funding could bring about significant benefits. guaranteed in the future.

**Environment Agency** and their external catchment partners can bid into the DEFRA Water Environment Investment Fund for WFD outcomes. This fund can contribute to achieving statutory water body objectives. Note – this funding is only available in England.

#### Revenue Only

#### Natural Resources Wales

**Welsh Government** fund the **NRW** Dairy Project across Wales which employs officers to visits dairy farms including the Dee catchment to give advice and guidance on ways of minimising agricultural pollution.

**Welsh Government** provide funding for a Nature Network Fund and this has provided **NRW** resource in other SAC catchments to carry out investigations and visits to reduce nutrient inputs into the watercourses. NRW will seek funding for future work in the Dee catchment.

**NRW** will carry out regulatory compliance visits to farms in the Dee catchment and this includes working to reduce agricultural nutrients entering watercourses.

**NRW** will carry out regulatory compliance audits at permitted water discharge sites ensuring that nutrients entering watercourses are in compliance with permit conditions.

**NRW** will carry out regulatory compliance visits at permitted water abstraction and impoundment sites ensuring that the required river flows and dilution continues.

**NRW** will respond to reports of pollution incidents or sites without relevant permits in the Dee catchment and ensure their response minimises the input of nutrients to the catchment.

**NRW** will respond to consultations such as permit applications in order to minimise the addition of any additional nutrients.

**NRW** will provide advice to Local Planning Authorities, in order to ensure that development (including associated wastewater discharges) does not have an adverse effect on the integrity of the River Dee and Bala Lake SAC.

#### Other Stakeholders

**Local Authorities** will work to resolve misconnections in the catchment.

**DCWW** will continue to educate customers regarding the flushing of inappropriate items into the sewer which then leads to sewer blockages and discharges to the watercourse.

### 5.3 Pathway to achieve targets and associated milestones

- 5.3.1 The strategy milestones are defined dates for certain tasks or actions to have been completed or delivered. Milestones are necessary to ensure that work to implement the DCPRS is progressing in a timely manner. The milestones are of central importance as policies NE6 of the Wrexham Local Development Plan and EN15 of the Flintshire Local Development Plan render the release of development provided for within the Local Development Plans conditional upon these milestones being met. The milestones will therefore serve to constrain or delay the delivery of development provided for within the plans to the extent necessary to ensure that adverse effects on the integrity of the River Dee and Bala Lake SAC are avoided. Adverse effects will be avoided where delivery and maintenance of category 1 measures through the DCPRS ensures that development will not generate additional phosphorus loading to the SAC.
- 5.3.2 This strategy is a live document, and, in any version, the milestones reflect the level of detail available at the time. In particular the level of detail available in sections 4.4 and 4.5 regarding the category 1 and 2 measures which will be implemented through the strategy. At the time of writing the category 1 and 2 measures for delivery have not yet been defined and **the milestones will be updated with increasing specificity once further detail is available.**
- 5.3.3 The nature of the mitigation measures to be delivered is such that it is anticipated that 'development windows' will be agreed. These will be defined on the basis of the timetable for delivery of specified mitigation measures and the phosphorus reductions which will be secured. This will ensure that occupation of development occurs in accordance with the delivery of necessary mitigation measures.

Table 5.1 – Delivery Milestones		
Milestone	Description and justification	Date
First meeting of Technical Officer Group	Work to begin to identify and agree the list of <a href="#">cat 2</a> measures for delivery.	By end Dec 2021
First meeting of Nutrient Management Board and agreement of Terms of Reference	Subsequent milestones will be dependent upon the operation of the Nutrient Management Board. Initial meeting will be important to maintain momentum and start work on implementation.	By end Jan 2022
Appoint Project Officer (and any additional staff resource identified)	Staff resource will be necessary to co-ordinate the delivery of DCPRS measures.	End Jan 2022
Finalise mechanism for collection of developer contributions	This will be necessary before applications for development are determined.	End Feb 2022

**Commented [A64]:** Could add extra column to id who is responsible.

**Commented [A65]:** Dates will needs updating

**Commented [A66]:** Need to specify this is for cat 2 measures only. The Tech Group will not deliver cat 1 measures.

Category 1 (short-term) measures list to be finalised and quantified.	The category 1 (short term) list will comprise measures which can be prioritised according to implementation timescales. Short-term category 1 measures are concerned with securing a reduction in phosphorus levels in the short term to allow the release of development once the Local Development Plans have been approved for adoption by their respective Councils.	End March 2022
Agree first development window	Having quantified the reductions from category 1 (short-term) measures it will be possible to define the first 'development window' to phase the release of development accordingly.	End March 2022
Category 1 (short-term) delivery commenced	Delivery of short term measures will need to have commenced before development provided for within the first development window starts to be delivered and occupied (i.e. before flows connect to WWTW). Release of further development within the first 'window' will be dependent on sufficient measures to neutralise additional phosphorus being operational and effective. N.B. Commenced means that <u>at least</u> one measure is operational and effective.	End June 2022
Category 1 (long-term) measures list to be finalised and quantified.	The long-term measures list must be sufficient to ensure that the suite of measures delivered under category 1 (i.e. short-term and long-term measures) will avoid any adverse effects to the integrity of the SAC as a result of development provided for within the plan.	End Oct 2022
Agree second development window	Having quantified the reductions from category 1 (long-term) measures it will be necessary to phase the release of development according to the timetable for delivery.	End Oct 2022
Category 2 measures list to be finalised	The category 2 measures will be identified alongside the category 1 measures to avoid risks that category 1 measures will 'use up' measures which might otherwise be delivered to secure overall reductions in phosphorus.	End Oct 2022
Category 1 (short-term) delivery complete	Category 1 (Phase 1) measures will be delivered and effective within 6 months and will allow the first development window to be fully released.	End Dec 2022
Category 1 (long-term) delivery commenced	Long term measures will need to be in place before development provided for within the second development window comes forward (i.e. before flows connect to WWTW).	End Feb 2023

**Commented [A67]:** Clarity required on definition of 'short-term' – does this describe a temporary measure or one that can be installed quickly (and maintained in the longterm?)

**Commented [A68]:** This is an important milestone. Please can you check that the timelines align i.e. that the Cat 2 measures will be identified alongside the Cat 1 measures.

Category 1 (long-term) delivery complete	Date TBC when measures identified and delivery timetable agreed.	TBC
Agree release of all further development within plan	Once all category 1 measures are implemented and effective, the need for development windows will have passed and further development can be released. Date TBC when measures identified and delivery timetable agreed.	TBC

#### 5.4 Provisions for Monitoring and Review

- 5.4.1 Monitoring of delivery against the section 5.3 milestone is of central importance. The delivery of development provided for within the plans is conditional upon the milestones being met; all development will be subject to project level HRA which will provide a legal mechanism to ensure sufficient constraint. Beyond delivery of the milestones themselves monitoring of water quality within the SAC will also be necessary to provide confidence that the strategy is meeting its objectives.
- 5.4.2 This strategy is a live document and the details regarding monitoring of delivery against the milestones will reflect the level of detail available at the time of writing. In particular the level of detail available in sections 4.4 and 4.5 regarding the category 1 and 2 measures which have been identified to be taken forward for delivery through the strategy. The nature, scale, location of individual measures and the anticipated phosphorus reductions to be achieved will all be influential in how the delivery of the milestones will be monitored.
- 5.4.3 In this current version of the strategy the detail as to the precise location of measures to be delivered is not yet available this monitoring section establishes principles to which future monitoring approaches should adhere.
- 5.4.4 The Habitats Regulations Assessment Handbook provides guidance on the use of monitoring to inform compliance under the Habitats Regulations. Relevant extracts from section E.18 'Monitoring' are provided in Box 5.1.

**Box 5.1: Extracted text from section E.18 'Monitoring' of the Habitats Regulations Assessment Handbook**

There will be times when a competent authority and / or project proposers choose to monitor the effects of a project, or the effects or effectiveness of mitigation measures. This will usually be to provide an improved understanding of these effects to better design and calibrate mitigation in future, or to otherwise better understand effects, so that less reliance has to be placed on the precautionary principle in decision making. This kind of monitoring can lead to a more effective use of limited resources or reductions in project costs because mitigation is better tailored to case or site-specific circumstances...

.... monitoring can be useful, and will sometimes be necessary, either to ensure compliance (compliance or enforcement monitoring); or as a part of a package of mitigation or compensatory measures for the purposes of validation or to provide early warning during the implementation of plans or projects. We therefore recognise at least three types of monitoring relevant to Habitats Regulations Assessment, described in turn below:

- i. Compliance monitoring
- ii. Validation monitoring
- iii. Early warning monitoring

Monitoring needs to be purposeful and carefully designed to achieve its objectives. This is likely to involve the competent authority, in consultation with the project proposer and statutory nature conservation body, considering the following points:

- Why monitor? – Why is monitoring being considered? In what way will the monitoring enable the competent authority to move closer to reaching their decision, or be relevant to the conditions or restrictions that might be imposed on any consent granted, or be relevant to future decisions or the implementation of a plan?
- What needs to be monitored? – What aspect(s) of the [plan] is potentially being considered for monitoring? Is it the way the [plan] is to be carried out, or its effects or the effects and effectiveness of the mitigation (or compensatory) measures?

- How should it be monitored? - Is there is a reliable and appropriate monitoring approach in relation to the effect being considered? In some cases the effects may be of a nature and scale which may be difficult to reliably monitor with the necessary confidence.
- When and for how long should it be monitored? – when should monitoring start and how long will the monitoring be required for, when will it be reviewed, what factors will indicate that monitoring may no longer be needed?
- Who will undertake, report and check the monitoring? – Who will be responsible for undertaking the monitoring and for the analysis and interpretation of the data? Whilst the [plan] proposer will generally be responsible for collecting and presenting the data, the ongoing review of the information and decisions as to the implications for the findings would be likely to involve the competent authority, advised by the statutory nature conservation body.

5.4.5 With reference to Box 5.1, the monitoring of the DCPRS will involve both 'compliance monitoring' and also 'early warning monitoring'. The HRA Handbook provides the following further explanation against each of these monitoring approaches in E.18.2 and E.18.4.

*'Compliance monitoring will normally fall to be undertaken by the competent authority. It is put in place to ensure that measures proposed, prescribed or imposed in order to mitigate effects on the qualifying features of European sites are complied with and if necessary to enforce against any breaches.'*...

*...The role of early warning monitoring as a mitigation measure is in preventing adverse effects on site integrity from occurring and therefore enabling a competent authority to authorise or undertake a [plan] in accordance with the integrity test. The competent authority may authorise the [projects provided for by the plan] if such a set of monitoring and follow-up measures:*

- a) is able to adequately monitor the effects of the project and, before any adverse effects to site integrity can occur;*
- b) will alert the competent authority and project proposer to the possibility that adverse effects will or may occur if nothing else is done; and*
- c) then require the project manager to implement the follow-up measures, which may include either:
  - i. an automatic trigger to implement previously determined measures; or*
  - ii. a procedure for review and agreement as to the action to be taken in respect of new, different or greater measures, previously identified as options, or which reflect recent improvements in best available technology;**and in either case, which when implemented;**
- d) will prevent the project from adversely affecting the integrity of the site.*

5.4.6 Compliance monitoring will be undertaken through the delivery of milestones set out in section 5.3 above. Early-warning monitoring will involve monitoring the effectiveness of the measures relied upon to avoid adverse effects to the SAC. Should monitoring indicate that measures relied upon to avoid adverse effects are not effective additional category 1 measures can be identified and delivered. The approach to such monitoring will be agreed when further details as to the category 1 and 2 measures are available.

# APPENDICES

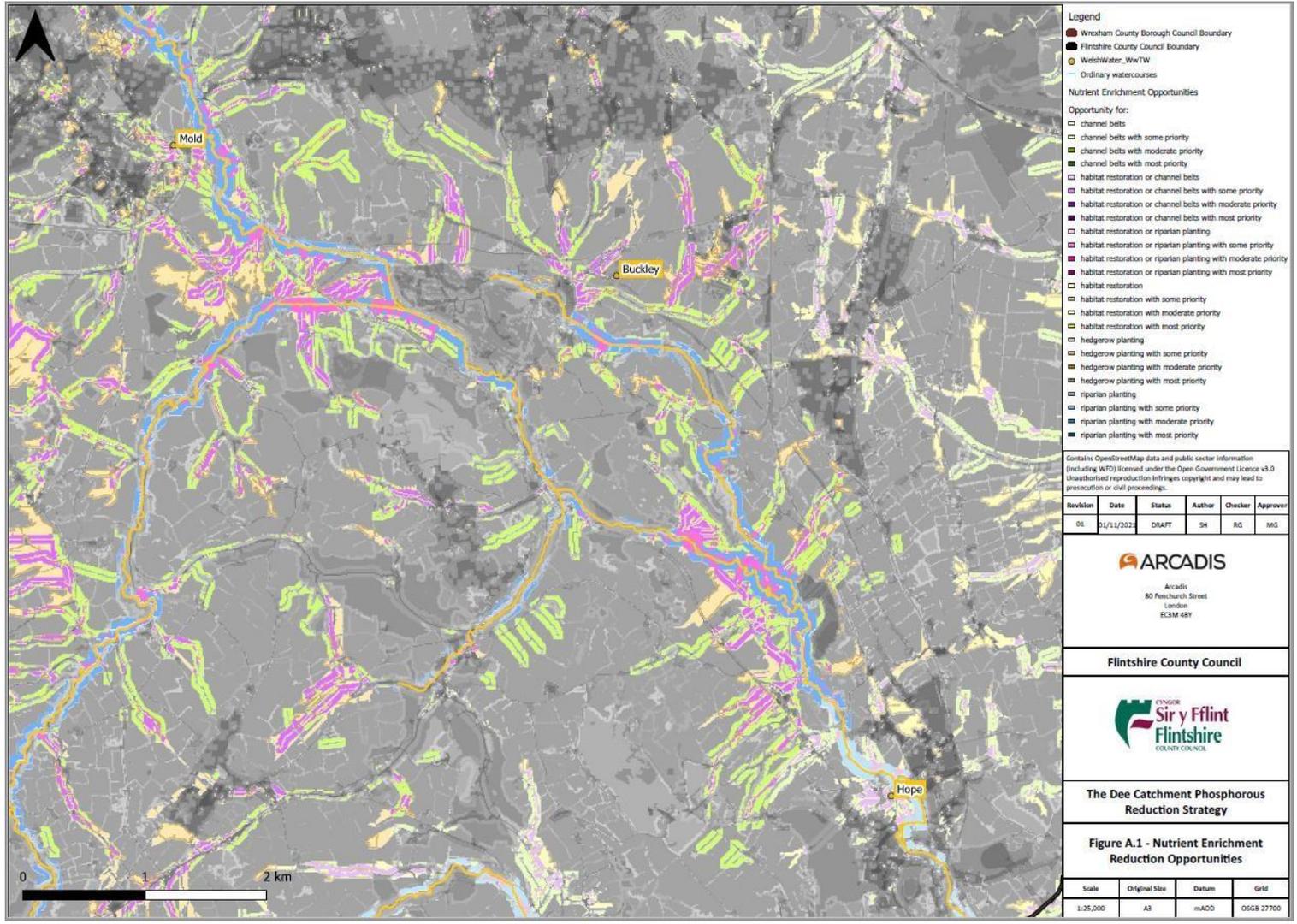
APPENDIX A: INSETS A1-A4 FROM FIGURE 3.11

APPENDIX B: INSETS B1-B4 FROM FIGURE 3.12

APPENDIX C: PRELIMINARY EXAMPLE LOCATIONS FOR WETLANDS

APPENDIX D: PRELIMINARY EXAMPLE LOCATIONS FOR ~~OTHER~~ CATEGORY 2 MEASURES

APPENDIX E: TERMS OF REFERENCE FOR RIVER WYE NUTRIENT MANAGEMENT BOARD



- Legend**
- Wrexham County Borough Council Boundary
  - Flintshire County Council Boundary
  - WelshWater\_WwTW
  - Ordinary watercourses
- Nutrient Enrichment Opportunities**
- Opportunity for:**
- channel belts
  - channel belts with some priority
  - channel belts with moderate priority
  - channel belts with most priority
  - habitat restoration or channel belts
  - habitat restoration or channel belts with some priority
  - habitat restoration or channel belts with moderate priority
  - habitat restoration or channel belts with most priority
  - habitat restoration or riparian planting
  - habitat restoration or riparian planting with some priority
  - habitat restoration or riparian planting with moderate priority
  - habitat restoration or riparian planting with most priority
  - habitat restoration
  - habitat restoration with some priority
  - habitat restoration with moderate priority
  - habitat restoration with most priority
  - hedgerow planting
  - hedgerow planting with some priority
  - hedgerow planting with moderate priority
  - hedgerow planting with most priority
  - riparian planting
  - riparian planting with some priority
  - riparian planting with moderate priority
  - riparian planting with most priority

Contains OpenStreetMap data and public sector information (including WFD) licensed under the Open Government Licence v3.0. Unauthorised reproduction infringes copyright and may lead to prosecution or civil proceedings.

Revision	Date	Status	Author	Checker	Approver
01	31/11/2021	DRAFT	SH	RG	MG

**ARCADIS**

Arcadis  
80 Fenchurch Street  
London  
EC3M 4BY

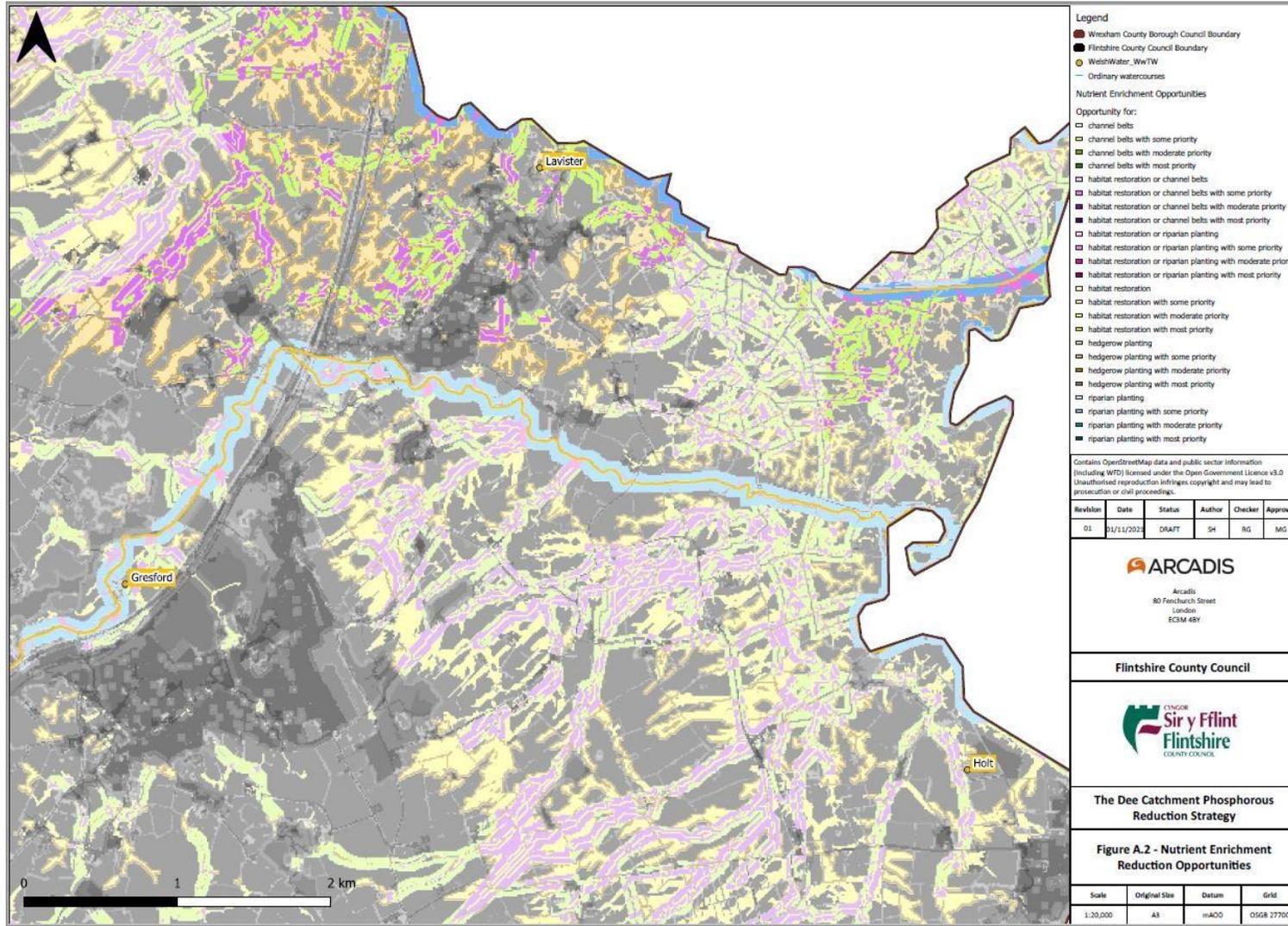
**Flintshire County Council**

**Sir y Fflint**  
COUNTY COUNCIL

**The Dee Catchment Phosphorous Reduction Strategy**

**Figure A.1 - Nutrient Enrichment Reduction Opportunities**

Scale	Original Size	Datum	Grid
1:25,000	A3	mAOD	OSGB 2700



- Legend**
- Wrexham County Borough Council Boundary
  - Flintshire County Council Boundary
  - WebWater\_WwTW
  - Ordinary watercourses
- Nutrient Enrichment Opportunities**
- Opportunity for:
- channel belts
  - channel belts with some priority
  - channel belts with moderate priority
  - channel belts with most priority
  - habitat restoration or channel belts
  - habitat restoration or channel belts with some priority
  - habitat restoration or channel belts with moderate priority
  - habitat restoration or channel belts with most priority
  - habitat restoration or riparian planting
  - habitat restoration or riparian planting with some priority
  - habitat restoration or riparian planting with moderate priority
  - habitat restoration or riparian planting with most priority
  - habitat restoration
  - habitat restoration with some priority
  - habitat restoration with moderate priority
  - habitat restoration with most priority
  - hedgerow planting
  - hedgerow planting with some priority
  - hedgerow planting with moderate priority
  - hedgerow planting with most priority
  - riparian planting
  - riparian planting with some priority
  - riparian planting with moderate priority
  - riparian planting with most priority

Contains OpenStreetMap data and public sector information (including WFD) scanned under the Open Government Licence v3.0. Unauthorised reproduction infringes copyright and may lead to prosecution or civil proceedings.

Revision	Date	Status	Author	Checker	Approver
01	31/11/2025	DRAFT	SH	RG	MG

**ARCADIS**

Arcadis  
80 Fenchurch Street  
London  
EC3M 4BF

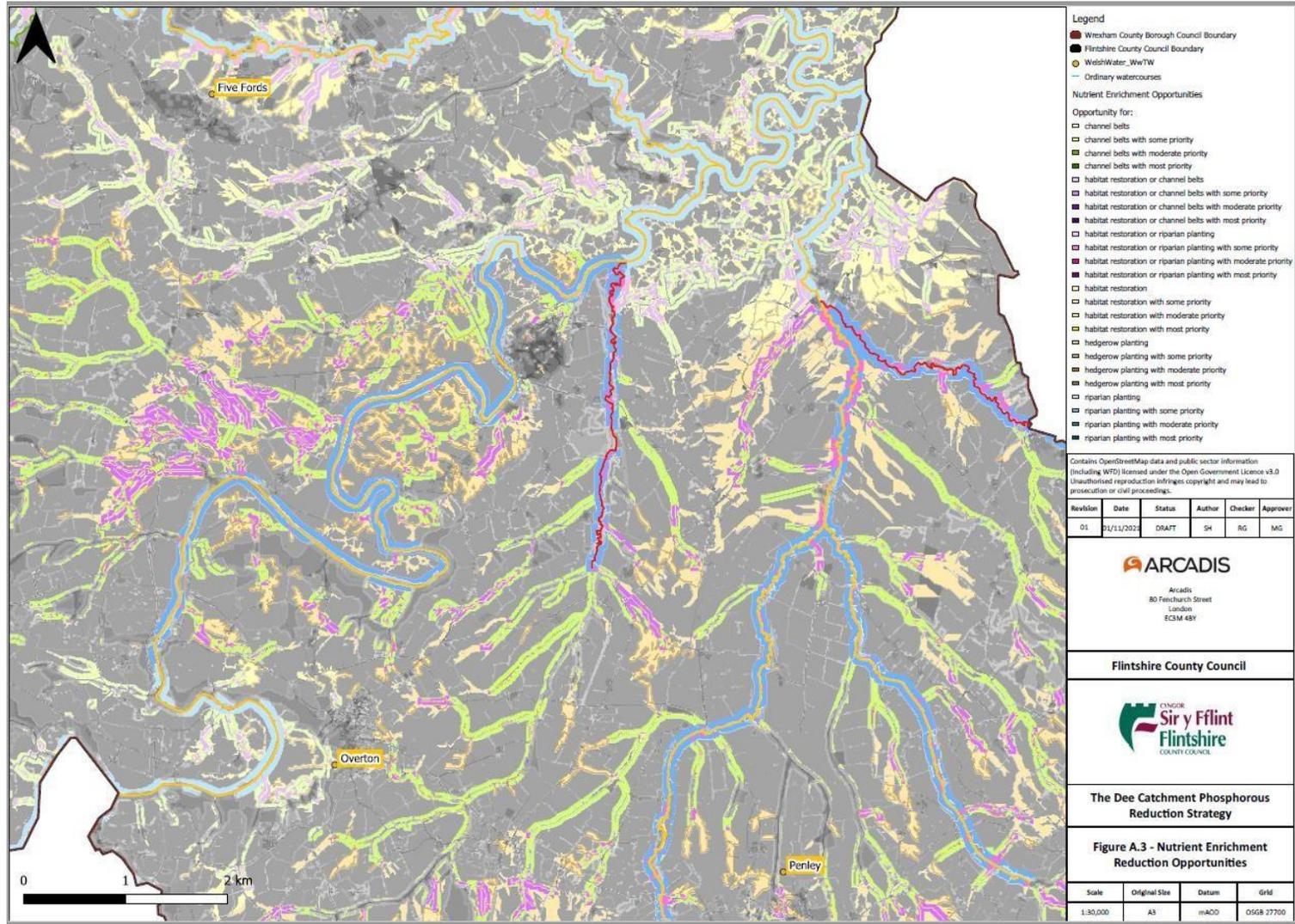
Flintshire County Council

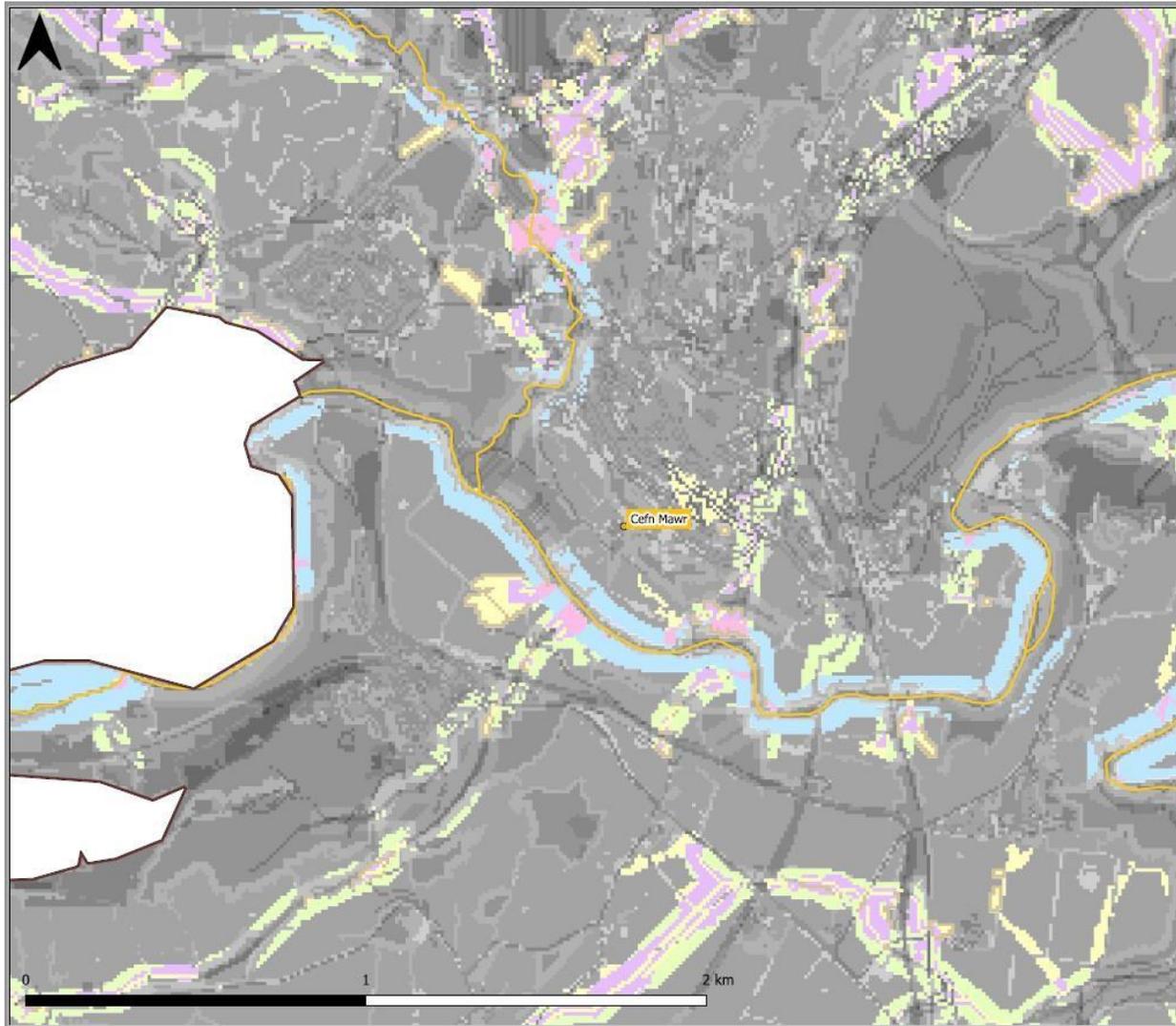
**Sir y Fflint**  
Flintshire  
COUNTY COUNCIL

The Dee Catchment Phosphorous Reduction Strategy

**Figure A.2 - Nutrient Enrichment Reduction Opportunities**

Scale	Original Size	Datum	Grid
1:20,000	A3	mADO	OSGB 27700





**Legend**

- Wrexham County Borough Council Boundary
- Flintshire County Council Boundary
- WelshWater\_WwTW
- Ordinary watercourses

**Nutrient Enrichment Opportunities**

Opportunity for:

- channel belts
- channel belts with some priority
- channel belts with moderate priority
- channel belts with most priority
- habitat restoration or channel belts
- habitat restoration or channel belts with some priority
- habitat restoration or channel belts with moderate priority
- habitat restoration or channel belts with most priority
- habitat restoration or riparian planting
- habitat restoration or riparian planting with some priority
- habitat restoration or riparian planting with moderate priority
- habitat restoration or riparian planting with most priority
- habitat restoration
- habitat restoration with some priority
- habitat restoration with moderate priority
- habitat restoration with most priority
- hedgerow planting
- hedgerow planting with some priority
- hedgerow planting with moderate priority
- hedgerow planting with most priority
- riparian planting
- riparian planting with some priority
- riparian planting with moderate priority
- riparian planting with most priority

Contains OpenStreetMap data and public sector information (including WFD) licensed under the Open Government Licence v3.0. Unauthorised reproduction infringes copyright and may lead to prosecution or civil proceedings.

Revision	Date	Status	Author	Checker	Approver
01	31/11/2024	DRAFT	SH	RG	MG

**ARCADIS**  
 Arcadis  
 80 Fenchurch Street  
 London  
 EC3M 4BY

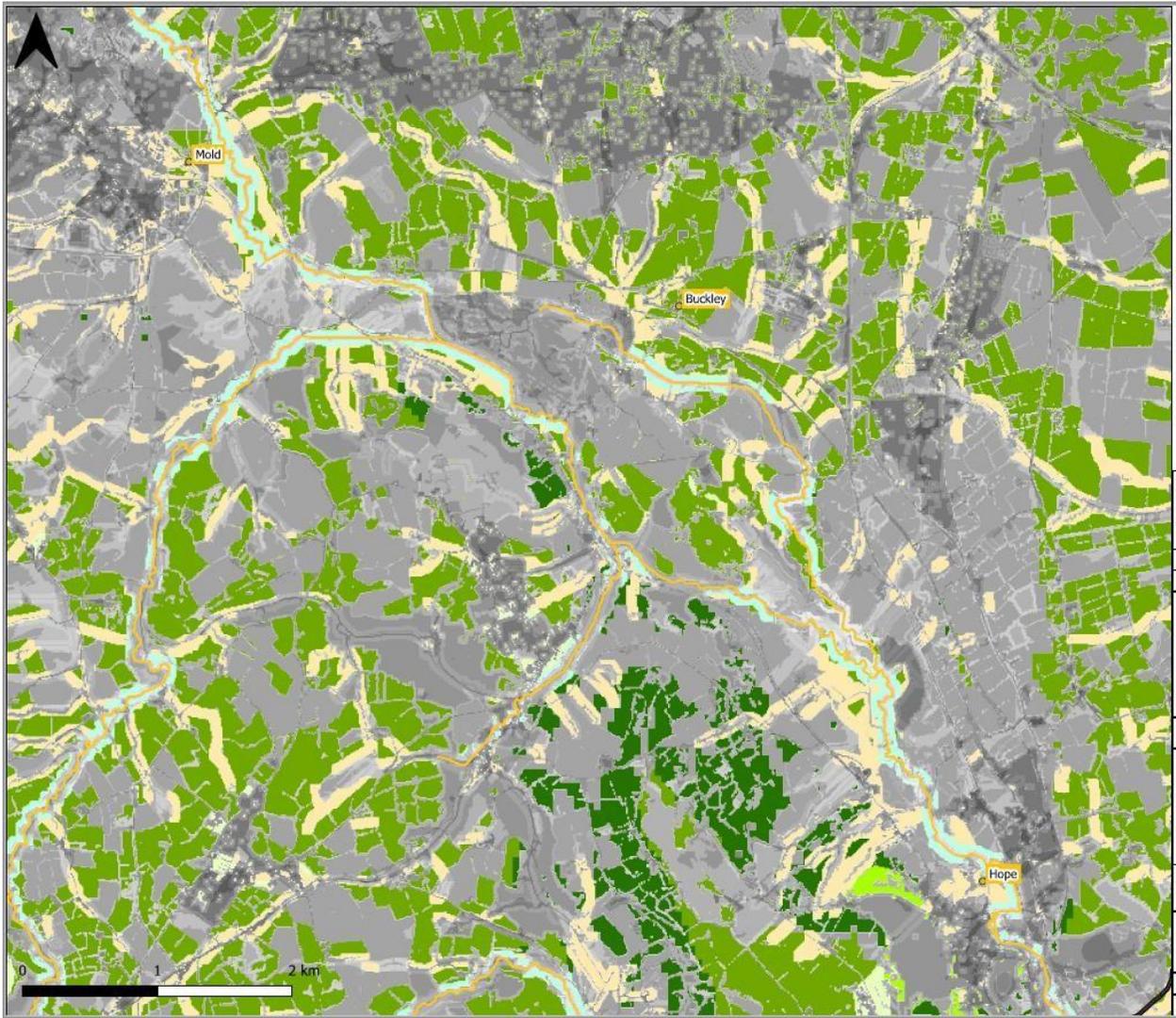
**Flintshire County Council**

**Sir y Fflint**  
 Flintshire  
 COUNTY COUNCIL

**The Dee Catchment Phosphorous Reduction Strategy**

**Figure A.4 - Nutrient Enrichment Reduction Opportunities**

Scale	Original Size	Datum	Grid
1:10,000	A3	WAD	OSGB 27700



**Legend**

- Wrexham County Borough Council Boundary
- Flintshire County Council Boundary
- WelshWater\_WwTW
- Ordinary watercourses

**NRW WFD River waterbodies Overall Status**

- Good
- Moderate
- Poor

**Nutrient Enrichment Opportunities**

Opportunity for:

- fencing
- tree planting
- tree planting with fast growth
- tree planting with extra conditions
- tree planting with fast growth and extra conditions
- riparian woodland planting

Contains OpenStreetMap data and public sector information (including WFD) licensed under the Open Government Licence v3.0  
 Unauthorized reproduction infringes copyright and may lead to prosecution or civil proceedings.

Reviser	Date	Status	Author	Checker	Approver
01	01/11/2022	DRAFT	SH	RG	MG

**ARCADIS**  
 Arcadis  
 80 Fenchurch Street  
 London  
 EC3M 4BY

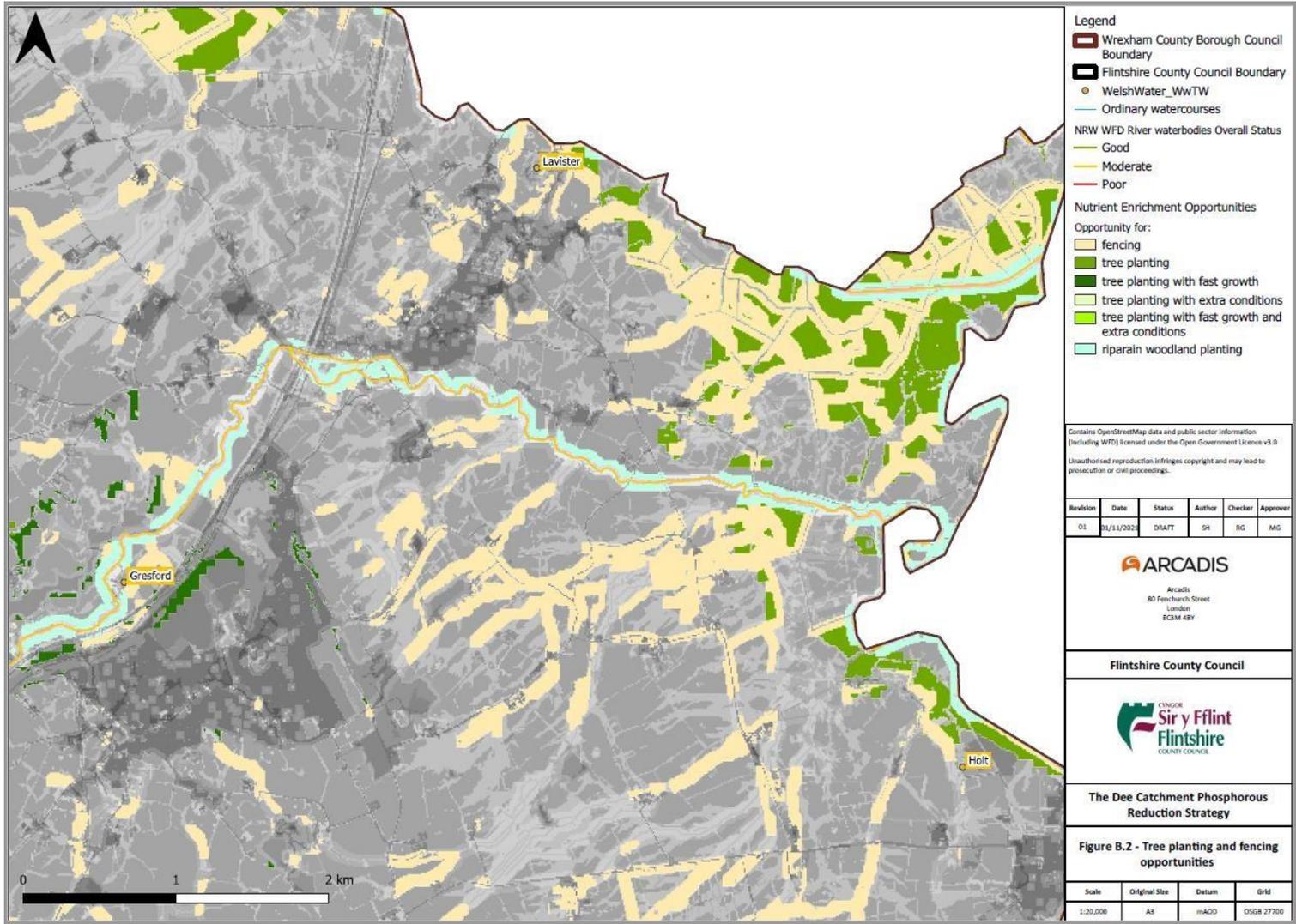
Flintshire County Council

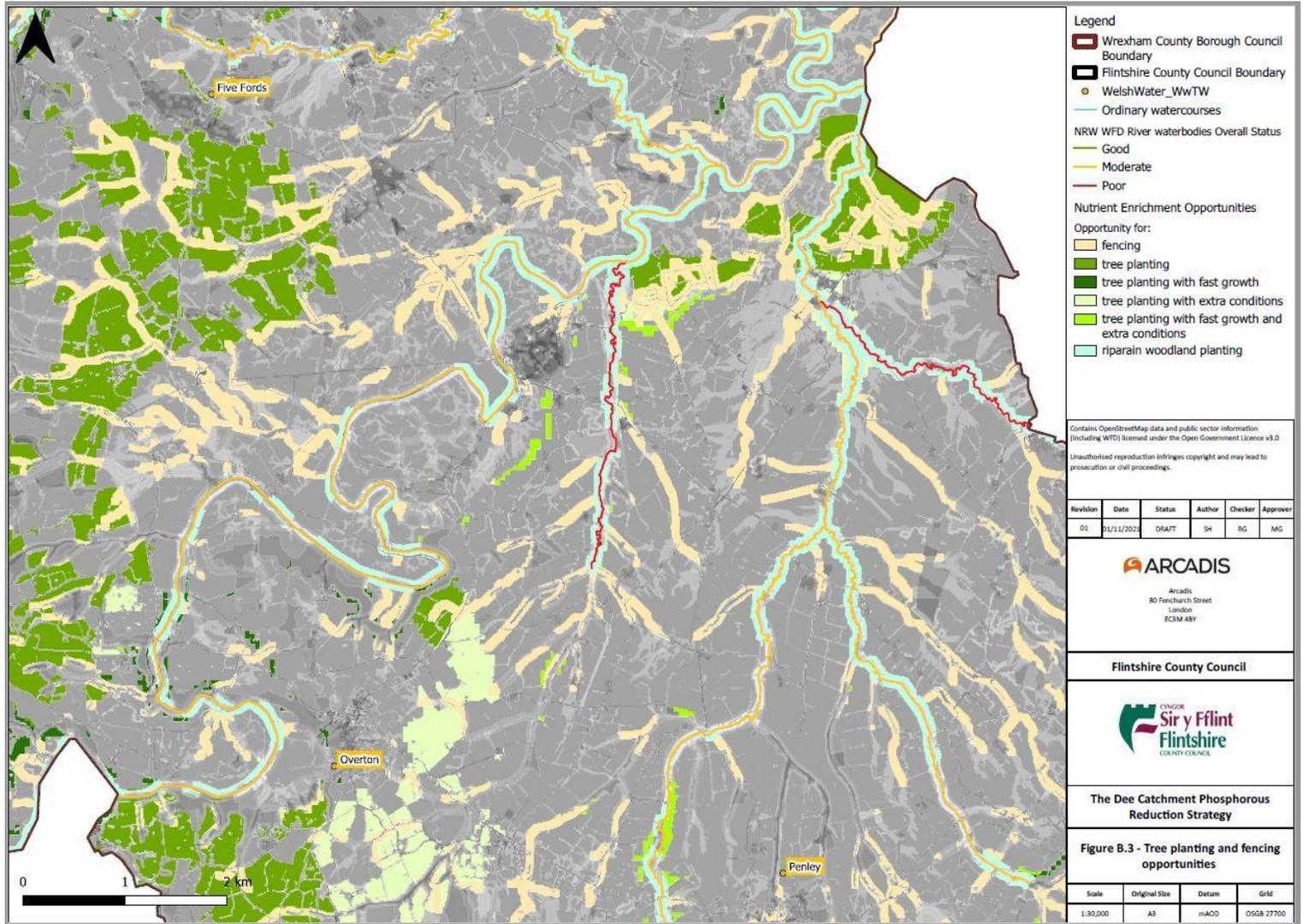
**Sir y Fflint**  
 Flintshire  
 COUNTY COUNCIL

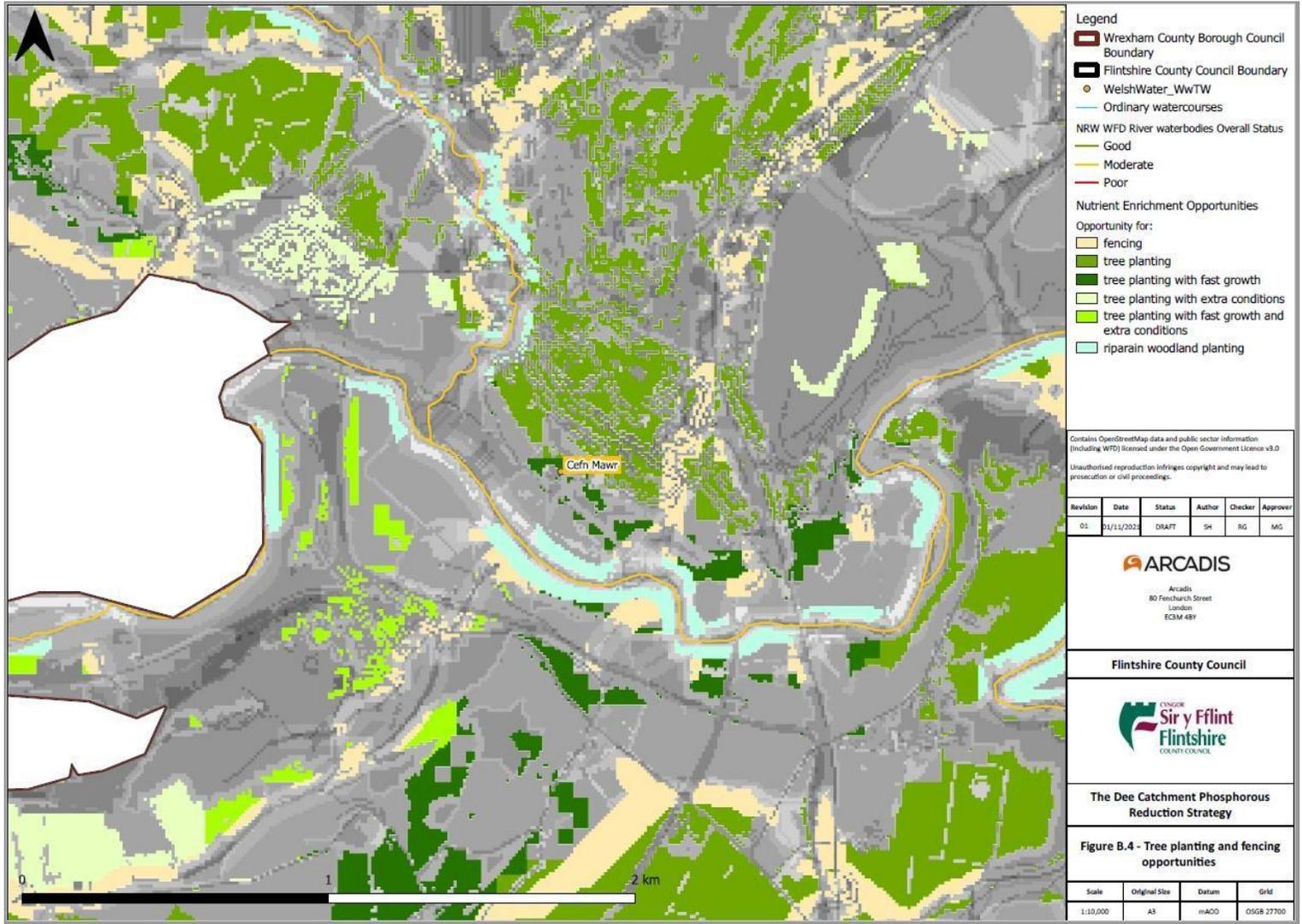
**The Dee Catchment Phosphorous Reduction Strategy**

**Figure B.1 - Tree planting and fencing opportunities**

Scale	Original Size	Datum	Grid
1:25,000	A3	WAD	0508 27700







**Legend**

- Wrexham County Borough Council Boundary
- Flintshire County Council Boundary
- WelshWater\_WWTFW
- Ordinary watercourses

NRW WFD River waterbodies Overall Status

- Good
- Moderate
- Poor

Nutrient Enrichment Opportunities

Opportunity for:

- fencing
- tree planting
- tree planting with fast growth
- tree planting with extra conditions
- tree planting with fast growth and extra conditions
- riparian woodland planting

Contains OpenStreetMap data and public sector information (including WFD) licensed under the Open Government Licence v3.0  
 Unauthorised reproduction infringes copyright and may lead to prosecution or civil proceedings.

Revision	Date	Status	Author	Checker	Approver
01	31/11/2021	DRAFT	SH	RG	MG

**ARCADIS**

Arcadis  
80 Fenchurch Street  
London  
EC3M 4BY

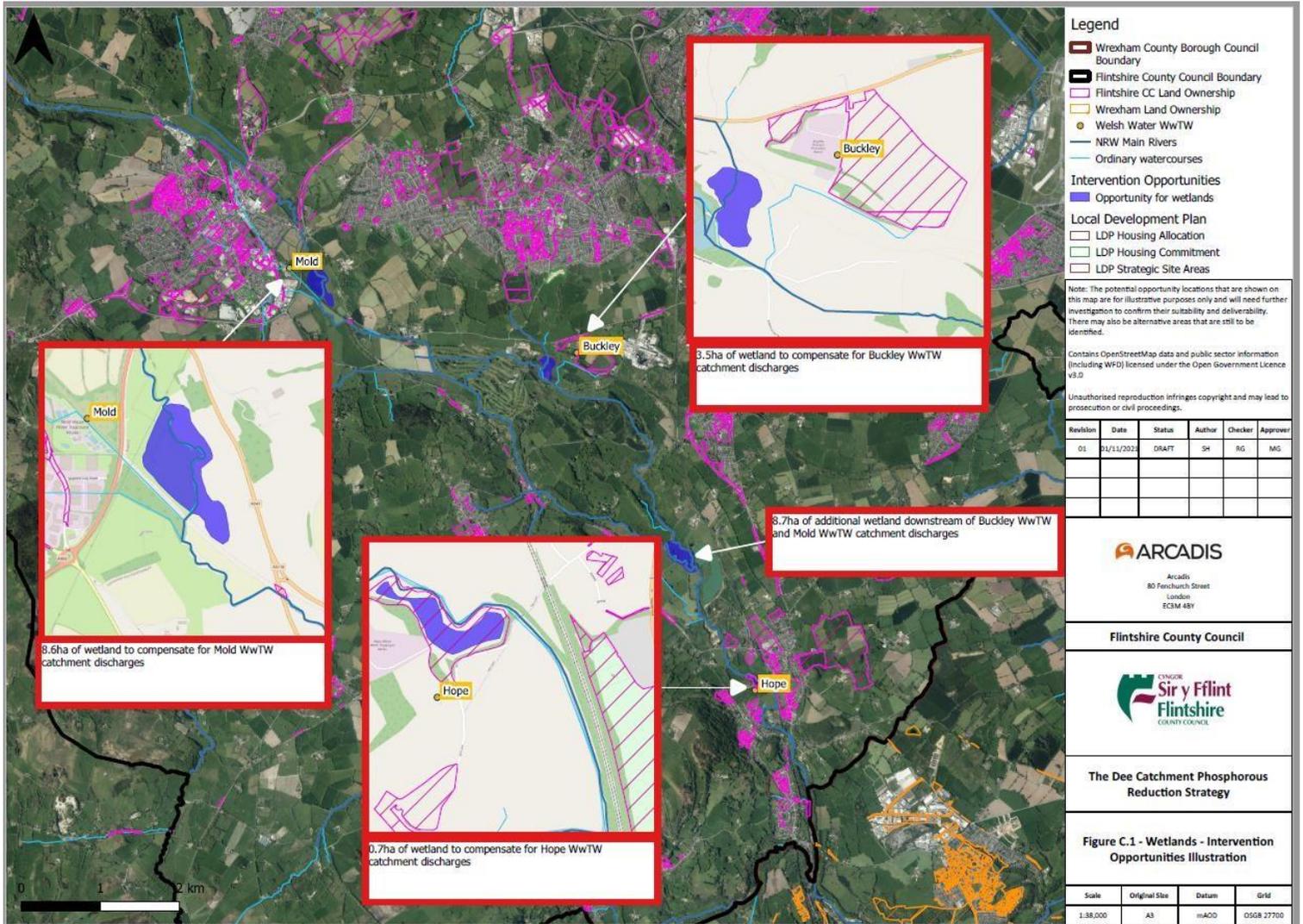
Flintshire County Council

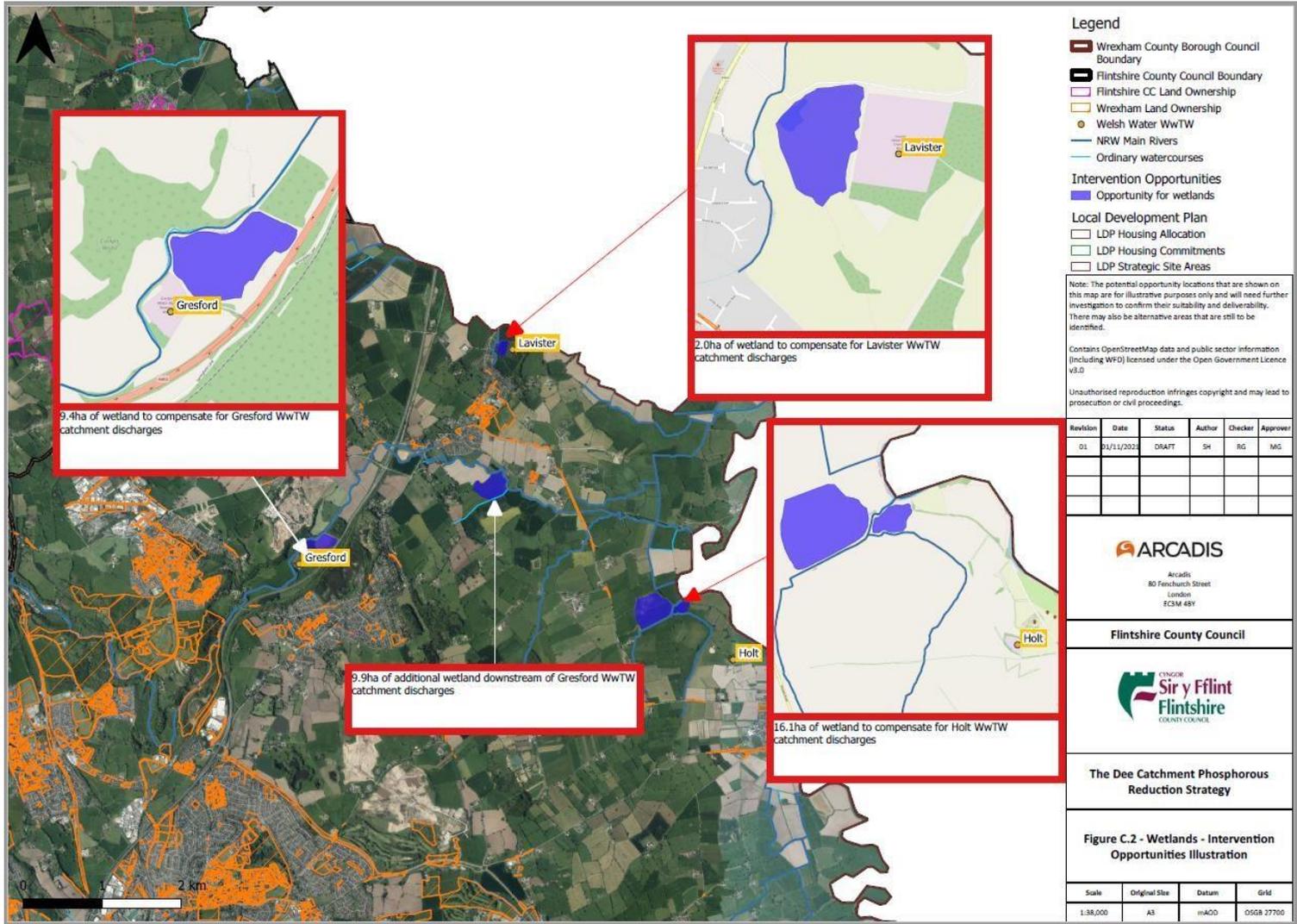
CYNGOR  
**Sir y Fflint**  
**Flintshire**  
COUNTY COUNCIL

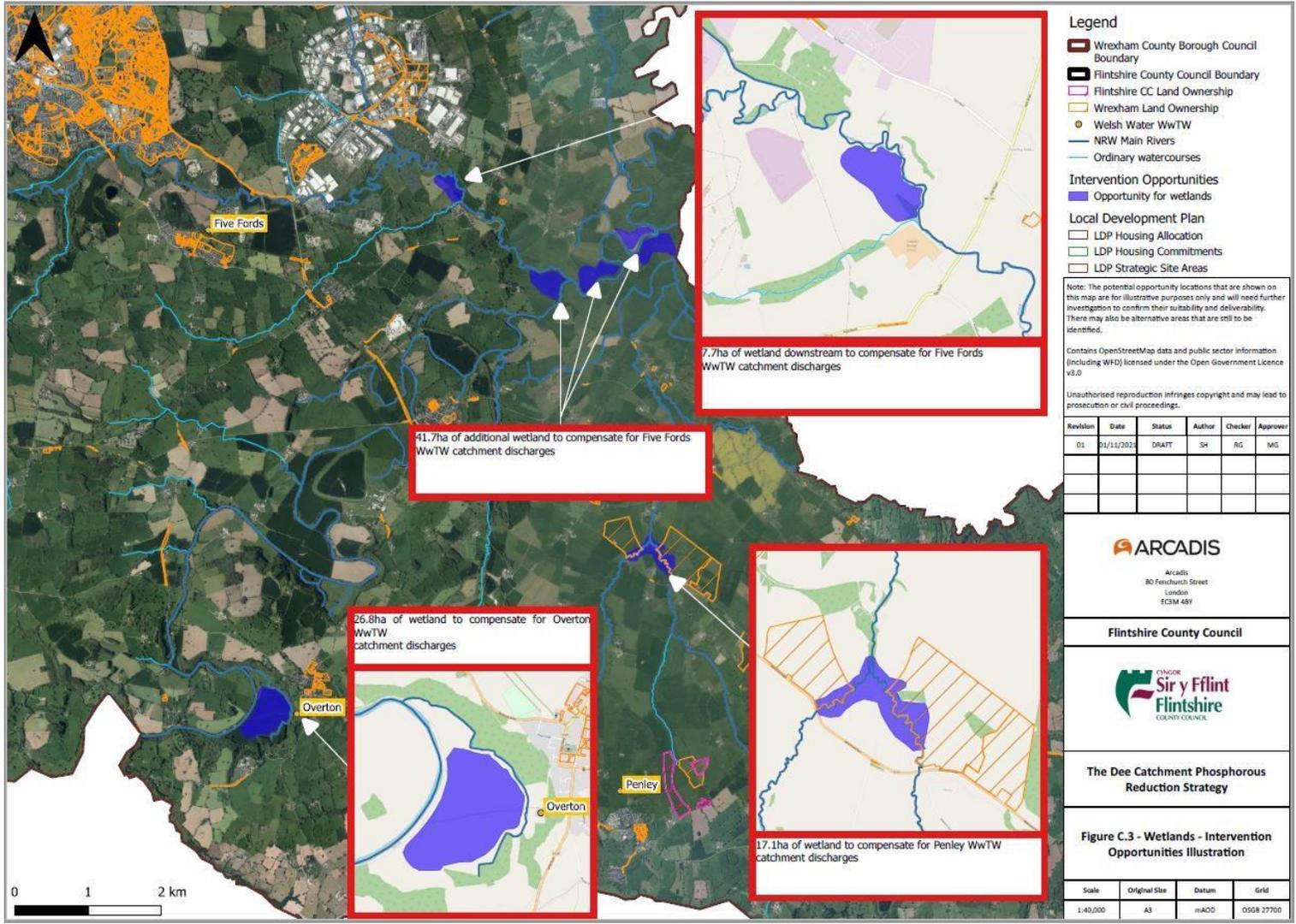
**The Dee Catchment Phosphorous Reduction Strategy**

**Figure B.4 - Tree planting and fencing opportunities**

Scale	Original Size	Datum	Grid
1:10,000	A3	mADO	OSGB 27700









**Legend**

- Wrexham County Borough Council Boundary
- Flintshire County Council Boundary
- Flintshire CC Land Ownership
- Wrexham Land Ownership
- Welsh Water WwTW
- NRW Main Rivers
- Ordinary watercourses

**Intervention Opportunities**

- Opportunity for wetlands

**Local Development Plan**

- LDP Housing Allocation
- LDP Housing Commitments
- LDP Strategic Site Areas

Note: The potential opportunity locations that are shown on this map are for illustrative purposes only and will need further investigation to confirm their suitability and deliverability. There may also be alternative areas that are still to be identified.

Contains OpenStreetMap data and public sector information (including WFD) licensed under the Open Government Licence v3.0

Unauthorised reproduction infringes copyright and may lead to prosecution or civil proceedings.

Revision	Date	Status	Author	Checker	Approver
01	01/11/2022	DRAFT	SH	RG	MIG

**ARCADIS**  
 Arcadis  
 80 Fenchurch Street  
 London  
 EC3M 4BY

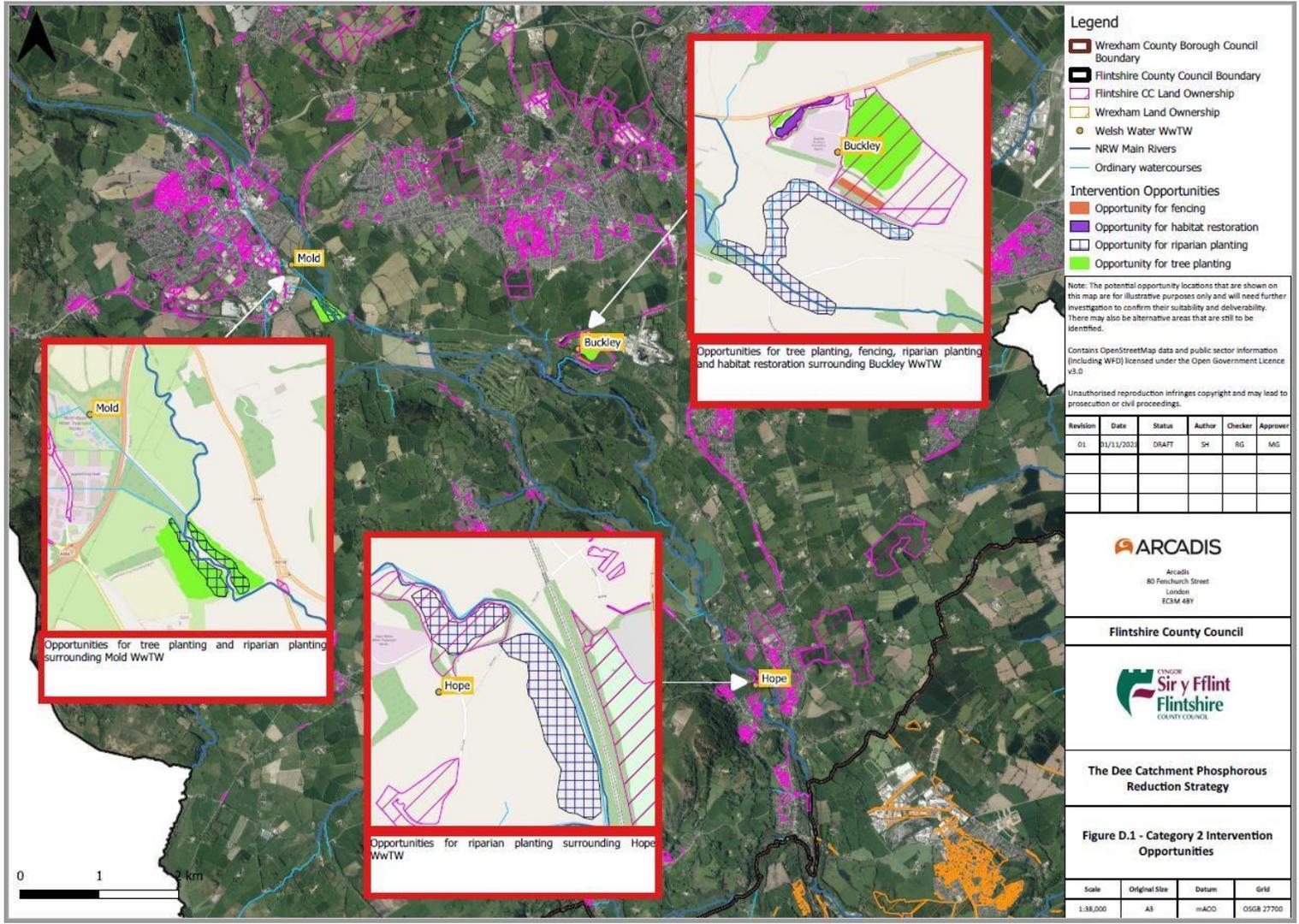
**Flintshire County Council**

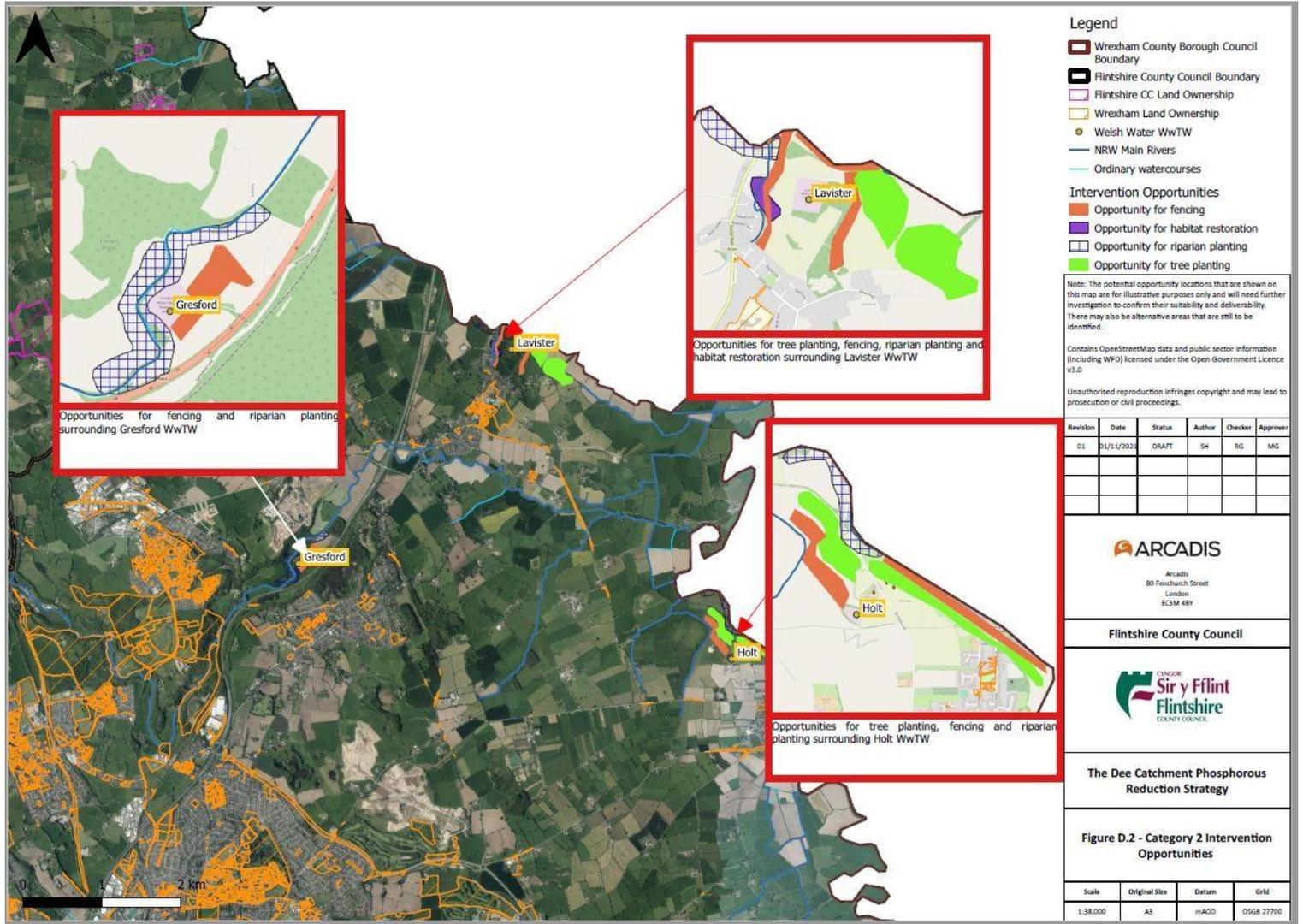
**Sir y Fflint Flintshire**  
 COUNTY COUNCIL

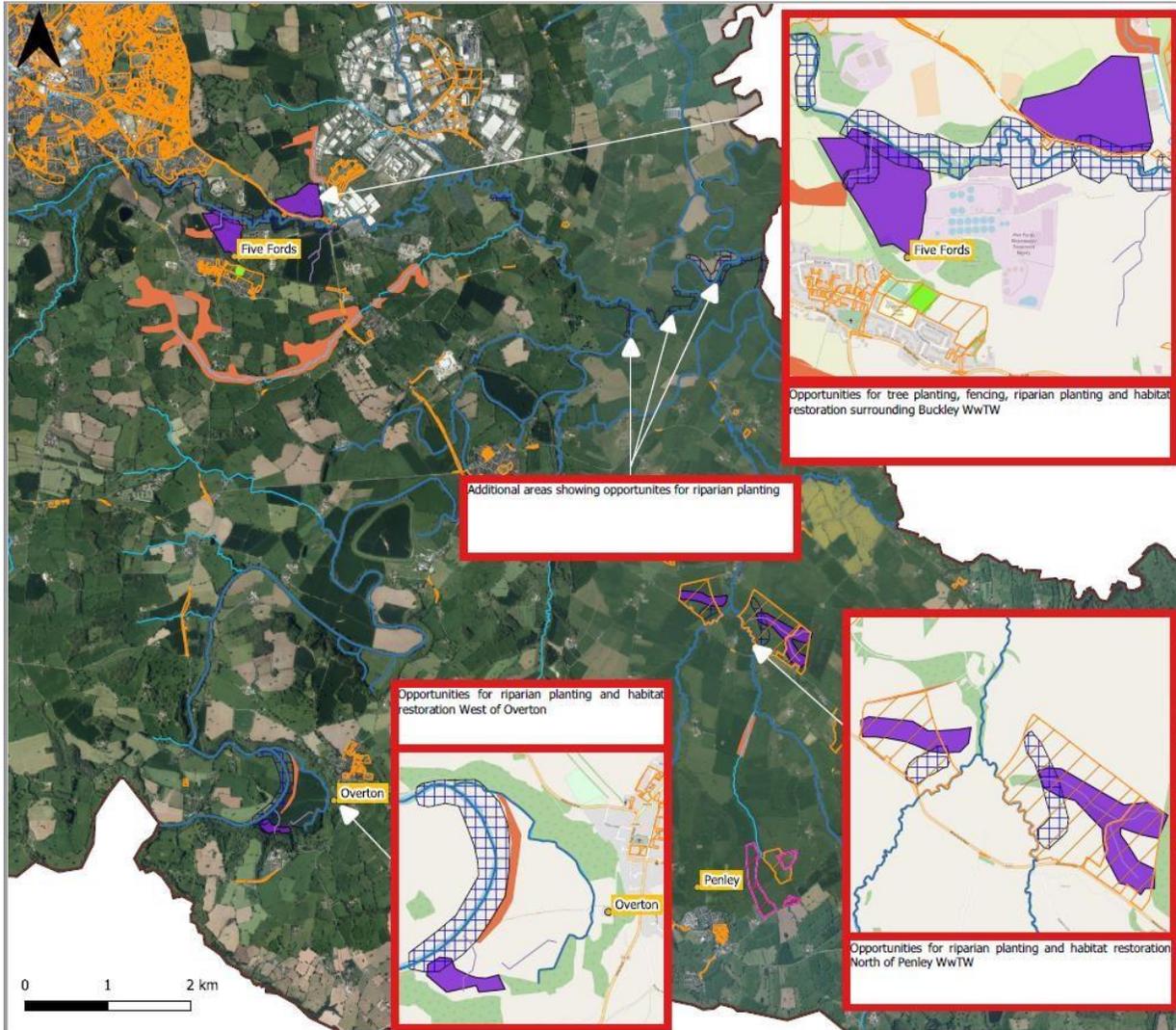
**The Dee Catchment Phosphorous Reduction Strategy**

**Figure C.4 - Wetlands - Intervention Opportunities Illustration**

Scale	Original Size	Datum	Grid
1:7,000	A3	mAOD	OSGB 27700







**Legend**

- Wrexham County Borough Council Boundary
- Flintshire County Council Boundary
- Flintshire CC Land Ownership
- Wrexham Land Ownership
- Welsh Water WwTW
- NRW Main Rivers
- Ordinary watercourses

**Intervention Opportunities**

- Opportunity for fencing
- Opportunity for habitat restoration
- Opportunity for riparian planting
- Opportunity for tree planting

Note: The potential opportunity locations that are shown on this map are for illustrative purposes only and will need further investigation to confirm their suitability and deliverability. There may also be alternative areas that are still to be identified.

Contains OpenStreetMap data and public sector information (including WFD) licensed under the Open Government Licence v3.0

Unauthorized reproduction infringes copyright and may lead to prosecution or civil proceedings.

Revision	Date	Status	Author	Checker	Approver
01	12/11/2021	DRAFT	SH	RG	MG

**ARCADIS**  
 Arcadis  
 80 Fenchurch Street  
 London  
 EC3M 4BF

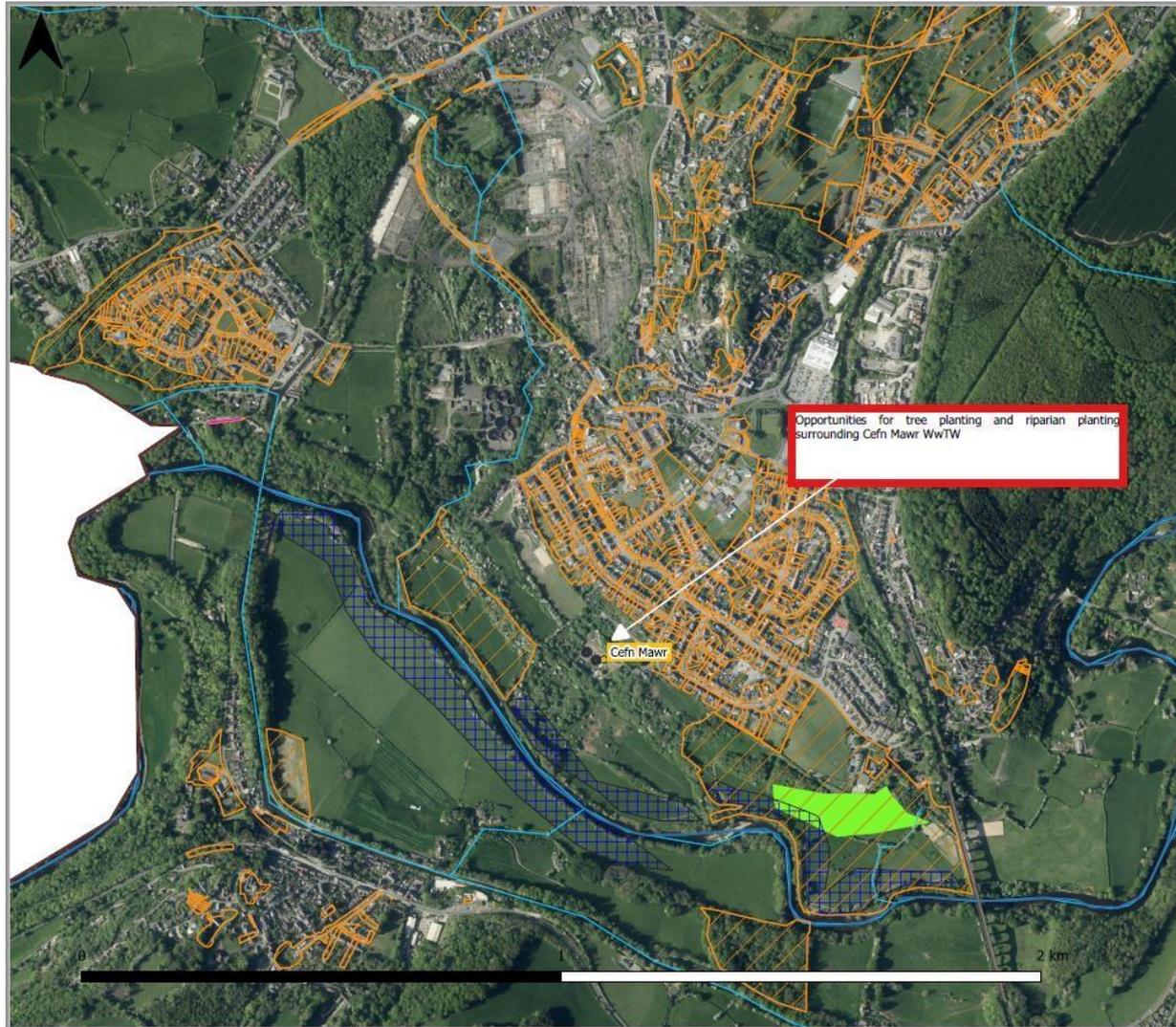
**Flintshire County Council**

**Sir y Fflint Flintshire**  
 COUNTY COUNCIL

**The Dee Catchment Phosphorous Reduction Strategy**

**Figure D.3 - Category 2 Intervention Opportunities**

Scale	Original Size	Datum	Grid
1:40,000	A3	WAD	OSGB 27700



Opportunities for tree planting and riparian planting surrounding Cefn Mawr WwTW

- Legend**
- Wrexham County Borough Council Boundary
  - Flintshire County Council Boundary
  - Flintshire CC Land Ownership
  - Wrexham Land Ownership
  - Welsh Water WwTW
  - NRW Main Rivers
  - Ordinary watercourses
- Intervention Opportunities**
- Opportunity for riparian planting
  - Opportunity for tree planting

Note: The potential opportunity locations that are shown on this map are for illustrative purposes only and will need further investigation to confirm their suitability and deliverability. There may also be alternative areas that are still to be identified.

Contains OpenStreetMap data and public sector information (including WFD) licensed under the Open Government Licence v3.0

Unauthorised reproduction infringes copyright and may lead to prosecution or civil proceedings.

Revision	Date	Status	Author	Checker	Approver
01	01/11/2021	DRAFT	SH	RG	MG

Arcadis  
80 Fenchurch Street  
London  
EC3M 4BY

Flintshire County Council

Sir y Fflint  
Flintshire  
COUNTY COUNCIL

The Dee Catchment Phosphorous Reduction Strategy

Figure D.4 - Category 2 Intervention Opportunities

Scale	Original Size	Datum	Grid
1:7,000	A3	mAOD	OSGB 27700

# Appendix E

## River Wye Special Area of Conservation Nutrient Management Plan Board Terms of Reference:

1. The objective of the Board is to identify and deliver actions that achieve the phosphorus conservation target of the River Wye SAC. The primary mechanism for achieving this will be through the delivery of the Nutrient Management Plan.
2. Board Members will be responsible and accountable for the delivery of identified actions for their respective organisations and for identifying and obtaining the necessary resources to deliver the actions.
3. The Board will work together to review contributions across all organisations, working collaboratively to achieve the objectives and ensuring all members understand the issues and work together to resolve them.
4. The Board will review performance and delivery of actions within the plan and take timely corrective action where identified. The contributions of all organisations will be discussed as a whole.
5. The Nutrient Management Action Plan will initially be reviewed annually and be subject to regular updates. The Nutrient Management Plan will be reviewed every 4 years as detailed in the action plan.
6. The Board will be supported by input from a Technical Group to help inform their decisions with the Board agreeing the frequency of Technical Group meetings.
7. The Board will direct the Technical Group where additional actions or evidence is required.

## River Wye SAC NMP Board Role and Structure:

Chair: Herefordshire Council **Clr Price**, Cabinet member: Infrastructure

**Commented [A69]:** May need updating

Role: NMP Board will be the responsible body for ensuring the delivery of the Conservation Objectives for the River Wye Special Area of Conservation. It will provide oversight and direction to all involved in delivering the Nutrient Management Plan.

Attendees: Area level Managers from Natural England, the Environment Agency, Natural Resources Wales Director of Environment Welsh Water Director / Assistant Director Herefordshire Council Elected Member / Director / Assistant Director Powys County Council Nominated member from the Countryside Land and Business Association (CLA) Nominated Member from the National Farmers Union (NFU) Nominated member from the Catchment Partnership Chair of the stakeholder group  
The Board may co-opt further members as it deems appropriate.

River Wye Water Technical Group:

Chair: EA and NE Role: The Technical Group will be responsible for identifying and analysing options to deliver improvements to Water Quality. This will result in the Technical Group presenting options and recommendations to the Board. The Board will then decide upon the appropriate course of action and whether further evidence is required.

Attendees: Officers/Senior Officers from Natural England, the Environment Agency, Natural Resources Wales. Growth Strategy Manager Dwr Cymru Welsh Water Officers/Senior Officers of Herefordshire Council, Monmouthshire and Powys County Council Representative from the Catchment Partnership Chair of the Stakeholder group. Consultancy support as required.

The NMP Board will meet every 3 months

The Technical Group will meet every 6 weeks initially, with a view to reduce this as the group becomes established.

Herefordshire Council will chair and provide secretariat for the NMP Board, including minutes being published on the CC website.

Agenda's for the meetings should be circulated 2 weeks in advance of the meeting.

At each NMP meeting a member of the Technical Group will provide an update on progress, and provide a steer on options, discussions and decisions required by the Board.

The Technical Group will be jointly chaired by EA and NE with details tbc.

