Environmental Report

Draft Dee Flood Risk Management Plan

Rev No 1.0

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Our purpose is to ensure that the natural resources of Wales are sustainably maintained, used and enhanced, now and in the future.

We will work for the communities of Wales to protect people and their homes as much as possible from environmental incidents like flooding and pollution. We will provide opportunities for them to learn, use and benefit from Wales' natural resources.

We will work for Wales' economy and enable the sustainable use of natural resources to support jobs & enterprise. We will help businesses and developers to understand and consider environmental limits when they make important decisions.

We will work to maintain and improve the quality of the environment for everyone. We will work towards making the environment and natural resources more resilient to climate change and other pressures.

Environment Agency

We are the Environment Agency. We protect and improve the environment and make it a better place for people and wildlife.

We operate at the place where environmental change has its greatest impact on people’s lives. We reduce the risks to people and properties from flooding; make sure there is enough water for people and wildlife; protect and improve air, land and water quality and apply the environmental standards within which industry can operate.

Acting to reduce climate change and helping people and wildlife adapt to its consequences are at the heart of all that we do.

We cannot do this alone. We work closely with a wide range of partners including government, business, local authorities, other agencies, civil society groups and the communities we serve.

Non-Technical Summary

Flood risk management plans highlight the hazards and risks from rivers, the sea, surface water, groundwater and reservoirs and set out how risk management authorities will work together with communities to manage flood risk. They are required by the European Union Floods Directive and the Flood Risk Regulations 2009.

In this first cycle of implementing the regulations, Natural Resources Wales and the Environment Agency are required to prepare flood risk management plans for all of England and Wales covering flooding from main rivers, the sea and reservoirs. Lead local flood authorities must prepare flood risk management plans in flood risk areas, however, there are none of these within the Dee RBD. The flood risk management plans must be reviewed and reissued every six years to describe progress.

The Dee flood risk management plan will be published in December 2015 and will cover the period 2015 to 2021. The draft plan is being consulted on between 10 October 2014 and 31 January 2015. It provides a description of the risk from flooding within the river basin district and outlines measures that are currently ongoing to manage flood risk, along with proposed new measures.

The Dee river basin district

The Dee River Basin District is home to over 500,000 people and covers an area of 2,251 square kilometres of North East Wales, Cheshire, Shropshire and the Wirral. The district consists of a single river basin; the River Dee, its tributaries and estuary. The district is characterised by a varied landscape. It ranges from the mountains and lakes of the

Snowdonia National Park in the upper part of the basin, through the Vale of Llangollen in the middle reaches, to the open plains of Cheshire and the mudflats of the Dee Estuary in the lower basin. The River Dee and Llyn Tegid are designated as a Special Area of Conservation (SAC) under the Habitats Directive. The Dee estuary is a Special Protection Area (SPA) and SAC. Chester and Wrexham are the two major urban centres, but the dominant land uses are agriculture and forestry. Nearly three million people get their drinking water from the Dee, including many in North West England. The reservoirs are also used to

modify flood response and reduce the flooding frequency in the Dee between Bala and Chester.

Strategic environmental assessment

The draft Dee flood risk management plan has the potential to affect people and the environment. There is a legal requirement for this type of plan to be subject to a strategic environmental assessment (SEA) to determine these effects, recommend how to address them and to consider different ways of developing the plan.

Here is a summary of the likely effects of the plan on the wider environment, any mitigation required to manage the negative effects and opportunities to deliver environmental benefits:

The RBMP was assessed as having potential effects on the following ecosystem services:

Provisioning services

- **Food (e.g. crops, fruit, fish):** minor negative effect locally from potential agricultural land-take as a result of construction and /or realignment of defences. This must be considered against potential benefits where flood risk management measures protect agricultural land. There are potential negative effects on fisheries habitat caused by protection measures. However, all flood risk management schemes will need to comply with European regulations to allow fish and eel passage. Opportunities for schemes to improve fish habitats and passage, in line with RBMP recommendations, will be sought.

Regulating services

- **Water Regulation (e.g. flooding):** minor positive effect across the RBD that would be locally significant in the specific communities where actions will be implemented that will reduce the risk of flooding to people and property.

Cultural services

- **Cultural Heritage:** minor negative effect from the potential for measures to disturb buried, unknown archaeology and the effect on known features of cultural heritage and landscapes. This is a precautionary assessment given the high degree of uncertainty as to the design of measures. To conserve and enhance the historic environment it will be important that individual schemes at the earliest stage identify any designated or non-designated heritage assets, including the risk of unknown buried archaeology, in order to: establish the potential for adverse effects as well as

opportunities for enhancement; determine whether any action should be taken due to the significance of the heritage assets and likely impacts; inform scheme options and detailed design; and identify an appropriate mitigation strategy. The effect also needs to be considered against the protection afforded to cultural heritage assets from ongoing, agreed and proposed measures.

- **Recreation and Tourism (including accessible blue and green space):** minor negative effect locally on recreation and tourism in the delivery of flood alleviation schemes due to potential loss of recreational or amenity land, disruption to public rights of way and changes in water levels that could affect water-based activities. This can be mitigated by involving relevant interests at an early stage at the project level to identify possible impacts and agree scheme specific mitigation. Opportunities for schemes to improve public access, interpretation and footpath and cycling networks, and enhance recreational and amenity land will be sought.
- **Aesthetic Value (e.g. landscape, seascape, tranquillity):** minor negative effect locally subject to the location, type and design of flood risk management schemes. The mitigation approach to potential negative impacts will include early consultation at the project level with relevant landscape interests and the undertaking, where necessary, of landscape and visual impact assessments to inform scheme design and mitigation.

Supporting services

- **Provision of Habitat:** minor negative effect. Ongoing and agreed measures being delivered under the draft Tidal Dee Strategy are supported by compensatory habitat delivery projects under the National Habitat Creation Programme. Proposed measures have the potential to have local effects subject to the location, type and design of flood risk management schemes. The mitigation approach for potential negative effects on habitats and species will involve early consultation with nature conservation interests to identify and assess at the project level any potential impacts (including designated sites of nature conservation interest and protected species) and agree scheme specific mitigation. Early engagement with nature conservation interests will enable opportunities to be identified for habitat creation, improving habitat diversity and the condition and connectivity of sites, and for improving fish and eel passage and other habitats for protected species.

Overall, the draft Dee flood risk management plan is anticipated to have a positive effect on water regulation as it proposes measures to manage the flood risk to those communities most at risk. Potential negative effects identified can be reduced at a project level through stakeholder engagement, good environmental design and the support of the National Habitat Creation Programme. Potential synergies and conflicts with the Dee RBMP have also been identified to inform implementation of the FRMP measures.

To determine if this is the case, Natural Resources Wales and the Environment Agency will monitor the effects the plan is having on the environment. The main mechanism will be through the river basin management plan which will report annually on various water quality aspects. Natural Resources Wales and the Environment Agency will also use readily-available and regularly collected information from existing sources to monitor change associated with the other predicted environmental effects. In this way, Natural Resources Wales and the Environment Agency will be able to determine whether any further action is necessary to manage the wider environmental effects of the Dee flood risk management plan.

This environmental report was published with the draft update to the Dee flood risk management plan on 10 October 2014 and is available for consultation for a three month period. Consultation will close on 31 January 2015. We welcome your views and have set out some specific consultation questions below:

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1. Do you agree with the conclusions of the environmental assessment? (yes / no)

a. If not, please explain why.

2. Are there any further significant environmental effects of the draft plan which you think should be covered by this assessment? (yes / no).

b. If yes, please describe what they are.

3. As part of the environmental report, we have set out mitigation measures for addressing any significant negative effects on the environment, as well as opportunities to deliver positive effects on the environment.

c. Are there further mitigation measures or opportunities for improving the environment that we should consider for the plan? (yes / no)

d. If yes, please give details.

How to respond

Natural Resources Wales would prefer you to respond to this consultation by email at: Flood.risk.management.plan@naturalresourceswales.gov.uk

This will allow you to make your comments more effectively, while helping us to gather and summarise responses quickly and accurately. However, if you want to respond in another way, please contact the NRW customer contact centre on 0300 0653000.

Please return written responses by 31 January 2015 to:

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Contents

The Dee river basin district 3
Strategic environmental assessment 4
How to respond 7
1. Introduction 10
Draft flood risk management plans 10
Approach to Flood Risk Management in Natural Resources Wales 10
Flood Risk Management in England 11
The Dee FRMP 12
Purpose of the environmental report 13
Finding your way through this report 14
2. Undertaking the assessment 17
The approach to the Strategic Environmental Assessment 17
Ecosystems services approach and SEA 18
Scope of the assessment 20
Assessing significance 22
Assessment method 23
Alternatives considered 24
Approach to developing the FRMP 24
Ongoing and agreed measures from existing plans 24
Proposed measures in the FRMP 25
Habitat Regulation Assessment 25
3. The environmental context for the plan 27
The Dee River Basin District 27
Review of relevant plans and policies within the Dee River Basin District 30
4. Significant effects of the Dee Flood Risk Management Plan 33
Overview of the effects of the Dee Flood Risk Management Plan 33
Significant effects of the Dee flood risk management plan 34
Significant effects of the updated Dee Flood Risk Management Plan 35
Soil formation 59
Nutrient cycling 59
Primary production 59
Water cycling 60
5. Monitoring the effects of the plan 68
6. What happens now? 70
How to respond 70
Next steps 71

Annex A: Plans, policies and programmes reviewed for the SEA..... 72

1. Introduction

The Environmental Report provides details of the outcome of the Strategic Environmental Assessment of the draft update to the Dee Flood Risk Management Plan (FRMP). The Strategic Environmental Assessment is used to take account of the likely effects on the wider environment when developing the plan.

Draft flood risk management plans

The European Floods Directive sets out requirements to manage flood risk from all sources in order to reduce the consequence of flooding on human health, economic activity and the environment. The Flood Risk Regulations 2009 transposed the European Floods Directive into law for England and Wales and there are four main stages to achieve the requirements of the regulations. Each of these stages is carried out in a six yearly cycle:

1. Prepare preliminary flood risk assessment report that details past floods and the possible consequences of future floods. This was completed in December 2011.
2. Identify flood risk areas where the risk from surface water flooding is significant. This was completed in December 2011.
3. Prepare flood hazard maps showing flood extent and velocity/depth and flood risk maps showing the consequences for flood risk areas. This was competed in December 2013.
4. Develop flood risk management plans (FRMPs). We are currently consulting on draft flood risk management plans.

The Dee RBD is in England and Wales and the Environment Agency and Natural Resources Wales are responsible authorities for flood risk management respectively.

Approach to Flood Risk Management in Natural Resources Wales

The National Flood and Coastal Risk Management Strategy sets the national framework for flood risk management in Wales. Natural Resources Wales (NRW) takes a risk based community approach to prioritise where best to direct investment. This is informed by the strategic framework provided by Catchment Flood Management Plans (CFMPs) and draft second generation Shoreline Management Plans (SMPs). The strategic framework set by these plans enable NRW to make short term decisions to manage present day risk whilst

also considering the longer term projection of risk. The risk based community approach of present day risk assessment is done through NRW's Communities at Risk Register. This is a tool that considers a number of factors to give an indication of where the most vulnerable communities at risk of flooding from main rivers and the sea are located across Wales. This is then used to inform, plan and prioritise our investment programme to target investment in the most at risk communities.

The FRMP objectives in Wales are:

1. Reduce the risk of harm to life from flooding to people and communities from main rivers, reservoirs and the sea.
2. Increase resilience of services, assets and infrastructure to the risk of flooding
3. Improve understanding of flood risk so that decisions are based upon the best available information.
4. Improve community awareness and resilience to flooding.
5. Provide an effective and sustained response to flood events.
6. Allocate funding and resources for all sources of flooding on a risk basis.
7. Incorporate the ecosystem approach into the delivery of flood risk management.

Flood Risk Management in England

The Environment Agency's flood risk management work is focussed where each pound of public money spent can provide the greatest amount of economic benefit. RMAs can apply for an allocation of government funding annually from the Environment Agency. Flood and coastal erosion risk management grant in aid (FCERM GiA capital grants) money can be used towards the costs of building new flood and coastal erosion defences. The amount of government funding the Environment Agency allocates to projects depends on the public benefit it provides. Benefits include reducing flood risk to households, businesses and infrastructure and creating habitat for wildlife. The amount of government funding available each year is limited. There are always more schemes proposed than there is government funding available.

The FRMP objectives in England are:

1-6 As above

7. Incorporate and promote an integrated approach to flood risk management, working with natural processes at a catchment scale, to provide multiple benefits to people and the environment.
8. Incorporate climate change adaptation into all aspects of flood risk management.

The Dee FRMP

The Dee flood risk management plan aims to deliver Welsh Governments National flood and coastal erosion risk management strategy in Wales and the Environment Agency's National Flood and Coastal Erosion Risk management Strategy in England by setting out measures to manage flood risk from 2015 to 2021 and beyond. It brings existing flood risk management planning together, in particular drawing on information from the Dee catchment flood management plan (CFMP), the North and North West Wales Shoreline Management Plan (SMP) and NRWs Communities at Risk Register.

By law, the Environment Agency and Natural Resources Wales must produce flood risk management plans for each **river basin district (RBD)**. These FRMPs must cover flooding from main rivers, the sea and reservoirs.

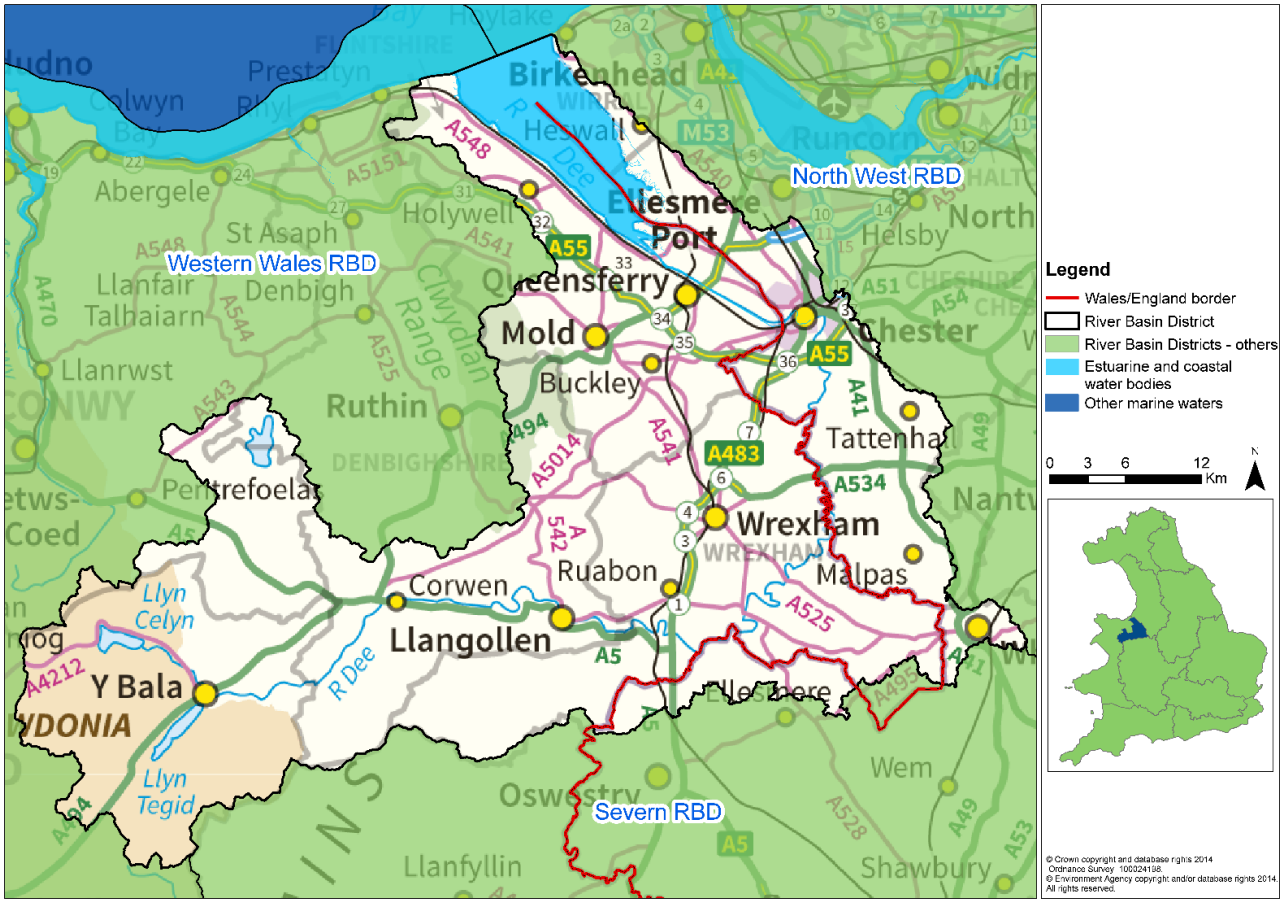
By law, Lead Local Flood Authorities (LLFAs) must produce FRMPs for all **flood risk areas** covering flooding from local sources, which includes surface water, ordinary watercourses and groundwater. No LLFAs in the Dee RBD are required to produce FRMPs to meet the requirements of the Flood Risk Regulations.

The flood risk management plan has been developed at three scales:

- The plan covers flooding issues for main rivers, the sea and reservoirs across the whole of the **river basin district**. This information is included as a statutory requirement. The Dee RBD is made up of a single **management catchment**. A catchment is an area with several, often interconnected water bodies (rivers, lakes, groundwater and coastal waters) and are based on the catchments used for river basin management planning.
- Where possible, the plan has been co-ordinated at the river basin district scale. As the Dee river basin district covers both Wales and a small part of England, there may be elements of flood risk management work that are not applicable to the whole river basin district and may just cover the Welsh section or the English section due to different administrations.

- The plan sets out objectives and measures to manage flood risk for communities at risk from main rivers, the sea and reservoirs within the management catchment as a statutory requirement.

Figure 1.1: The Dee River Basin District Management Catchment



Part A of the Dee draft FRMP describes how the plan has been developed and Part B sets out how flood risk is managed in the Dee RBD, and in particular it identifies:

- **Ongoing** flood risk management measures which are already underway. These measures have already been consulted on and adopted in existing plans and are not specifically being consulted on in the FRMP.
- **Agreed** measures that are already planned with funding provisionally agreed. These measures are set out in plans that have been consulted on and adopted, such as measures drawn from catchment flood risk management. They are not being specifically consulted on in this FRMP.
- **Proposed** measures to be progressed from 2015 onwards that have not been consulted on previously. These are the measures that are specifically being consulted on in this FRMP.

Purpose of the environmental report

The purpose of this report is to consider the significant environmental effects of the Dee FRMP at the scale of the river basin district. We have assessed the environmental effects of the measures and considered their significance for the river basin district.

The strategic environmental assessment has also been undertaken to fulfil the requirements of the 'Environmental assessment of plans and programmes regulations 2004' (known as the 'strategic environmental assessment regulations'). This requires plans within certain sectors (including the water sector) that provide a framework for future development to be subject to a strategic environmental assessment to ensure that the environment is considered from the outset. Table 1.2 sets out the requirements for an environmental report produced in accordance with the strategic environmental assessment regulations and indicates where these are addressed within this report.

Finding your way through this report

This report provides a record of how we have taken the environment into account during the development of the flood risk management plan:

- **section 2: undertaking the assessment** describes how we have undertaken the assessment of significant environmental effects and the approach to the consideration of alternatives
- **section 3: the environmental context for the plan** provides an overview of the environmental context for the plan in terms of both the physical environment and the planning and policy context
- **section 4: significant effects of the flood risk management plan** sets out the significant environmental effects of the plan at the river basin district scale
- **section 5: monitoring the effects of the plan** sets out our initial proposals to monitor the significant effects of the plan
- **section 6: what happens now?** provides further information on how you can comment on the plan and/or the environmental report and asks specific questions on which we would like to hear your views

Table 1.2: How the requirements of the strategic environmental assessment regulations are addressed in this report.

SEA regulations requirement	How this has been addressed	Section
1. An outline of the contents and main objectives of the plan or programme, and of its relationship with other relevant plans and programmes.	*Section 1 sets out the main objectives of flood risk management plans and an outline of the content of the plan can be found in section 4.* *Section 3 sets out the relevant key themes arising from a review of relevant*	*1, 3 and 4 Annex A*

	plans and programmes. A full list of plans reviewed is provided in Annex A.	
2. The relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan or programme.	*An overview of the river basin district is provided in Section 3. Section 4 provides a description of the current state of the ecosystem services provided by the water environment and how these are likely to evolve in the absence of the plan.*	*3 and 4*
3. The environmental characteristics of areas likely to be significantly affected.		
4. Any existing environmental problems which are relevant to the plan or programme including, in particular, those relating to any areas of a particular environmental importance, such as areas designated pursuant to Council Directive 79/409/EEC on the conservation of wild birds(**a**) and the Habitats Directive.	*Existing environmental problems are presented as part of the baseline in Section 4.* *Consideration of designated sites (SAC, SPA and Ramsar sites) is outlined in Section 4.10, Provision of Habitat (Biodiversity)*	*4*
5. The environmental protection objectives, established at international, Community or Member State level, which are relevant to the plan or programme and the way those objectives and any environmental considerations have been taken into account during its preparation.	*Environmental protection objectives are summarised as part of the review of relevant plans and programmes in Section 3.*	*3*
6. The likely significant effects on the environment, including short, medium and long-term effects, permanent and temporary effects, positive and negative effects, and secondary, cumulative and synergistic effects.	*The likely significant effects of the plan are described in Section 4*	*4*
7. The measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment of implementing the plan or programme.	*Mitigation measures and opportunities for additional environmental improvements are provided in Section 4.*	*4*
8. An outline of the reasons for selecting the alternatives dealt with, and a description of how the assessment was undertaken including any difficulties (such as technical deficiencies or lack of know-how) encountered in compiling the required information.	*Section 2 sets out the alternatives considered together with the reasons the selection of the one presented in the draft flood risk management plan.*	*2*

9. A description of the measures envisaged concerning monitoring in accordance with regulation 17.	*Proposals for monitoring are provided in Section 5*	*5*
10. A non-technical summary of the information provided under paragraphs 1 to 9.	*A non-technical summary is provided at the front of this document and is available as a separate document.*	

2. Undertaking the assessment

In this section we set out how environmental issues were considered in the development of the plan; the approach to considering alternatives and how we undertook the assessment of the significant environmental effects of the draft plan.

The approach to the Strategic Environmental Assessment

The purpose of strategic environmental assessment is to integrate environmental considerations into the preparation and adoption of plans that are likely to have significant effects on the environment[1].

In designing the SEA for the draft FRMP we have taken a number of factors into account:

- FRMPs are new plans, however Risk Management Authorities[2] already plan for flooding and a large proportion of the Dee FRMP is taken from existing plans that are covered by previous consultations and accompanying SEAs. These are set out as **ongoing and agreed** flood risk management measures in the FRMP that will not be consulted on. They are described in this SEA as part of the environmental context and considered separately to the proposed measures of the FRMP.
- The Dee FRMP includes a number of new flood risk management measures that will be delivered from 2015 onwards. These are **proposed measures**, which are being consulted on as part of the FRMP. The proposed measures have been prioritised using NRW's Communities at Risk Register. This SEA assesses their effects on the wider environment in order to ensure the FRMP takes this into account.
- The Dee FRMP crosses the border between England and Wales

Given these factors, the assessment is focused on the proposed measures and their environmental effects, whilst also identifying the cumulative effects arising from ongoing and agreed measures at a river basin district scale.

[1] Paragraph 4 of the preamble to Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment (the Strategic Environmental Assessment Directive)

[2] Risk Management Authorities are Environment Agency, Natural Resources Wales, Lead Local Flood Authorities, district councils for areas for which there are no unitary authorities, internal drainage boards, water companies and highway authorities

Table 2.1: Measure categories and descriptions

Measure Type	Description
Prevention	Preventing damage caused by floods: 1. By avoiding construction of houses and industries in present and future flood-prone areas; 2. By adapting existing receptors to the risk of flooding; and ensure that future developments take flood risk into account; 3. By promoting appropriate land-use.
Protection	Taking measures, both structural and non-structural, to reduce the likelihood of floods in a specific location.
Preparedness	Informing the population about flood risk and what to do in the event of a flood, including emergency response; developing emergency response plans in the case of a flood.
Recovery and Review	Returning to normal conditions as soon as possible and mitigating both the social and economic impacts on the affected population.

Ecosystems services approach and SEA

The draft FRMPs are being developed alongside the set of draft updates to the river basin management plans (RBMPs) that are being consulted on at the same time. The strategic environmental assessment of both the RBMPs and FRMPs is based on an ecosystem services approach. Using the same assessment approach for both plans allows us to directly compare the environmental effects and consider the interaction between the two plans.

The ecosystems services approach is based on the principle that a healthy functioning ecosystem will provide services that derive benefits to society that are essential for sustainable development. Examples include the essentials for life, such as clean air, water, food and fuel; services that help to regulate natural processes such as flooding; and services that contribute to wellbeing and the quality of life, such as recreation and tourism and beautiful landscapes.

Welsh Government and Natural Resources Wales have agreed that we will adopt the ecosystem approach in all our natural resource management and planning. The ecosystem approach is about managing the environment so that its different components are considered together, including its natural systems and the benefits that people get from it. The emerging Environment Bill sets out a new framework for managing natural resources and will build on the United Nations' Convention on Biological Diversity. The approach is guided by 12 principles.

There is an increasing level of support for the adoption of an ecosystems approach in decision making processes as well as in decision support tools such as Strategic Environmental Assessment and Environmental Impact Assessment. We therefore chose to adopt the ecosystems approach as the method for assessing the environmental effects for the Strategic Environmental Assessment.

Of the 12 Core Principles of the Ecosystem Approach the SEA will specifically consider:

- Potential positive and negative effects of the plan on adjacent and other ecosystems.
- Consider potential effects of the plan on the structure and function of the ecosystem services, this in turn will influence the plan development to ensure the resilience of ecosystems.
- Potential positive and negative effects on ecosystem services, including cumulative effects. This will be assessed against specific limits where possible but where there is a lack of defined limits or data, assessment will be qualitative.
- Potential positive and negative effects on Biological Diversity itself and the services that are reliant upon it.

Figure 2.1 shows the relationship between ecosystem services and the environmental receptors we are required to consider by the Strategic Environmental Assessment regulations. This demonstrates that, even based on a conservative comparison, the ecosystem services based assessment provides coverage of the receptors required to be covered by the Regulations.

Figure 2.1: Relationship between ecosystem services and the factors required to be considered by the strategic environmental assessment regulations.

	Ecosystem services	SEA Regulations environmental factors								
		Biodiversity, flora & fauna	Population & human health	Soil	Water	Air	Climatic factors	Cultural heritage	Landscape	Material assets
Provisioning services	Fresh water				*					
	Food (e.g. crops, fruit, wild collected food)	*	*							*
	Fibre & fuel (e.g. timber & wool)		*							
	Genetic resources	*								
	Biochemical, natural medicines		*							
	Water for non-consumptive use (e.g. Hydropower, navigation)		*		*					*
Regulating services	Air quality regulation					*				
	Climate regulation						*			
	Water regulation (e.g. flooding)		*		*					
	Natural hazard regulation		*							
	Disease & Pest regulation		*							
	Soil & Erosion regulation	*	*	*						
	Water purification & waste treatment	*			*					
	Pollination	*								
	Noise & light regulation	*	*							
Cultural services	Cultural heritage							*	*	
	Recreation & tourism (accessible blue & green space)		*							*
	Aesthetic value (e.g. landscape, seascape, tranquility)								*	
	Intellectual & scientific, education value		*							
	Spiritual & religious value		*							
	Existence value (appreciation of nature & wildlife)	*						*	*	
Supporting services	Soil formation (geodiversity)			*						
	Primary production	*								
	Nutrient cycling			*						
	Water recycling				*					
	Photosynthesis	*								
	Provision of habitat (biodiversity)	*								

Scope of the assessment

The scope of the strategic environmental assessment has been informed by the consultation in January 2014 with Natural Resources Wales (Strategic Assessment Team in Governance), Cadw, Natural England, English Heritage and the Environment Agency as Statutory Consultees under the SEA regulations.

Scoping is a continuous process and after initiating the assessment we were able to identify ecosystem services that are not anticipated to significantly change as a result of the plan. In order to focus to the assessment we undertook an initial review of the possible

flood risk management measures that could be included in the plan and the ecosystem services that could be significantly affected by them. Other services were unlikely to warrant further consideration.

In addition, when undertaking the assessment there were further ecosystem services for which no significant effects were identified. In this way we have narrowed down the services which are not considered to be significant at the RBD-scale. We have therefore not given further consideration to the following ecosystem services in this report:

Provisioning services	Freshwater	People obtain freshwater from ecosystems and therefore the supply of freshwater can be considered a provisioning service. Because water is required for other life to exist, however, it could also be considered a supporting service.
	Fibre and fuel	Ecosystems provide a great diversity of materials for construction and fuel including wood, biofuels and plant oils that are directly derived from wild and cultivated plant species.
	Genetic resources	This includes the genes and genetic information used for animal and plant breeding and biotechnology.
	The provision of biochemicals, natural medicines, pharmaceuticals	Many medicines, biocides, food additives such as alginates and biological materials are derived from ecosystems.
	Water for non-consumptive use	The use of water for economic activity that does not involve permanent abstraction, this includes water used for energy generation (hydroelectric, cooling for thermoelectric such as fossil fuel and nuclear plants), navigation and transport.
Regulating services	Air quality regulation	Ecosystems both contribute chemicals to and extract chemicals from the atmosphere, influencing many aspects of air quality.
	Climate regulation	Ecosystems influence climate both locally and globally. For example, at the local level, changes in land cover can affect both temperature and precipitation. At the global level, ecosystems play an important role in climate by either sequestering or emitting greenhouse gases.
	Soil and Erosion regulation	Soil erosion is a naturally-occurring process involving the mobilisation and deposition of soil particles, mainly by water and air. Erosion Regulation Services are a means of describing

		the ability of habitats and plants to help retain soils and reduce rates of erosion
	Natural hazard regulation	The presence of coastal ecosystems such as saltmarsh can reduce the damage caused by hurricanes or large waves.
	Water purification and waste treatment	Ecosystems can be a source of impurities (e.g. in fresh water). However, they can help in the filtering out and decomposition of organic wastes introduced into inland waters and coastal and marine ecosystems and can also assimilate and detoxify compounds through soil and sub-soil processes.
	Disease & Pest regulation	Ecosystems are important for regulating pests and vector borne diseases that attack plants, animals and people. Ecosystems regulate pests and diseases through the activities of predators and parasites. Birds, bats, flies, wasps, frogs and fungi all act as natural controls.
	Pollination	Insects and wind pollinate plants and trees which is essential for the development of fruits, vegetables and seeds.
	Noise and light regulation	Noise, or unwanted sound, and light can have a negative effect on human well-being and wildlife, but can be regulated by ecosystems.
Cultural services	Intellectual, scientific and education value	The natural environment provides an outdoor classroom and laboratory for the study and teaching of a diverse range of subjects.
	Spiritual and religious value	Many religions attach spiritual and religious values to ecosystems or their components.
	Existence Values	The value that individuals place on knowing that an ecosystem or component exists, even if they never use it.

We also scoped out flood risk management measures that would not be expected to significantly change any of the ecosystem services. This filtered out measures for flood preparedness, prevention and recovery and review. The assessment therefore focussed on the flood risk management protection measures that were likely to set a framework for future development. This is because flood risk management protection measures largely involve physical works, for example building new flood defences or creating flood storage areas, which could have significant environmental effects.

Assessing significance

Significant effects of the flood risk management plan have been determined at the river basin district scale. There are no definitive criteria that can be used to determine whether an effect is significant, particularly when assessing the change to an ecosystem service.

Rather we have determined significance by characterising the types of effects that would be considered to be significant:

- Effects are widespread across the river basin district.
- Local effects that are of a large enough scale to be considered significant for the river basin district. For example, this might apply to a major habitat creation project.
- Effects that are likely to result in a demonstrable change in the health and/or social or economic wellbeing of communities.

Significant effects of the plan are likely to occur over the long term. However, the assessment does note effects that could occur over the short to medium term. For clarity, we have defined these terms in the following way:

- short term – within the current proposed plan cycle, 2015 to 2021
- medium term – within the cycle covered by the first update to the plan, 2021 to 2027
- long term – beyond 2027

Assessment method

The environmental assessment followed a number of steps:

- Ongoing and agreed flood risk management measures from previously consulted on plans (e.g SMPs, CFMPs, Tidal Dee Strategy) were reviewed against the proposed measures to ensure consistency with the existing policies.
- Proposed flood risk management measures that had been screened into the SEA were assessed for their effects on the ecosystem services. We recommended mitigation to address any adverse effects and improvements that would realise additional benefits.

We undertook the assessment of effects using an Appraisal Summary Table for the management catchment. These documented the current baseline for each ecosystem service and their evolution without plan implementation. The evolution of the baseline with implementation of the proposed measures was assessed for positive and negative effects, consideration of the duration of predicted effects and prediction of any secondary and cumulative effects. This information was considered and the significance of the predicted effect at a River Basin District scale was proposed. Chapter 4 of this report documents the outputs from this assessment, with figures showing significant positive and negative effects

on ecosystem services for each community at risk, where measures have been proposed within the life of this plan.

This environmental report sets out the anticipated significant changes across the river basin district. A precautionary approach was adopted where there were uncertainties during the assessment, for example, the location or design of particular flood risk management measures, or the value of some of the ecosystem services that are likely to be affected.

Alternatives considered

Approach to developing the FRMP

In August 2012 the Environment Agency Wales consulted over a three month period about the strategic approach for developing the FRMPs for this first planning cycle (2015-2021) and also for future planning cycles. Our consultation was an e-consultation, with questions posed on our website. We also held meetings with individual organisations and invited risk management authorities and national stakeholders to contribute their views. We suggested three options for developing the flood risk management plans:

- Option A. LLFAs prepare FRMPs for flood risk areas covering local sources of flood risk. Natural Resources Wales and the Environment Agency prepares FRMPs for main river, the sea and reservoirs.
- Option B. A consolidated FRMP is produced by Natural Resources Wales or the Environment Agency in partnership with others by bringing together information from separate plans.
- Option C. A FRMP is developed in partnership through one integrated process covering all sources of flood risk.

Natural Resources Wales published the proposed way forward in June 2013, taking account of the feedback from the consultation. The preferred approach to FRMPs was option B, a consolidated FRMP, however, following correspondence and discussions with the LLFA's they opted to produce independent plans.

Ongoing and agreed measures from existing plans

As outlined in section 1, a large proportion of this flood risk management plan is directly drawn from plans that are covered by previous consultations and strategic environmental

assessments (CFMPs, SMPs, Tidal Dee Strategy). These plans considered alternatives at the time and at their appropriate scale that do not require review within the FRMP and thus the FRMP SEA.

Proposed measures in the FRMP

The proposed measures of the FRMP for the river basin district set out the future management needs across the catchments and shoreline. At this scale they tend to set preliminary actions for the future investigation and development of business case appraisals and options. Further planning processes and supporting environmental assessments will focus on alternatives at project level. So the focus of alternatives for this FRMP SEA is limited and has been where the environmental assessment has identified that significant adverse environmental effects are likely from proposed flood risk management measures. This is described in section 4.

Habitat Regulation Assessment

In England and Wales, the Conservation of Habitats and Species Regulations (SI 490, 2010), termed the 'Habitats Regulations', implements the EU 'Habitats Directive' (Directive (92/43/EEC) on the Conservation of natural habitats and of wild flora and fauna, and certain elements of the 'Birds Directive' (2009/147/EC). This legislation provides the legal framework for the protection of habitats and species of European importance in Wales. The protected sites comprise Special Areas of Conservation (SAC), Special Protection Areas (SPAs, classified under the Birds Directive), candidate SACs (cSAC), Sites of Community Importance (SCIs) and, as a matter of government policy, to potential Special Protection Areas (pSPA) and Ramsar sites (sites designated under the 1971 Ramsar Convention for their internationally important wetlands). These sites are referred to collectively in this report as 'European sites'. Regulation 9(5) of the Habitats Regulations requires that a competent authority must consider the requirements of Habitats Directive in exercising any of its functions which includes assessment of plans and projects potentially affecting European sites.

It is considered that the flood risk management plan fits within the definitions of a 'plan' as defined by the Habitats Directive. The flood risk management plan therefore requires a Habitats Regulations Assessment (HRA), and this will be tailored to be appropriate for the nature of the plan. The HRA will be reported separately following discussion with Natural

Resources Wales (Strategic Assessment Team in Governance Directorate). Effects on SPAs, SACs and Ramsar sites have also been considered as part of the SEA, within the ecosystem service ‘Provision of Habitat’, and initial findings suggest that the flood risk management measures are unlikely to have significant effects on SPAs and SACs. Notwithstanding this conclusion, existing plans that have contributed to the FRMP have undergone their own HRA prior to their adoption and may have identified significant effects. In these cases, we have taken these findings into account in the assessment of the overall plan and adopted a precautionary approach. However, it is not the intention of this plan to reopen consideration of the habitats regulations assessments or the statement of case made as part of the HRA.

3. The environmental context for the plan

In this section we provide an overview of the environmental context for the Dee RBD. We also consider how other national and local plans relate to the FRMP. In some cases these will provide opportunities through shared objectives or areas of activities. In others there are potential challenges where objectives may appear to conflict with those things that the FRMP is seeking to achieve.

The Dee River Basin District

The Dee River Basin District is home to over 500,000 people and covers an area of 2,251 square kilometres of North East Wales, Cheshire, Shropshire and the Wirral. The district consists of a single river basin; the River Dee, its tributaries and estuary. The district is characterised by a varied landscape. It ranges from the mountains and lakes of the

Snowdonia National Park in the upper part of the basin, through the Vale of Llangollen in the middle reaches, to the open plains of Cheshire and the mudflats of the Dee Estuary in the lower basin. The Dee and its tributaries are renowned for their excellent fishing and there is an important cockle fishery in the estuary.

The River Dee and Llyn Tegid are designated as a Special Area of Conservation (SAC) under the Habitats Directive. The Dee estuary is a Special Protection Area (SPA) and SAC. Chester and Wrexham are the two major urban centres, but the dominant land uses are agriculture and forestry, particularly in the upper part of the basin. Key economic sectors in the region include business services, retailing, health, banking and insurance. Llyn Tegid, Celyn and Brenig reservoirs in the upper catchment are used for water storage to regulate river flows in the Dee downstream all year round. In the drier months, typically between April and September, this is to sustain abstractions for public supply, and industry.

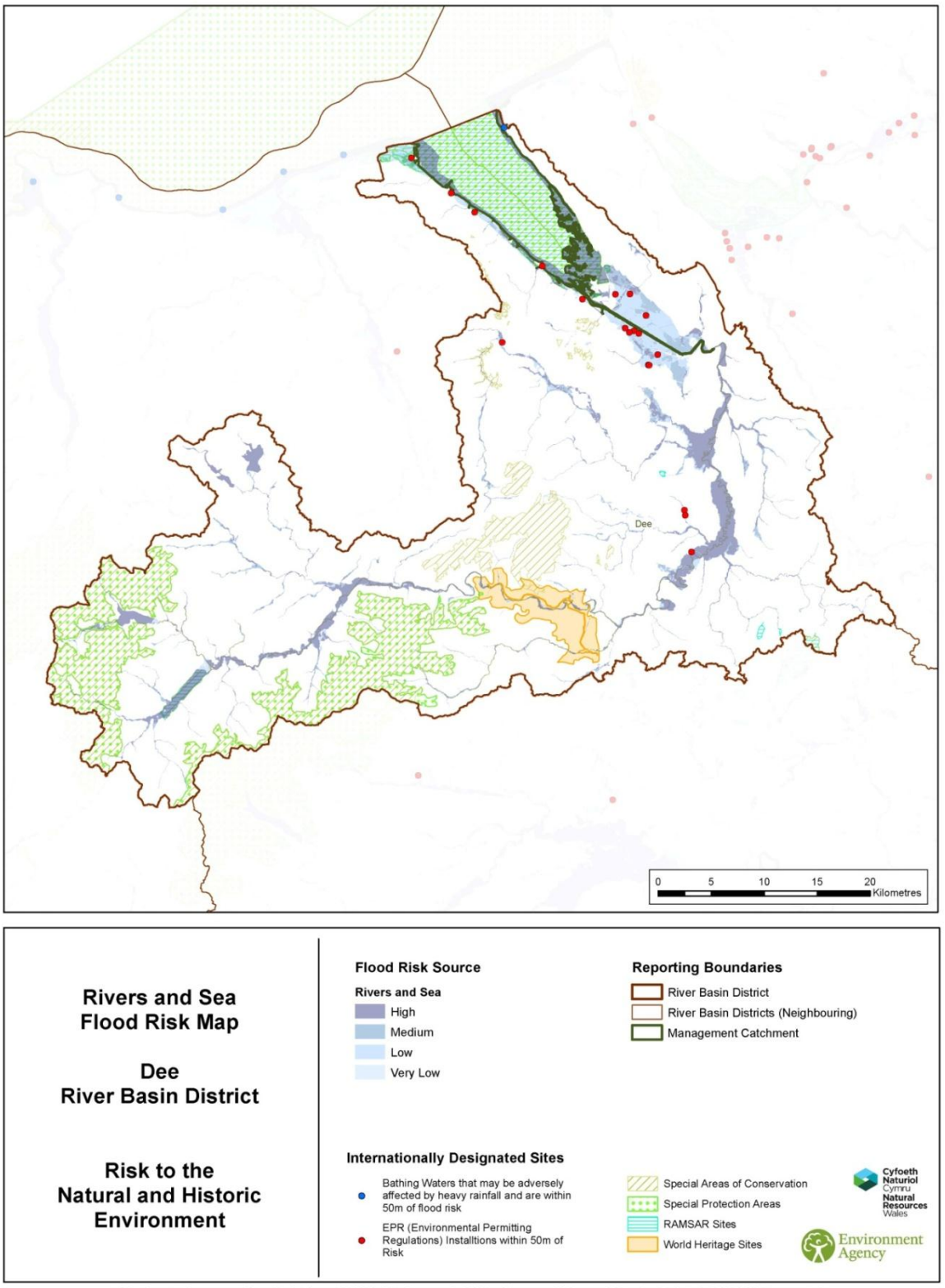
Nearly three million people get their drinking water from the Dee, including many in North West England. The reservoirs are also used to modify flood response and reduce the flooding frequency in the Dee between Bala and Chester.

Since the 1st April 2013 Natural Resources Wales and the Environment Agency are jointly responsible for managing the Dee Regulation System under the Dee and Clwyd River Authority Act 1973. Natural Resources Wales has agreed to lead on this under the terms of a “service provision agreement” with the Environment Agency.

Operational Management rules are established for operation of the scheme under "normal" and "drought" conditions. Within these rules and within the powers given by the Dee and Clwyd River Authority Act, Natural Resources Wales and the Environment Agency can specify the level of residual flow to be maintained over Chester Weir, and detail specific measures to be taken to reduce demands on the system in times of drought. Regard must also be given to mitigating flooding, supplying a specific volume of water to Canals and Rivers Trust for the Shropshire Union Canal, safeguarding the fisheries and other purposes including the safeguarding of specific features and habitats designated under the Habitats Directive that may be affected by management of flows in the River Dee. The strategic importance of the Dee as a potable water source and the risk posed to it from pollution have led to the Dee becoming one of the most protected rivers in Europe. In 1999, the lower part of the Dee was designated as the UK's first, and to date only, Water Protection Zone.

Section 4 of this report documents the baseline for each of the ecosystem services that the river basin district provides along with the future baseline in the absence of the plan.

Figure 3.1: Main rivers and the sea – natural and historic environment at risk



A more detailed baseline for those services scoped into the assessment is presented in Section 4. The environmental baseline has been developed in close collaboration with the river basin management plans. If you wish to have more detail on the environmental context for each of the management catchments, please refer to the catchment summaries included in the draft flood risk management plan.

Review of relevant plans and policies within the Dee River Basin District

The SEA Regulations require that consideration is given to the relationship with other plans and programmes and environmental objectives set at an international, (European) community or national level. Given the geographical scale of this plan, only relevant policies, plans, strategies and legislation relevant to the RBD have been considered as part of this review. Table 3.1 sets out the key themes arising from the policy review. The purpose of the review is to take account of the objectives of these key documents in the assessment with a view to aligning the Plan to compliment and work with other environmental policies and legislation rather than against. The documents consulted are detailed in Annex A.

The plan review can also help to identify where other planning processes and organisations may be able to work with the flood risk management planning process. Table 3.1 below lists the main themes emerging from this review in terms of areas of possible mutual influence with respect to the FRMP.

Table 3.1 Main themes from the review of policies, plans, programmes

Environmental Topic	Common Themes
Maintain and restore habitats	The Flood Risk Management Plan objectives will help to deliver improvements to the natural environment through reductions in habitat loss and mortality through flood events, so is consistent with PPP aims to protect, maintain and enhance the quality of the terrestrial environment. Aquatic habitats, however, need to be considered in the design and implementation of measures to achieve the objectives, and care must be taken to ensure the physical infrastructure implemented through the FRMPs do not damage or inhibit restoration of these aquatic habitats.

Environmental Topic	Common Themes
Improve status and diversity of species	The policy direction is to protect and enhance biodiversity and the natural environment; implementation of the FRMP must ensure steps are taken to protect, compensate and enhance biodiversity and habitats to enable alignment with the PPP.
Landscape	The PPP generally aim to conserve and enhance valuable landscapes; there are opportunities for changes in land use or land management to benefit the landscape, along with delivering the FRMP objectives to reduce flood risk.
Water resources / efficiency / water abstraction	The PPP aspires to protect natural resources. Some PPPs promote reducing water use and greater water efficiency, while others will put pressure on water resources. There is limited interaction between the FRMP and the conservation of water resources, but care must be taken to ensure that reductions in flood risk through, most notably, improved defence infrastructure projects is not at the expense of water resources.
Water quality	There is alignment within the PPPs that potable and non-potable water quality should be both protected and enhanced, through a wide range of strategies. Care must be taken to ensure that reductions in flood risk through, most notably, improved defence infrastructure projects is not at the expense of potable water supplies.
Flood risk	The PPPs concur that the management of flood risk, and also raising awareness of flood risk is desirable and should be supported. However, this should be progressed whilst also considering the wider environment and potential effects of reducing flood risk. A move away from direct flood defence is evident, with flood risk management offering the potential for delivering wider environmental enhancements. The FRMPs will align with this PPP theme.
Waste/ pollution	The PPP outline a desire to reduce waste and increase resource efficiency. Reducing waste and pollution will be driven, indirectly, by the FRMP so there is broad alignment between the FRMP and the PPP.
Material assets	The aim of the PPP is to provide sustainable transport networks. The FRMP will help to deliver this aim through reduction in flood risk to key infrastructure where required.
Planning	The PPPs set out that future land use planning should be undertaken through the principle of sustainable development, and also that the water environment should be specifically considered. The FRMP will assist in the achievement of these aims through reductions in flood risk in a greater number of areas. Care must

Environmental Topic	Common Themes
	be taken to ensure this reduction in flood risk does not compromise other factors to sustainable development.
Mitigation and adaptation to climate change	The recognition of the need to adapt to climate change is a common theme through the PPP and this encompasses a wide range of changes to the economy, society and environmental management such as changes to land use practices and soil management. Adapting to an increased flood risk due to more frequent and severe extreme events and sea-level rise is a primary theme of the PPP, and the FRMP aims to deliver this adaptation.
Land Use	Farming practices are changing to ensure long-term sustainability of the industry, e.g., a move to organic farming, promotion of locally-based producers; and agricultural practices increasingly seeking to protect and enhance the landscape. Woodland management is aspiring to high-quality woodlands, with a diverse mixture of species and habitats. The FRMPs will reduce flood risk to agricultural, urban and other areas and will protect key land uses.
Natural Resources	Managing Wales' natural resources is a key direction within the PPPs, and includes maintaining the diversity of species and habitats and Wales' landscape and heritage assets, whilst realising the economic benefits of forestry, fisheries, agriculture and mineral resources. There is a desire to challenge traditional approaches to managing flood within the PPP, putting much greater emphasis on the management of the flood risk as whole, starting with retaining more water in uplands and slowing its rate of movement, allowing more areas of lowland to flood naturally to dissipate impacts. This approach will be actively considered within the FRMP.
Water-based/ waterside recreation and tourism	The PPP identifies the water environment as a key tourist and recreation resource. It promotes opportunities to provide appropriate water-based recreation. The FRMPs need to take into account the use of Wales' rivers, lakes and coastal waters as an outdoor recreation and health resource. Access to these waters should not be compromised through the achievement of the FRMP objectives so their recreational use is retained.
Historic Environment	The FRMP should ensure that it does not compromise the historic environment in achieving its objectives, as the PPPs outline a desire to conserve and enhance heritage assets, and provide a framework to value these assets.

4. Significant effects of the Dee Flood Risk Management Plan

In this section we set out the significant effects of the FRMP. We have presented these in terms of how they affect the ecosystem services we currently receive from the water and related environment. Where adverse effects occur we have proposed mitigation that will assist in avoiding or reducing them. We have undertaken the assessment of environmental effects using a combination of previous experience of the catchment and using our wider experience of strategic environmental assessment.

Overview of the effects of the Dee Flood Risk Management Plan

As outlined in section 2, in scoping the assessment we focussed on the statutory flood risk management measures that set the framework for development consent or make a decision about a particular option for managing flood risk. These are generally categorised as protection measures. We scoped out prevention measures (for example avoidance measures, land use planning and individual property protection), preparedness measures (for example flood forecasting, flood warning and public awareness) and recovery and review measures (for example clean-up work and supporting activities following a flood event). This meant that quite a large proportion of the agreed, ongoing and proposed measures were scoped out of the assessment.

While prevention, preparedness and recovery have been scoped out of the assessment, it is important to acknowledge the health and wellbeing benefits associated with these measures. There is strong evidence that demonstrates the adverse health effects of flooding. Deaths can occur, but more frequent and widespread are the psychological effects. In a study into the social impacts of flooding in Scotland[3], intangible impacts were considered to be more important than material losses. Intangible impacts included the stress of the flood itself, the anxiety of being out of one's home, the discomfort of living in temporary accommodation and the time and effort in dealing with insurers and builders. Longer lasting impacts included the fear of future flooding and the loss of sentimental/irreplaceable items. These effects were exacerbated when they affected low income families, the elderly or other vulnerable groups. The stress can result in physical or mental health problems and has also been shown to exacerbate pre-existing conditions. There are subsequent economic effects on the health care system and businesses whose employees are affected.

[3] Werritty A, et al (2007), Exploring the social impacts of flood risk and flooding in Scotland, Scottish Executive Social Research, Edinburgh.

Prevention measures offer the opportunity to avoid these adverse social and health effects. Preparedness and recovery measures can provide mitigation to reduce the severity of the effects. For example, the provision of, or improvements to, flood warning enables people to move treasured belongings to a safe place, to deploy individual property protection, to turn off electricity and gas before vacating a property and allows public services to manage closures (such as roads or railways) to improve the safety of the public. These not only reduce the stress of the flooding event itself, but will aid the recovery process.

Table 4.1: Number of proposed measures for the Dee FRMP

Measures	Welsh Dee	English Dee
Prevention	19	0
Preparedness	40	10
Protection	22	3
Recovery and Review	0	0

The assessment focused on the most significant effects to the range of ecosystem services. This considered both which types of measures typically caused effects and which ecosystem services would be more affected than others. The results below are set out as follows:

- effects that are potentially significant across the river basin district
- effects that are potentially less significant at this scale but would be more locally significant
- effects on ecosystem supporting services

Significant effects of the Dee flood risk management plan

The flood risk management plan was assessed as having potentially significant effects on the following ecosystem services at an RBD scale:

Provisioning Services

- Food

Regulating Services

- water regulation

Cultural Services

- cultural heritage
- recreation and tourism

- aesthetic value

Supporting services

- Provision of habitat (Biodiversity)

We have set out below, under each of these headings, an outline of the current status of the service within the river basin district, how the service is considered to change as a result of the flood risk management plan and any mitigation likely to be required if the effects are considered to be adverse.

For the purposes of the assessment the following assumptions were made:

- Existing plans for flood risk management in the Dee RBD were taken to comprise the Dee CFMP, SMPs, Tidal Dee Flood Risk Management Strategy.
- The assessment takes account of measures at the level of the river basin district, strategic areas (England and Wales).

Significant effects of the updated Dee Flood Risk Management Plan

1. Food (e.g. crops, fruit, wild collected food)

What are Food services?

Ecosystems provide the conditions for growing food. Food comes principally from managed agro-ecosystems but marine and freshwater systems or forests also provide food for human consumption.

What is the current baseline in this service in the Dee RBD?

The RBD is primarily rural in character, with urban centres situated in the lower RBD. Rural land in the Dee RBD is mainly used for agriculture and forestry. Mixed sheep and beef-cattle farming is undertaken in the uplands, with intensive dairy farming in the lower lying land of the Cheshire Plain and some arable farming in the lower Dee valley. The Dee Estuary supports commercial fishing, including a nationally important cockle fishery situated within the estuary. The upper waters also support salmon and trout game fishing with excellent fly fishing for Brown Trout, Sea Trout, Salmon and Grayling. The River Dee is recognised as one of North Wales' premier rivers for Atlantic salmon. The Mynach, Meloch and Ceiriog tributaries are the most important salmon spawning tributaries in the Dee RBD.

Future baseline – what food services are likely to be provided in future in the absence of the plan?

In the absence of the plan, the management of land and waters for agricultural purposes and the production of food is likely to continue, with increased technological and scientific advancements enhancing the productivity of the land and waters within the RBD and thus the amount of food that is produced. Development in the lower areas of the RBD are likely to encroach onto agricultural land around the urban centres of Chester, Wrexham and Buckley, which will reduce the amount of agricultural land available and thus the amount of food produced and the value of this service in the RBD. Increasing use of the lower RBD for industrial use could cause changes to water quality and availability, which in turn could decrease fish populations.

What is the change in benefits to this service predicted through the Dee FRMP?

Key measures that result in potential effects on the food service in the RBD include:

- In the short term, there may be a small reduction of available agricultural land through construction of defences at the Turn o' Dee depending upon the design implemented. This will result in reduced food supply and increased cost to the farmers in this area. However, in the long term the works would cause a positive effect as the agricultural land behind the defences would be protected from flooding and potential damage to crops.
- In the long term, there is the potential for deterioration in fish habitats through reductions in geomorphological diversity, and in the short term increased fish mortality from in-river works, from channel conveyance improvements at Bretton. This could reduce the fish populations in the channel and have a negative effect on the food service.
- From the initial assessments in Wrexham, Walwen and Whelston and Connah's Quay there are potential long-term positive and negative effects anticipated from future works carried out as a result of the feasibility studies. There could be a positive effect where flooding is reduced or prevented to agricultural land on the floodplain surrounding the towns, thereby reducing crop and soil damage. There is also a negative effect where a new scheme may reduce the amount of land available for agricultural use through land take for embankments or storage areas. Lastly, changes to the channel could affect natural habitats i.e. blockstone used to

reinforce eroding river banks; which could reduce the habitat suitability of the river for fish, and cause a decline in local fish populations and a negative effect.

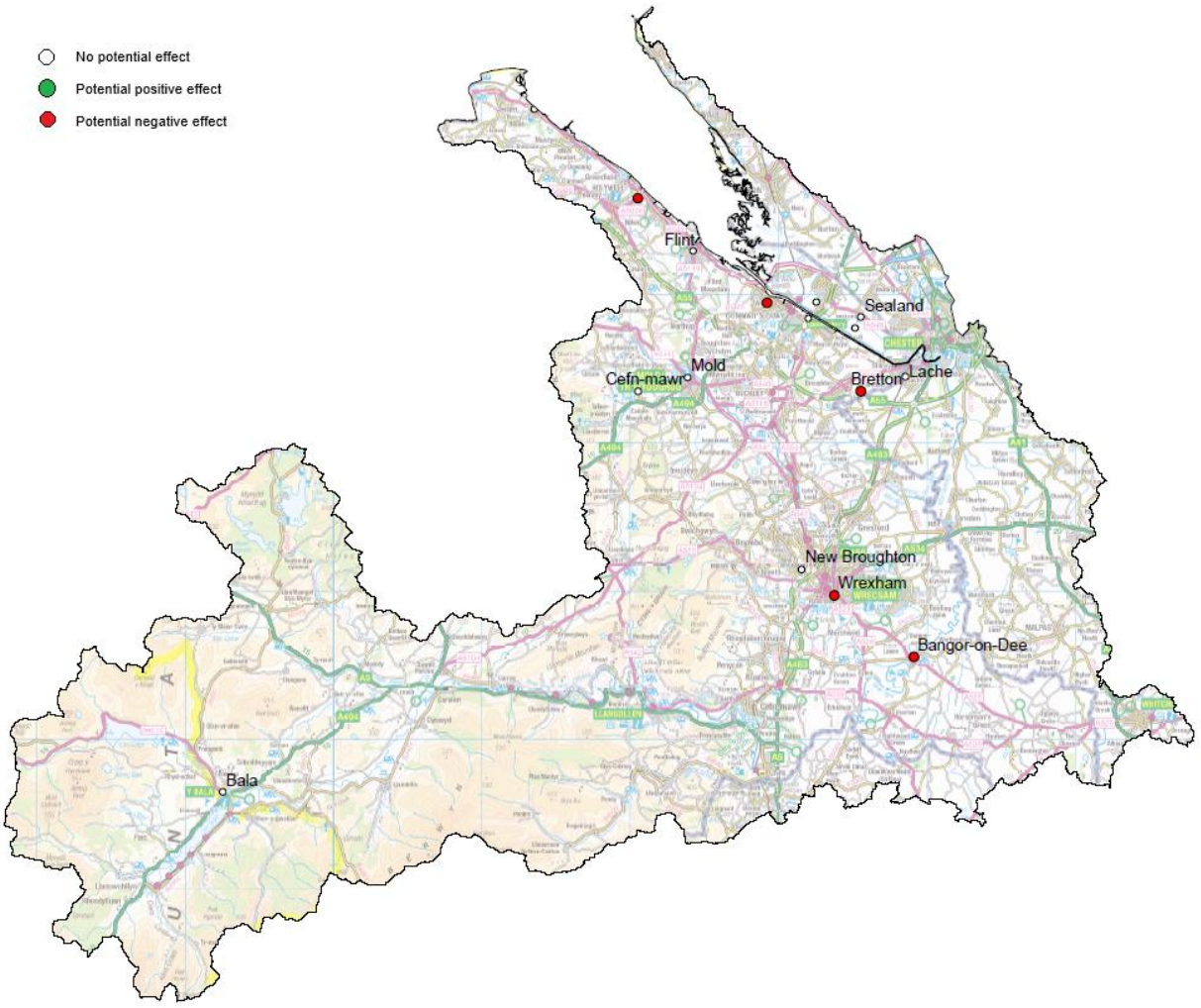


Figure 4.1: Distribution of potential effects to food service within the Dee RBD

Overall, it is anticipated that as a result of the FRMP there will be a direct minor negative effect on the food services provided within the Dee RBD in the long-term as a result of agricultural land-take and deterioration of fish habitats but the FRMPs will provide an indirect beneficial effect by ensuring effects from flooding are minimised in these areas. Effects will largely be confined to the areas surrounding the communities where the actions are to be implemented, and these are concentrated in the lower RBD and Dee Estuary as shown in Figure 4.1.

To mitigate for potential negative effects on this service, the following mitigation should be implemented:

- Site works away from highest grades of agricultural land (i.e. Grade 1 or 2 ALC land);
- Inform and engage with affected landowners to minimise potential effects; and
- Ensure appropriate fish passage, improvements to fish habitats and fish-rescue provisions are developed when undertaking in-river works to ensure the food service in the RBD is maintained.

What are the significant effects of implementing the Dee FRMP on this service?

Implementation of the Dee FRMP is not anticipated to have a significant effect on the food services in the RBD, however there is anticipated to be a minor, negative effect to the food services overall, concentrated in specific areas of the RBD. Indirectly there could be benefits through reductions in flood damages. The main affected parties from these effects will be the agricultural and fishing industries as their land may be less productive and the water environment may not support the same fish and shellfisheries populations. The indirect and cumulative effects of the improvements to the food service are outlined in Section 3 below.

2. Water Regulation (e.g. flooding)

What are water regulation services?

The timing and magnitude of run-off, flooding and aquifer recharge can be strongly influenced by changes in land cover, including, in particular, alterations that change the water-storage potential of the system such as the conversion of wetlands or the replacement of forests with farmland or farmland with urban areas.

What is the current baseline in this service in the Dee RBD?

The River Dee is 110 kilometres long from its source in the Snowdonia National Park to where its estuary discharges into Liverpool Bay. Upstream of Llyn Tegid the river is fast flowing in a narrow incised valley, whilst downstream of the lake the valley bottom and natural floodplain opens out to approximately one kilometre wide. The river once again follows a narrow incised valley through Llangollen and downstream to Erbistock (upstream of Bangor-on-Dee). Between Erbistock and Chester the floodplain is flat and very wide.

Downstream of Chester Weir the river was canalised over 200 years ago and flood defences, which are still maintained today, were constructed to protect land from tidal

inundation. The River Dee is normally tidal up to Chester Weir. This boundary is exceeded for spring high tides and extreme tides when tidal influence can affect river levels as far upstream as Shocklach, 15 kilometres upstream of Chester Weir.

The natural river system is modified in the upper RBD through flow-control at the Bala sluices located at the confluence of the River Dee and the River Tryweryn. The River Dee is a heavily regulated channel, for drinking water abstractions and flood alleviation purposes. This regulation is also beneficial for recreation around Tryweryn, with the presence of the National White Water Centre. When flows in the river are low, the lakes are regulated to maintain the volumes required for drinking water abstractions. Similarly, where flows in the river are high, the releases from the lakes are regulated to reduce the risk of flooding in the lower reaches. The regulation of the reservoirs in the upper RBD affects the whole reach of the main River Dee as drinking water abstraction points are in the lower reaches of the RBD.

In the Dee RBD there are approximately 26,400 people at flood risk from main rivers and the sea; over 3000 of these are considered to be at high risk. Flooding has occurred at many locations in the RBD, mostly from the main River Dee and its major tributaries, but also from smaller watercourses. Significant fluvial floods were recorded in 1890, 1946, and 1964 and recently in 2000. The RBD is also at risk of tidal flooding from the Dee Estuary. The areas that are at risk from tidal flooding from the Dee Estuary are between Talacre, Chester and Neston, covering the main centres of population around Talacre, Holywell, Flint, Connah's Quay, Queensferry, Sealand and Neston.

Land use within the RBD is predominantly agricultural, forestry or open moorland and peat bog. There are a number of large urbanised areas. Run-off from the agricultural land and urban areas is likely to be relatively quick, but the forestry and upland peat bogs will store water for a time.

Future baseline – what water regulation services are likely to be provided in future in the absence of the plan?

In the absence of the plan, water regulation services are likely to be under increasing pressure in the Dee RBD due to new development, agricultural intensification and climate change. Urban expansion, for example, will lead to greater rates of surface water run-off

and further reduce the capacity of natural floodplains to retain and store flood waters. Agricultural intensification could also increase surface water run-off in rural areas of the RBD. Predicted climate change increases the risk of more severe precipitation events, causing an increased risk of surface water and fluvial flooding, reducing the water regulation service provided by the RBD. Sea level rise will also increase the flood risk in the tidally affected reaches.

What is the change in benefits to this service predicted through the Dee FRMP?
Key measures that result in potential effects on the water regulation service in the RBD include:

- Culvert surveys at Queensferry and channel conveyance improvements at Bretton will improve this water regulation service through improved drainage ability of the RBD, and less risk of flooding from blocked culverts, leading to a short-term, positive effect.
- Minor improvements at Bangor-on-Dee will also deliver reductions in flood risk and the reservoir safety works at Bala will ensure risk of catastrophic flooding from dam collapse is avoided.
- From the initial assessments in Wrexham, Walwen and Whelston and Connah's Quay there will be no immediate change/effect but there is a potential long-term, positive effect anticipated from future works carried out as a result of the feasibility studies where flooding is reduced in extent or prevented altogether, improving the ability of the RBD to regulate water. This improved service will directly benefit the primary communities at risk of flooding within the RBD and will result in the greatest reduction in flood risk most efficiently.

It is recognised that many of these actions could be implemented in a number of ways to achieve the desired reductions in flood risk. Measures for encouraging natural flood management and wider catchment management measures in the upper catchments, improvements in land management and the creation of SuDs in urban and rural areas, will have a positive effect on this service by improving the attenuation, storage and infiltration of surface water run-off. This in turn will help to reduce the magnitude of flows entering watercourses and slow their response times with consequent benefits in areas downstream with respect to the possible extent and severity of flooding. Renaturalising watercourses (e.g. de-culverting) and reductions in the intensity of maintenance activities

will also provide positive benefits for water regulation by facilitating more natural watercourses in terms of their channel morphology and habitats. The creation and re-establishment of habitats, for example, will help to further reduce surface water run-off from entering watercourses, whilst improving morphological diversity will help to slow water flows and the response times of watercourses to rainfall events.

The removal or setting back of existing flood defences and opportunities for managed realignment together with associated habitat creation (e.g. saltmarsh, flood plain grazing marsh), such as is required along frontages on the Dee Estuary are also likely to benefit water regulation services. Such measures will help to reconnect watercourses with their floodplain and support their capacity to store water and facilitate its infiltration. Initiatives for managed realignment associated with the Tidal Dee Strategy, will maintain the capacity of these areas to accommodate tidal waters and help to dissipate the erosive capacity of tidal waters as well as improve the resilience of these areas to storm events.

Notwithstanding these positive changes, the implementation of flood alleviation schemes and improving the standard of protection of existing flood risk assets could have negative effects on water regulation services depending on the type and design of the action/works. Measures that involve raising existing flood defences in the longer term in response to climate change will serve to sustain or increase the disconnection between a watercourse and its natural flood plain preventing opportunities for improved storage and infiltration. Potential flood alleviation schemes in identified communities that employ hard engineering solutions and result in extensive physical modifications of the channel and banks could also adversely affect natural processes through the loss of habitats, reduced morphological diversity and exacerbating surface water run-off from surrounding areas.

Overall, it is anticipated that as a result of the plan there will be a minor positive effect on the water regulation service provided within the Dee RBD. Effects will largely be confined to the areas surrounding the communities where the actions are to be implemented, and these are concentrated in the lower RBD and Dee Estuary as shown in Figure 4.2.

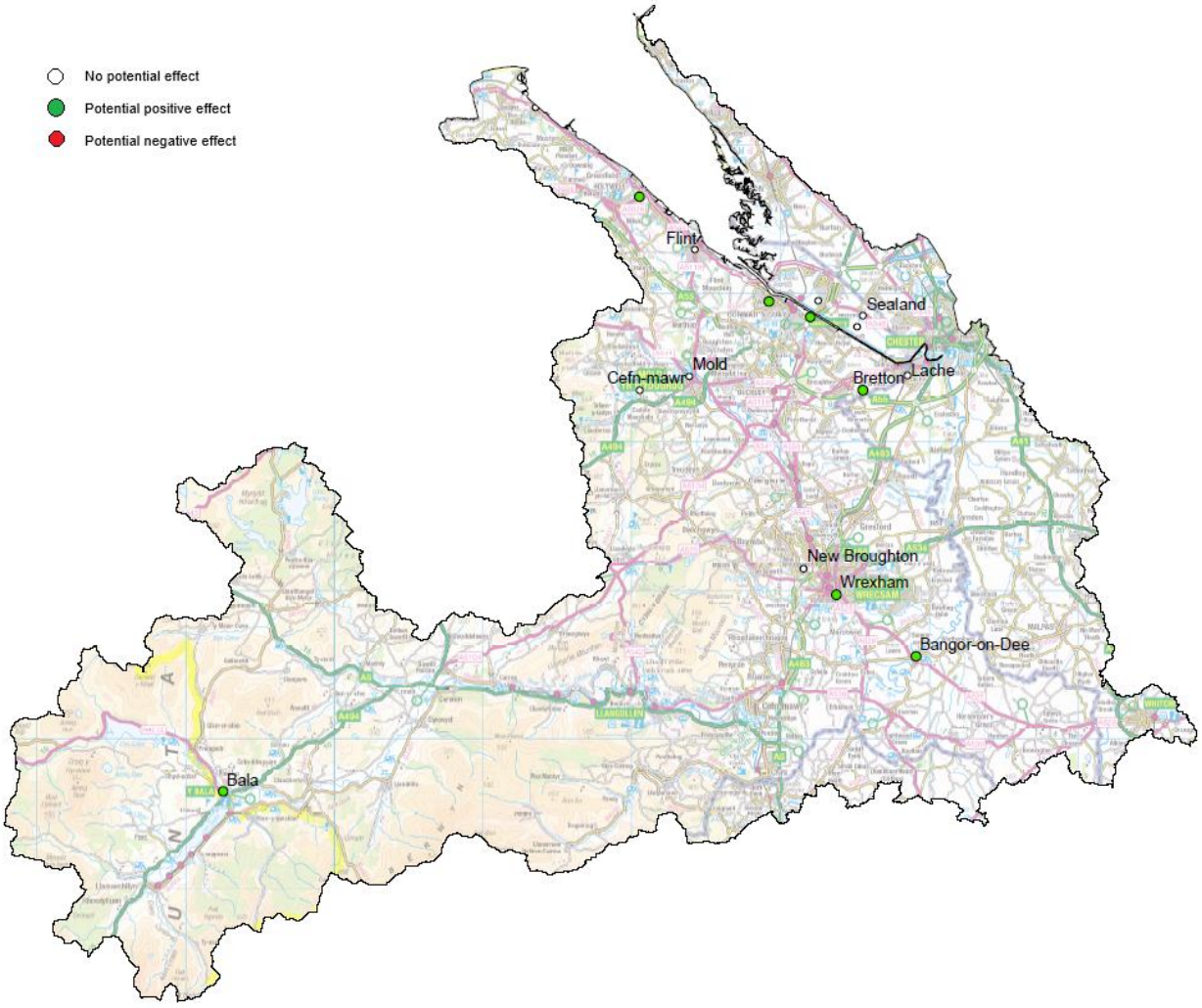


Figure 4.2: **Distribution of potential effects to water regulation service within the Dee RBD**

How significant are the predicted changes to water regulation services in the Dee RBD?

Implementation of the plan is not anticipated to have a significant effect on the water regulation services in the RBD, however there is anticipated to be a minor, positive effect to the water regulation service overall confined to the specific communities where actions will be implemented. The main beneficiaries of this positive effect will be the residents and business in low-lying parts of the RBD, near the rivers and Dee Estuary, as their flood risk will be reduced. Benefits to sensitive ecological habitats and species will also benefit through reduced potential for damage or mortality. In developing flood alleviation schemes and options for improving the standard of protection of existing defences or their refurbishment/replacement consideration should be given to approaches that avoid

potential negative impacts (e.g. property protection and resilience measures) and interventions that as far as possible utilise natural processes, such as the use of SuDs, re-naturalising modified watercourses and incorporating habitat creation. The indirect and cumulative effects of the improvements to the water regulation service are outlined in Section 3 below.

3. Cultural Heritage

What are cultural heritage services?

Many societies place high value on the maintenance of both historically important landscapes ('cultural landscapes') and other features (buildings, archaeology, and links to past industrial uses).

What is the current baseline in this service in the Dee RBD?

There are more than 400 Scheduled Monuments within the Dee RBD, as well as numerous sites of historical or archaeological importance (e.g. Listed Buildings, Registered Historic Parks and Gardens) and landscapes listed on the Register of Landscapes of Historic Interest in Wales including Holywell Common and Halkyn Mountain; Vale of Llangollen and Eglwyseg; Maelor; Bala and Bala Lakeside. Of particular importance to this plan is the heritage value of the canal network which includes the Pontcysyllte Aqueduct and Canal World Heritage Site.

The city of Chester has an important heritage value, having been founded as a Roman fort with the name Deva Victrix. Chester's four main roads, Eastgate, Northgate, Watergate and Bridge, follow routes laid out at the time of founding. The first evidence of settlement in the town of Wrexham was from the 12th century, and the town contains important medieval heritage. The settlement of Llangollen also has intrinsic heritage value, with Castell Dinas Brân standing above the town, the site of a medieval castle and prior to that an iron age hill fort. Llangollen also has an important post-medieval history, with the Llangollen Canal and Llangollen Railway constructed during the industrial revolution. 427 of the 4386 listed buildings in the RBD are at a 1 in 100 (1%) or greater chance of flooding each year; with 146 of these considered to be high risk.

Many structures such as mills, bridges, weirs and sluices within the river basin district have listed status or are of local historic importance and therefore removing or altering them to

aid fish passage can have negative cultural heritage impacts. The legacy of mining in the RBD has impacted water quality, but surviving mine features may also be important for their heritage value.

There are also likely to be numerous other, non-designated archaeological and built heritage assets across the RBD. Archaeological features associated with the flood plain and land saturated by groundwater can be put at risk from drying out, erosion or inundation.

Future baseline – what cultural heritage services are likely to be provided in future in the absence of the plan?

The future baseline for cultural services is dependent on the actions of a range of stakeholders (e.g. public, private and voluntary sectors) to conserve and enhance the historic environment, heritage assets and their settings. In the absence of the plan, there is the potential for heritage assets within the Dee RBD to be affected by the abstraction of water and the resulting changes in groundwater flows and chemistry on buried, waterlogged archaeological and palaeo-environmental remains associated with the river valleys, floodplains and wetland habitats. Also by the implementation of planned flood alleviation schemes; the refurbishment and or improvement of existing flood defence assets; the extension of individual Property Level Protection programmes; the creation of SuDs in urban and rural areas; continued watercourse maintenance works; and localised initiatives for managed realignment and habitat creation. In particular, works that involve excavation may impact on archaeological remains whilst the introduction of new structures/features could harm the character and appearance of historic townscapes or affect the setting of heritage assets. Heritage assets may also be subject to increased flood risk as a result of climate change and increased development pressures in urban areas leading to more frequent and intense fluvial and surface water flooding events.

What is the change in benefits to this service predicted through the Dee FRMP?

Key measures resulting in potential negative effects to the cultural heritage service in the RBD include:

- Potential to harm features of historic interest and archaeological remains, including peat deposits and palaeo-environmental channels through changes to land use or

excavation works associated with maintaining, improving or constructing new defences.

- Works in Bangor-on-Dee could potentially affect existing heritage assets such as Bangor Bridge Scheduled Monument and a number of Listed Buildings adjacent to this monument, leading to a long-term, negative effect.
- From the initial assessments in Wrexham, Walwen and Whelston and Connah's Quay there will be no immediate change/effect. Should a scheme be carried out as a result of the feasibility study then siting of works near to any assets could potentially cause a long-term, negative effect, and intrusive groundworks could disturb areas of previously unknown, buried archaeology.

To mitigate for these potential negative effects, a cultural heritage assessment of any intrusive works should be undertaken, maximising use of local knowledge, prior implementing the relevant measure. This will ensure all effects on the archaeological or built heritage resource are managed appropriately.

There are opportunities for delivering localised positive changes in cultural heritage services by preserving and recording heritage at risk and by increasing awareness, understanding and enjoyment of the historic environment. These positive changes could occur through increasing the awareness of landowners and local communities of water related heritage assets and their significance; promoting their conservation and enhancement as part of an integrated approach to catchment management and sustainable land management; and improving public access and interpretation. Maintaining the level of flood defence and the implementation of flood alleviation schemes in identified communities is also likely to benefit heritage assets in these areas by reducing their risk of flooding and helping to sustain their continued use and maintenance.

Overall, it is anticipated that as a result of the FRMP there will potentially be a minor negative effect on the cultural heritage services provided within the Dee RBD. This is highly dependent upon the siting of measures however, as the cultural heritage value within the RBD is confined to distinct spatial areas and landscapes, and avoidance of these by measures will minimise the potential for effects. Effects will largely be confined to communities where actions are proposed as shown in Figure 4.3.

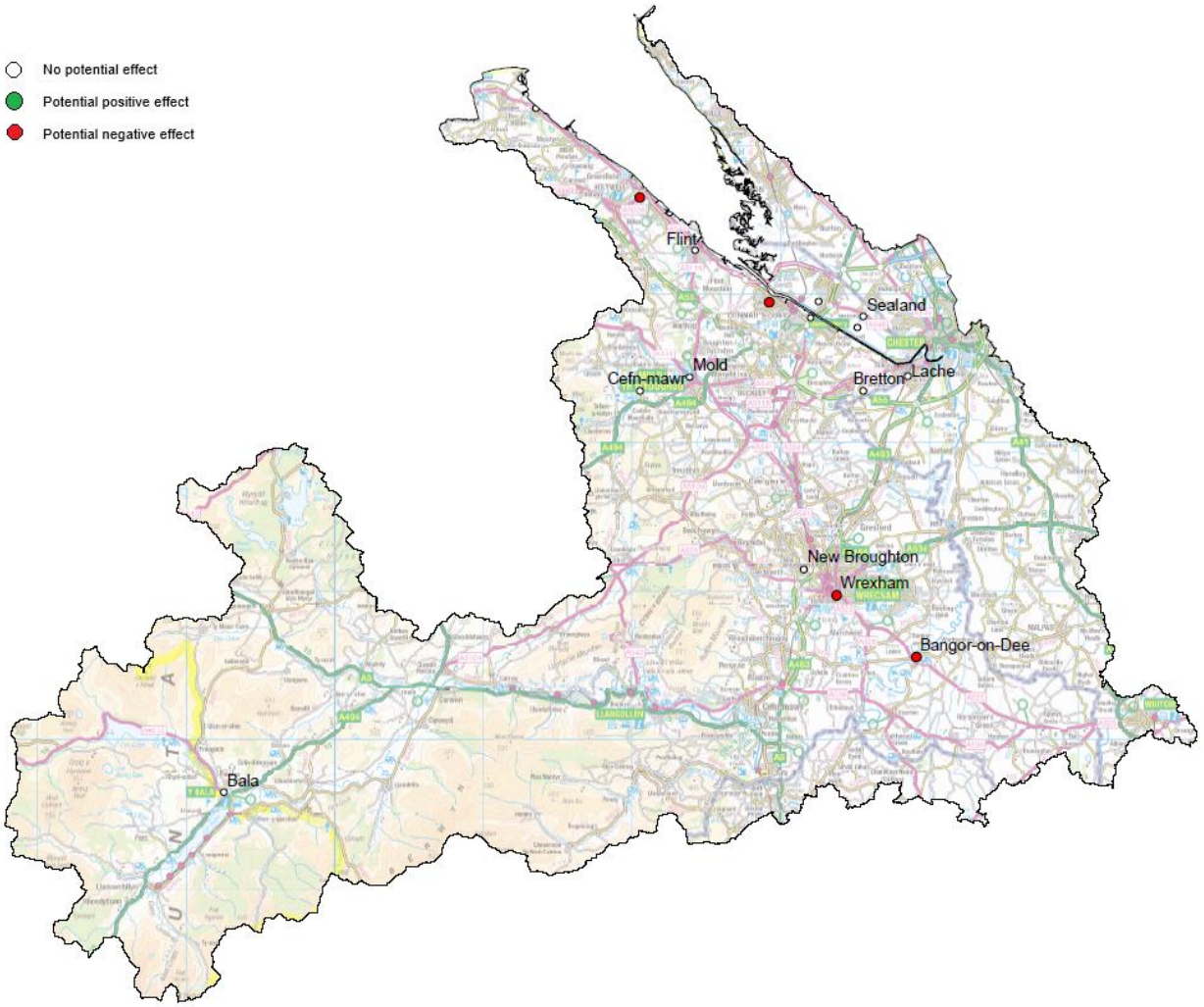


Figure 4.3: **Distribution of potential effects to cultural heritage service within the Dee RBD**

How significant are the predicted changes to cultural heritage services in the Dee RBD?

Implementation of the Dee FRMP is not anticipated to have a potential significant effect on cultural heritage services, however is anticipate to have a minor negative effect. This adopts a precautionary approach given the high degree of uncertainty across the majority of the RBD as to the design of measures and the nature of cultural heritage features that could be affected. The main parties subject to this negative effect will be the users of and visitors to assets, as the appreciators of the cultural heritage of the RBD. The intrinsic heritage value of the RBD could also be affected.

To conserve and enhance the historic environment it will be important that individual schemes at the earliest stage identify any designated or non-designated heritage assets, including the risk of unknown buried archaeology, in order to: establish the potential for adverse effects as well as opportunities for enhancement; determine whether any action should be taken due to the significance of the heritage assets and likely impacts; inform scheme options and detailed design; and identify an appropriate mitigation strategy.

If potential adverse effects are identified, scheme specific mitigation will need to be developed in consultation with the relevant organisations, such as Cadw or English Heritage, the relevant Archaeological Trust and the local authority conservation officer. The indirect and cumulative effects of the improvements to the cultural heritage service are outlined in Section 3 below.

4. Recreation and Tourism (including accessible blue and green space)

What are recreation and tourism services?

People often choose where to spend their leisure time based, in part, on the characteristics of the natural or cultivated landscapes in a particular area.

What is the current baseline in this service in the Dee RBD?

Recreational and tourism opportunities within the RBD are extremely varied from angling and other water sports to walking and popular visitor destinations such as Snowdonia National Park, Clwydian Range and Dee Valley AONB, Llangollen, Chester and Erddig near Wrexham.

The RBD has a network of walks often centred around watercourses and lakes, such as the Dee Valley Way. There is a variety of navigation and water sports in the RBD, including canoeing and white water rafting at the National Watersports Centre at Tryweryn, Sailing and Wind Surfing on Bala Lake, rowing at Chester and boating on the Llangollen Canal. There are also numerous biking opportunities in the RBD from mountain biking in upland areas to cycling along the Dee Estuary from Chester.

Angling is a popular recreational activity within the RBD. Salmon, trout and grayling fishing on the Dee itself and its tributaries, coarse fishing in the Llangollen canal and lakes in the

RBD and saltwater fishing along the Dee estuary. The Dee Estuary is also considered to be a premier bird watching location for wetland and shore birds.

These water and land-based recreational opportunities can contribute to improving the quality of people's lives and human health whilst bringing economic benefit from tourism. Recreation and tourism industries account for at least 10,000 jobs in north east Wales.

Future baseline – what recreation and tourism services are likely to be provided in future in the absence of the plan?

In the absence of the FRMP, it is anticipated that the recreation and tourism service will change and develop through time, influenced by projects and strategies to develop certain areas of the RBD. Some post-industrial areas will be transformed through regeneration initiatives, for example in the Deeside Enterprise Zone.

In the longer term, climate change may increase the vulnerability of particular recreational and tourism assets to flooding. As already covered in the assessment of cultural heritage services, the predicted increase in rainfall and the intensity and frequency of storm events could result in more severe and frequent flood events affecting the RBD's historic riverside towns and other heritage assets. Many of these towns are important centres for recreation and tourism, attracting visitors within the area as well as nationally. Prolonged and more frequent flooding could adversely affect the local tourism economy due to disruption, the costs of repair and a possible decline in visitor numbers due to negative images in the press.

What is the change in benefits to this service predicted through the Dee FRMP?

Key measures resulting in potential effects to the recreation and tourism service in the RBD include:

- Construction works in Queensferry and Bangor-on-Dee may involve short-term disruption to public access and rights of way, leading to a negative, short-term effect.
- The reservoir safety works at Bala will maintain this lake, and as it is an important recreational resource in the RBD there will be a positive, long-term effect on this service from these works.

- From the initial assessments in Wrexham, Walwen and Whelston and Connah's Quay there will be no immediate change/effect. However, there are potential negative effects anticipated from future works carried out as a result of feasibility study with a short-term, negative effect where temporary work is carried out to implement a new scheme. This temporary work could result in the closures of footpaths, restriction of the use of playing fields or restrictions of access to the riverbank for recreational fishing. Also, there could be a long-term, negative effect in these areas where new schemes/structures are required that might impact heavily on the current landscape, environment and its use for recreation and tourism.

Overall, it is anticipated that as a result of the plan there will be a minor negative effect on the recreation and tourism services provided within the Dee RBD. Effects will largely be confined to the communities where actions are to be implemented as shown in Figure 4.4. The implementation of flood alleviation schemes could have negative effects where their location or design would serve to limit access to a watercourse or hinder its use for water-based activities (e.g. boating, canoeing). There is also the potential for new schemes and increasing the standard of protection of existing flood defence assets to impact visually on the surrounding landscape and townscape of places that are valued for their aesthetic qualities. The managed realignment or removal/non-maintenance of existing raised defences could impact on the Public Rights of Way network, including long distance footpaths such as the Wales Coast Path. Reductions in the intensity of maintenance operations could also have negative consequences for the aesthetic appeal and attractiveness of watercourses that become overgrown and making them unsuitable for water-based activities. Lastly the replacement or alteration of existing flood defence assets (e.g. tidal and river gates) may also lead to changes in water levels and flows that could potentially impact on the use of a watercourse for recreational activities such as boating or sailing.

In order to mitigate for this potential effect, works must be designed appropriately for the local area, with finishes and working methods agreed with the appropriate governing bodies and consideration given to enhancing the area around the settlements for recreational purposes. There is an opportunity to mitigate these effects and enhance local communities through good environmental design. The creation of more natural and attractive riverine environments (e.g. aesthetic services) is likely to encourage more water-

based recreational activities and informal leisure pursuits such as walking and bird watching. Changes in maintenance regimes such as dredging, is likely to improve fish habitats and the recreational fishing resource of watercourses. Opportunities for managed realignment and the creation of intertidal habitat through the NHCP will also further enhance the area's attraction for bird watching.

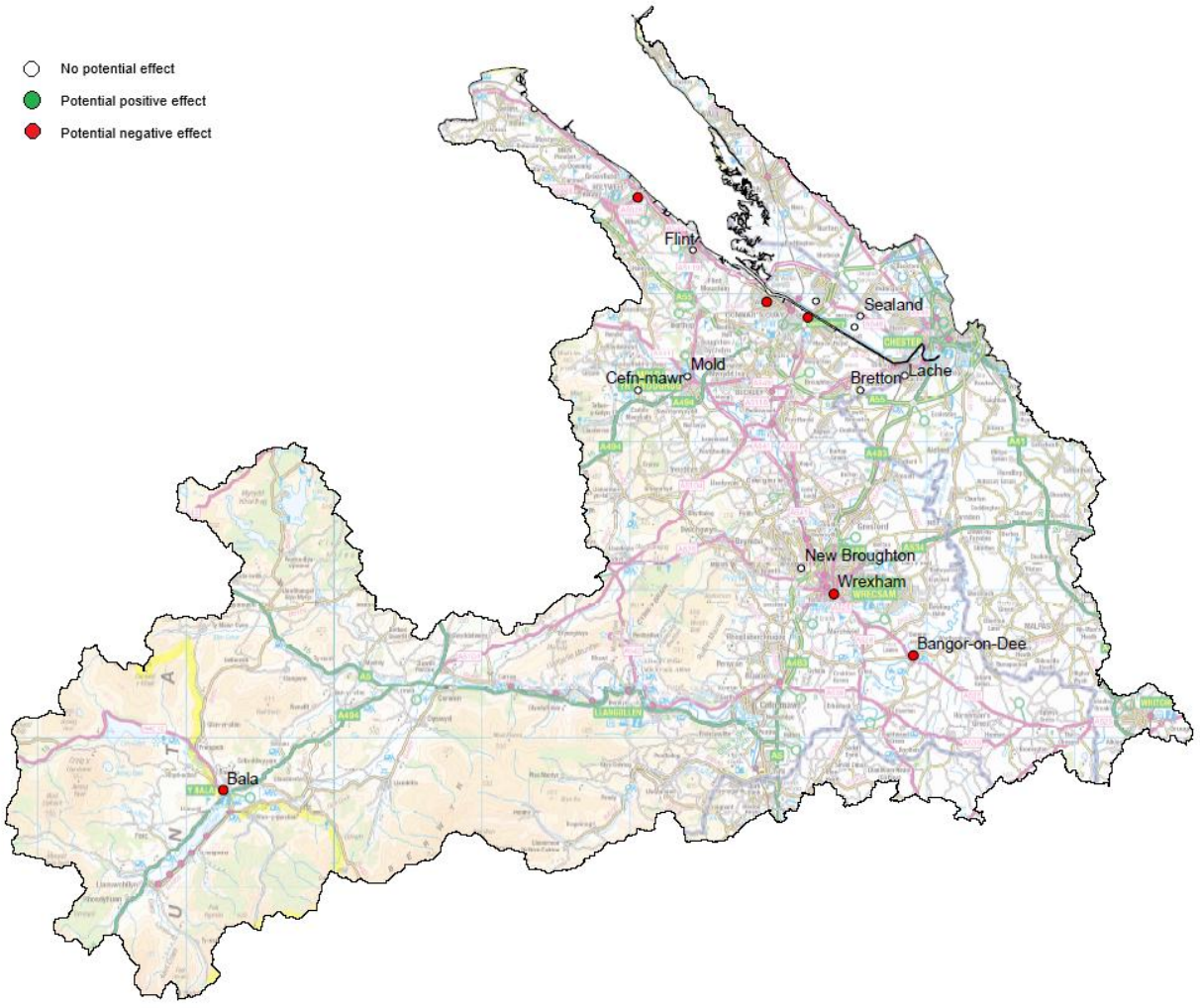


Figure 4.4: **Distribution of potential effects to recreation and tourism service within the Dee RBD**

How significant are the predicted changes to recreation and tourism services in the Dee RBD?

Implementation of the Dee FRMP is not anticipated to have a significant effect on the recreation and tourism service in the RBD, however there is anticipated to be a minor, negative effect to the recreation and tourism service overall. The main parties subject to this positive effect will be the users of and visitors to the rivers, lakes and estuary, as there

will potentially be an altered landscape and recreation provisions. The tourist industry will benefit from reduced flood risk indirectly however, due to reduced disruption and business losses. The indirect and cumulative effect of the improvements to the recreation and tourism service are outlined in Section 3 below.

5. Aesthetic Value (e.g. landscape, seascape, tranquillity)

What are aesthetic value services?

Many people find beauty or aesthetic value in various aspects of ecosystems, as reflected in the support for parks and scenic drives and in the selection of housing locations.

What is the current baseline in this service in the Dee RBD?

The landscape and visual amenity of the Dee RBD varies considerably, as does land use. Agriculture and forestry dominate in the upper RBD and there are a variety of landscape and settlement patterns. The upper sections of the RBD include part of Snowdonia National Park and are predominantly rural in character. In the middle to lower sections of the RBD, the landscape changes to rolling hill slopes that gradually form the Cheshire plain. In this lower part, urban development has had a significant impact upon the river system and many river channels and flood plains no longer function naturally. There is one Area of Outstanding Natural Beauty (AONB) on the north-western boundary of the RBD; the Clwydian Range and Dee Valley, which comprises a network of heather-clad hills and the historic towns of Llangollen and Corwen in the lowlands. The upper, rural RBD and the rolling hills of the middle sections of the RBD provide key aesthetic value services, through picturesque scenery and wide vistas. In the lower parts of the RBD, parkland, gardens and urban trees provide a natural element to the urban setting, and equally important aesthetic value services within the RBD.

Many of the areas providing aesthetic value services, those designated as sensitive landscapes and the urban green space areas, such as Grosvenor Park in Chester and Belle Vue Park in Wrexham, are sensitive to changes potentially caused as a result of the plan, notably from those measures involving extensive construction or land use change.

Future baseline – what aesthetic value services are likely to be provided in future in the absence of the plan?

In the absence of the plan, management of the sensitive landscapes is likely to continue to improve their quality and thus the aesthetic value services they provide. However, in the lowlands, there is a greater risk of changes to the landscape and to visual amenity through commercial, residential and industrial developments, particularly in Deeside and the surrounding area, due to the desire for economic development in this part of Wales with the proximity of the Port of Liverpool for industrial shipping.

What is the change in benefits to this service predicted through the Dee FRMP?
Key measures resulting in potential effects to the aesthetic value service in the RBD include:

- Construction works in Queensferry, Bangor-on-Dee and Bala may cause a negative, short-term effect on the local landscape and waterscape; and
- From the initial assessments in Wrexham, Walwen and Whelston and Connah's Quay there will be no immediate change/effect. However, potential short-term negative effects are anticipated from future works carried out as a result of the feasibility studies due to the disturbance of the landscape from construction activities. Where larger, or more visually intrusive structures are placed in landscape sensitive areas such as the Conservation Areas within the towns this could cause a more long-term, negative effect and dependent upon the scale cause a material change to the landscape character of the area.

In the assessment it is recognised, however, that many changes to this service are subjective and dependent upon the nature of the receptor and the value placed in certain landscapes.

Overall, it is anticipated that as a result of the plan there will be a minor negative effect on the aesthetic value services provided within the Dee RBD. Effects will largely be confined to the communities where actions are proposed as shown in Figure 4.5. To mitigate for these effects, works must be designed appropriately, with finishes, working methods and visual effects considered at an early stage. Also consideration should be given to the local landscape character of the town and surrounding area.

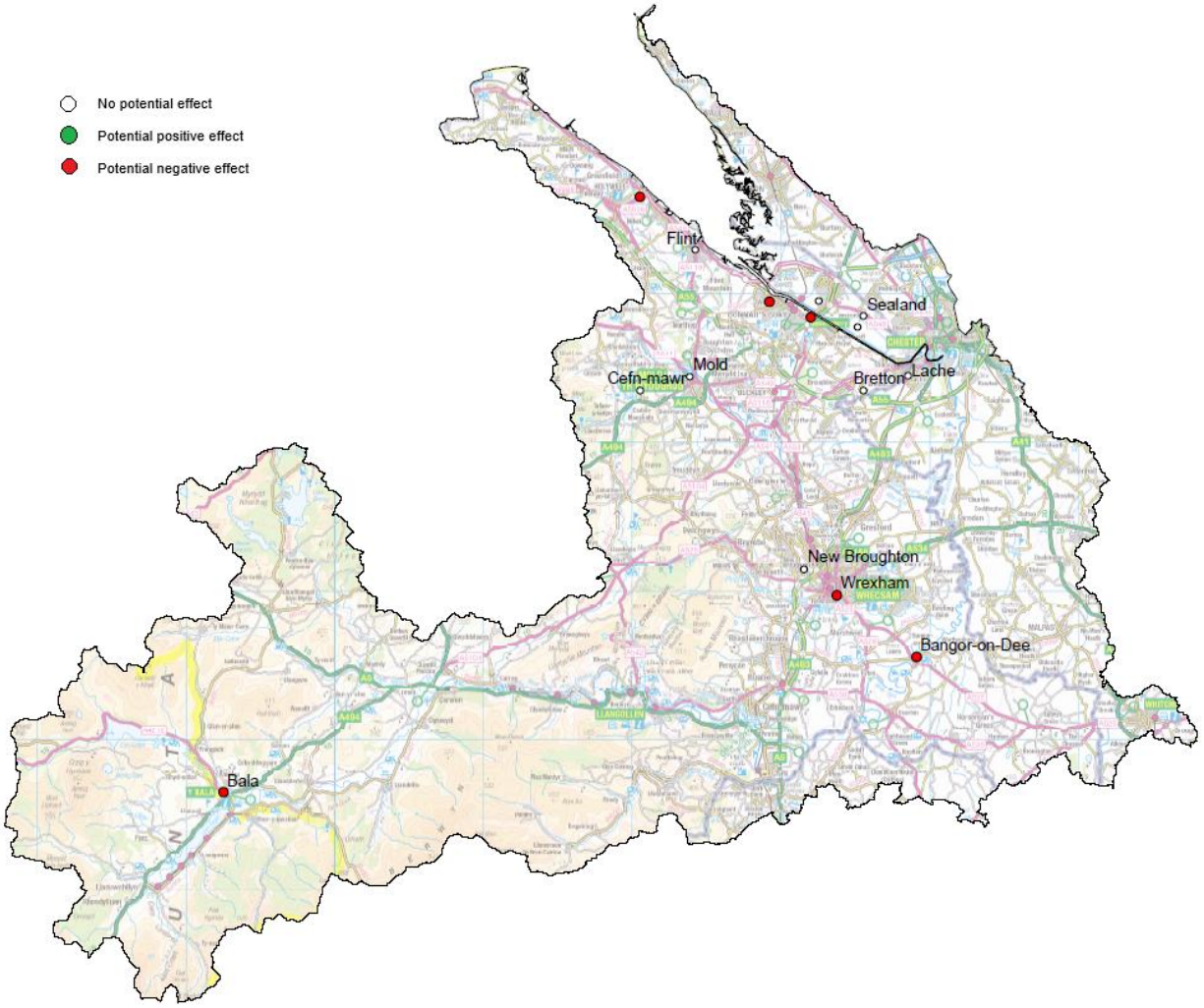


Figure 4.5: **Distribution of potential effects to aesthetic value service within the Dee RBD**

How significant are the predicted changes to aesthetic value services in the Dee RBD?

Implementation of the plan is not anticipated to have a significant effect on the aesthetic value services in the RBD, however there is anticipated to be a minor, negative effect to the aesthetic value services overall, confined to the specific areas where actions are proposed. The main parties subject to these effects will be the users of and visitors to the rivers, lakes and estuary, as well as residents and businesses within the communities. The indirect and cumulative effects of the improvements to the aesthetic value service are outlined in Section 3 below.

6. Provision of Habitat (Biodiversity)

What are habitat services?

Habitats provide everything that an individual plant or animal needs to survive: food; water; and shelter. Each ecosystem provides different habitats that can be essential for a species' lifecycle. Many species of bird, fish, mammal and insect rely on different ecosystems during migration.

What is the current baseline in this service in the Dee RBD?

The RBD provides a wide range of important ecological habitats, including wetland, dunes, bog, natural river corridors and grassland. There are a range of locally, nationally and internationally designated sites for ecology within the RBD, which support a diverse range of species. The Dee RBD supports varied wetland wildlife and the importance of wetland habitat is reflected by the number and variety of international and national nature conservation designations. Of the designations present, 7 of the Special Areas of Conservation (SACs) and 3 of the Special Protection Areas (SPA) within the river basin district are water dependent. Water dependent Ramsar sites include the Dee Estuary and the Midlands Meres and Mosses. Many of the Sites of Special Scientific Interest (SSSIs) within the river basin district (approximately 70 in total) also have close links with the water environment.

The River Dee itself is designated a SAC and a SSSI. The interest features include Floating Water Plantain, Atlantic Salmon, Lamprey, Otter and fluvial geomorphology. The tidal Dee Estuary is also internationally important for nature conservation. As well as being a SAC and SSSI, it is also designated a SPA and a Ramsar wetland.

For each of these European Sites, Natural Resources Wales is in the process of reviewing Conservation Objectives aimed at ensuring the sites achieve favourable conservation status. In principle it has been agreed that favourable conservation status is the more stringent objective for European sites, and that achieving Good Ecological Status under the Water Framework Directive is a milestone towards this goal.

Water bodies and wetland areas within the Dee RBD support a number of protected species (such as Otters and Water Voles) and priority species listed in the UK Biodiversity

Action Plan (such as Freshwater White-clawed Crayfish and Fresh Water Pearl Mussel). Fish are also important and the highly modified nature of the River Dee has led to there being many barriers to fish migration (45 in total). Invasive species in the RBD include Japanese Knotweed, Himalayan Balsam and North American Signal Crayfish.
Offshore, parts of the marine environment are protected as part of the Marine Protected Area network. This incorporates different levels of protection and including SPAs, SACs and SSSIs with marine components.

Habitat creation is planned in the RBD, through projects such as the Sustaining Welsh Rivers Project, led by Afonydd Cymru and supported by Natural Resources Wales (NRW). There are also numerous projects to remove in-river obstacles and build fish passes in order to re-open existing spawning and feeding habitat for fish.

Future baseline – what provision of habitat services are likely to be provided in future in the absence of the plan?
In the absence of the plan, climate change will place increasing pressures on this service, however, the provision of habitat services are likely to improve gradually over time associated with other initiatives and legislation targeted at environmental improvements and resilience to climate change.

What is the change in benefits to this service predicted through the Dee FRMP?
Key measures resulting in potential effects to the provision of habitat service in the RBD include:

- Works at Bangor -on-Dee could involve clearance of a small amount of vegetation, leading to a short-term negative effect.
- The channel conveyance improvements at Bretton will affect fish habitats leading to a short-term negative effect until habitats re-establish to a natural condition.
- The reservoir safety works at Bala will ensure that lake habitats are maintained into the future, having a positive, long-term effect.
- From the initial assessments in Wrexham, Walwen and Whelston and Connah's Quay there will be no immediate change/effect. There is the potential for a short-term, negative effect due to any future scheme resulting in a loss of habitat, however there is a potential long-term, positive effect where reduced flood risk and fewer flood events minimise disturbance to local species and habitats.

The development of new flood alleviation schemes could result in the direct loss of bank-side and in-channel habitats, including fish spawning areas. Maintenance activities, such as dredging, could also negatively impact fish habitat by reducing the morphological diversity of the channel and increasing sedimentation. The refurbishment/replacement of existing flood defence assets will, however, provide the opportunity to improve fish and eel passage in order to comply with European Directives

The implementation of flood alleviation schemes and improvements in the standard of protection of existing flood defence assets could result in the loss of habitat through land-take as well as modifying the natural form and functioning of watercourses with consequent impacts on habitat diversity for fish and other protected species (e.g. water voles). The development of new schemes and the introduction of SuDs and flood storage basins could also lead to changes in the hydrological regime of water dependent habitats in the surrounding area. The implementation of measures, such as SuDs and flood storage basins, however, could also incorporate habitat creation and enhancement as an integral part of the scheme design.

Works at Walwen and Whelston must consider the Tidal Dee Strategy Policy of Managed Realignment in years 2011-2031 to create intertidal habitat as part of the compensatory habitat for the strategy. There will be losses of this habitat in the medium to long term as a result of the strategy and the strategy states cites that there will be the managed realignment of the Lord Vivians Embankment by 2018 to create 29ha of habitat.

Overall, it is anticipated that as a result of the FRMP there will be a minor negative effect on the provision of habitat services provided within the Dee RBD. Effects will be felt primarily within the areas surrounding the communities where actions are to be implemented as shown in Figure 4.6.

Mitigation is being addressed through the HRA processes and statement of case for the shoreline management plan and the emerging Tidal Dee Strategy. Within the short term (epoch 1 or up to 2025), through planned delivery of habitat creation projects, the National Habitat Creation Programme is on target to create sufficient habitat to ensure full compliance with the Habitats Regulations and the Water Framework Directive in the RBD.

Candidate land areas for future managed realignment are also undergoing a process of appraisal by NRW.

Elsewhere, early consultation with Natural England and Natural Resources Wales will be required to identify and assess at the project level any potential implications for the nature conservation interest of designated sites. Early engagement with nature conservation interests will also enable the identification of possible opportunities for improving the condition and connectivity of designated sites as well as measures for enhancing habitats for protected species.

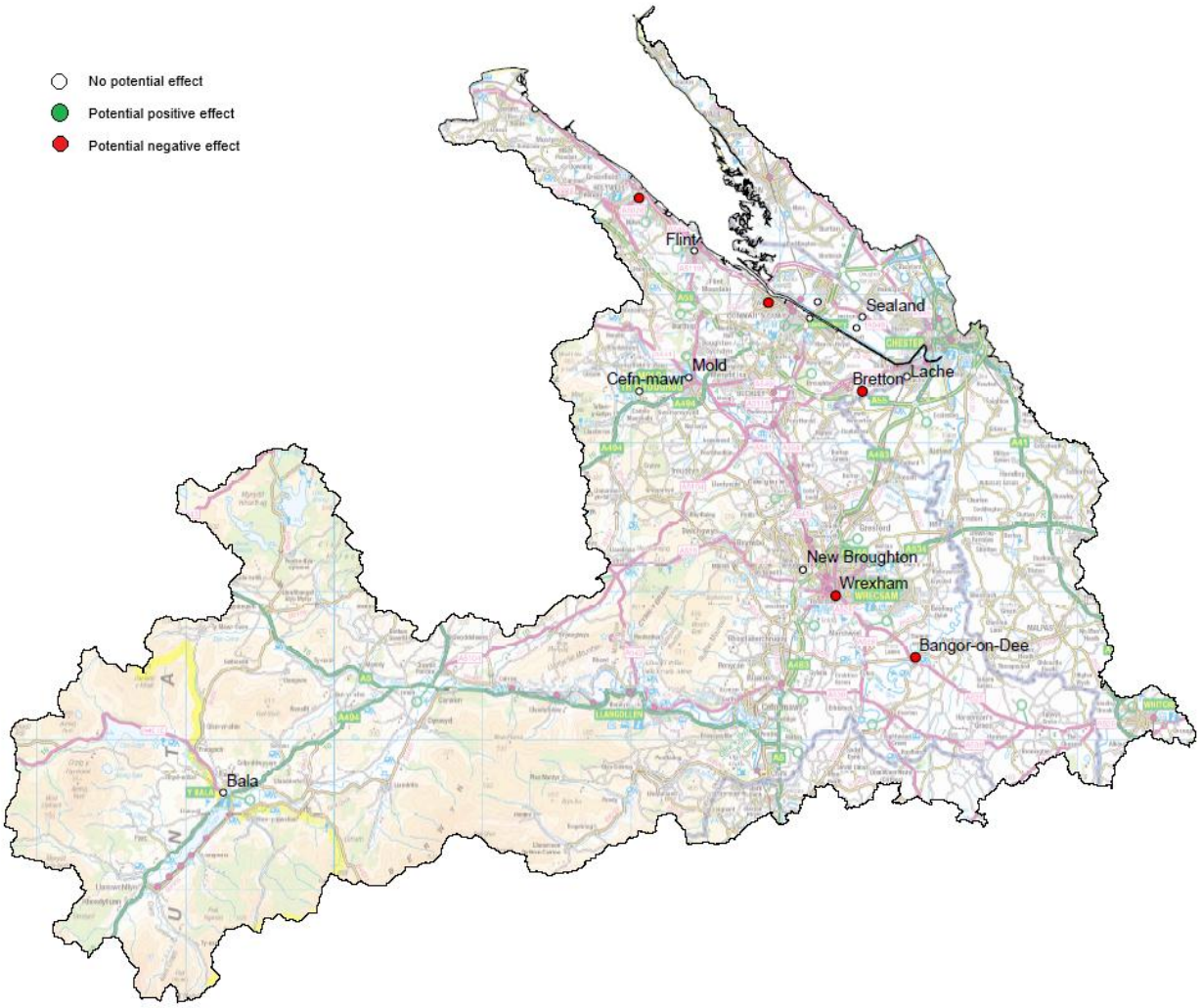


Figure 4.6: **Distribution of potential effects to provision of habitat service within the Dee RBD**

How significant are the predicted changes to provision of habitat services in the Dee RBD?

Implementation of the Dee FRMP is not anticipated to have a significant effect on the provision of habitat services in the RBD, but a minor negative effect. The main parties subject to this effect will be the habitats and species within the RBD with potential reductions in species diversity and habitat cover, and also the users of and visitors to the rivers, lakes and estuary, as there may be a less naturalised landscape with reduced vegetation and tree cover. This also takes into account the importance of the Dee Estuary to the river basin district; the conclusions of the HRA of the Tidal Dee Strategy that identified the potential for significant impacts on the Dee Estuary SAC / SPA / Ramsar; and uncertainty as to the effectiveness of measures for compensatory habitat and the delivery of other opportunities for managed realignment and habitat creation in the area of the Dee Estuary. The indirect and cumulative effects of the improvements to the aesthetic value service are outlined in Section 3 below.

The likely effects of the plan on features of the European designated sites within the RBD will be assessed under the Habitats Regulations and will be documented in a separate Habitats Regulations Assessment. It is good practice to undertake this iteratively with the plan development. It is therefore proposed that we will undertake the HRA in conjunction with the current consultation period.

Assessing effects on supporting services

Supporting services underpin the delivery of all other ecosystem services. They include the formation of soils, the cycling of nutrients and water and the provision of habitat. The National Ecosystem Assessment[4] notes that these services are strongly interrelated and are underpinned by a vast array of physical, chemical and biological interactions. Our understanding of these interactions and their influence on supporting services is limited, particularly when considered at a wider scale.

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[4] **UK National Ecosystem Assessment (2011) The UK National Ecosystem Assessment: Synthesis of the Key Findings. UNEP-WCMC, Cambridge.** TECHNICAL REPORT - **UK National Ecosystem Assessment (2011) The UK National Ecosystem Assessment: Technical Report. UNEP-WCMC, Cambridge.**

The assessment had identified that these supporting services are likely to be influenced by the flood risk management plan. However, there is a great deal of uncertainty as to the likely scale and therefore the significance of these effects. We have therefore provided an oversight of the likely effects in this section without attempting to assign any significance to these. The one exception to this is the provision of habitat. As the creation and improvement of habitats within the water environment can be affected by flood risk management activities we have addressed this within the section on the assessment of significant effects.

Soil formation

Soil formation in the UK is a long term process, taking place over decades and centuries. The National Ecosystem Assessment identifies that the main drivers of change in soil formation and associated threats in the UK are land use, climate change and urbanisation. In the last 50 years, UK agricultural soils have been subject to significant change. The flood risk management plan could promote land management measures such as new planting of trees. Significant tree planting on agricultural land could influence soil formation because trees root deeper and accumulate litter and organic matter at the surface, with likely consequences for physical properties and nutrient cycling.

Nutrient cycling

Nutrient cycling refers to the uptake, use, release and storage of nutrients by plants and their environments. The National Ecosystem Assessment noted that the most dramatic trend in nitrogen cycling over the last 50 years has been the enrichment of UK terrestrial habitats with nitrogen due to the application of fertiliser nitrogen in managed land and atmospheric nitrogen deposition in semi-natural systems. Increasing the availability of nutrients can affect the composition and diversity of plant communities, favouring those plants that are fast growing and able to take advantage of the additional resource. The flood risk management plan will have little interaction with either source.

Primary production

Primary production is focused on the formation of biological material by fixing carbon dioxide through photosynthesis and the assimilation of nutrients. The production of food and fibre and the developments that have resulted in increases in yields over the last 150 years are considered to be the main influence on primary production. The addition of nutrients has been successful in increasing primary production for food crops. However, there have been detrimental effects, particularly where this affects water bodies, their

water quality and species composition. In some cases eutrophication occurs affecting fish, shellfish and invertebrates in rivers, lakes and marine environments.

The flood risk management plan includes measures that promote river restoration and reconnection of rivers to their floodplains that can reduce the extent to which nutrient enrichment of agricultural land is washed into rivers. This will have the benefit of supporting more efficient use of nutrient enrichment for food and fibre provision, while reducing the adverse effects on the water environment.

Water cycling

As supporting ecosystem services, water cycling the major water flows (rainfall, evapotranspiration, river flow) and water storage (soil, groundwater, lakes) that combine to determine the availability of water. Human activity has a significant influence over the water cycle through land use, drainage, impounding water, changing the structure of rivers (particularly associated with flood risk management) and abstracting water. The effects of these activities are likely to be exacerbated by climate change, population growth and associated increased urbanisation. These will increase competition for a limited resource, particularly during the predicted dryer summers associated with climate change.
Conflicts in water resource management are common and managing flooding is one such conflict. Flood defences that involve engineered structures can disrupt the water cycle by disconnecting the river from its flood plain, whilst measures that restore rivers and natural processes will help to ensure that water is available to support the provision of other ecosystem services.

Indirect and Cumulative Effects

As the natural environment and all the ecosystem services are intrinsically linked, each cannot be considered in isolation and indirect and cumulative effects are caused. An indirect effect arises where one effect of the plan has a subsequent effect on another ecosystem service and a cumulative effect arises, for instance, where several plans, policies and programmes each have insignificant effects, but together have a significant effect; or where several individual effects of the plan have a combined effect.

The cumulative effects of the SMP2 and CFMP policies with the proposed measures set out in the FRMP was considered in the Appraisal Summary Tables, however, as the

proposed measures were all in line with the more strategic policies of the CFMP and SMP there were no significant effects. The draft Dee RBMP is being consulted on alongside the Dee FRMP. The RBMP proposes a programme of measures to improve the water environment. Flood risk management measures can have both positive and negative interactions with the water environment. The synergies and conflicts have been discussed in further detail below.

The alignment of, and cumulative effects of, the Dee FRMP with other plans, policies and programmes is considered in Chapter 3.

The indirect effects of the plan are considered below:

- A negative effect on the food service in the RBD could reduce the ability of the RBD to provide primary production services and photosynthesis services through reductions in extent of cropped areas.
- A positive effect to the water regulation service will lead to less risk of erosion and thus a greater erosion regulation service; less risk of contamination from flooding and thus a greater water purification and waste treatment service; less risk of damage to productive agricultural land and loss of crops, so increasing the food production service;
- A negative effect to the cultural heritage service through physical damage or degradation of setting of heritage assets may result in decreases in visitor numbers to assets and thus a minor negative effect to the recreation and tourism service in the RBD;
- A negative effect to the aesthetic value service is anticipated to cause an indirect negative effect to the recreation and tourism service, through affected views, less vegetation cover and modified water environments attracting fewer visitors to the RBD through a degraded recreational resource of the water environment for users. It is also anticipated to cause a negative effect to the cultural heritage service through potential deterioration to the setting of heritage assets;
- A negative effect in the provision of habitat service will reduce the extent, value and diversity of habitats and species across the RBD, which will affect landscapes, visitor numbers to the area, carbon storage potential and protection from soil

erosion. This will affect a number of ecosystem services, notably aesthetic value, recreation and tourism, climate regulation and erosion regulation.

Dee River Basin Management Plan

The flood risk management plan has been developed in parallel to, and has taken account of, the draft update to the Dee RBMP, which proposes a programme of measures to improve the water environment. There are 115 water bodies across the district comprising rivers, lakes, groundwater and the Dee estuary. In 2009, 28% of the water bodies were at "good" status, this rose to 30% in 2013. Significant water issues identified for the Dee are; physical modifications, pollution from sewage and waste water, pollution from rural areas and invasive non-native species.

Flood risk management measures can have both positive and negative interactions with the water environment. Flood risk management measures which work with natural processes to help slow flow and store water tend to have beneficial effects on the water environment, whereas measures that involve building defences or artificially regulating water tend to have adverse effects on the water environment. Flood risk management is one of the top ten reasons a water body fails to meet the objective set under the WFD in Wales. This is why it is important to ensure that where action is needed to manage the risk of flooding, an option is selected that does not lead to further deterioration of the water environment but instead seeks opportunities for improvement and delivers joint benefits.

Given the strategic nature of the FRMP and its broad scale we have not carried out a detailed WFD assessment of individual flood risk management measures as this will be undertaken at the project level when more certainty is available on the flood risk management measure type and location. However, broad consideration has been given to whether the FRMP and the RBMP are in conflict or there are synergies in their effects on ecosystem services considering the specific actions proposed in both plans, which is provided in Table 4.1.

Table 4.1: Synergies and conflicts between the Dee FRMP and Dee RBMP

Ecosystem Service	RBMP and FRMP synergy or conflict
Fresh water	FRMP actions will safeguard water supplies in Bala and downstream RBD thereby providing multiple benefits with the RBMP objectives to maintain water in the RBD.
Food (e.g. crops, fruit, wild collected food)	Where flood risk is reduced in the RBD through the FRMP, there is a potential opportunity to encourage riparian zone management and sustainable land management from the RBMP to maximise yields of agricultural land.
Fibre and fuel (e.g. timber & wool)	No potential synergies with the RBMP for this service have been identified, however the FRMPs will contribute to the maintenance of the service in the RBD through reduction in flood risk and associated damage.
Water for non-consumptive use (e.g. Hydropower, navigation)	The RBMP may cause a reduction in the water for non-consumptive use service in the RBD, with weir removal and alterations to dredging regimes, so there is a potential cumulative effect with the FRMP as it may also potentially reduce navigation ability. Also, the construction of weirs for FRM purposes, as they could be barriers to fish passage, conflicts with the aims of the WFD. Any weirs must have suitable fish passage provision designed into them.
Climate regulation	The FRMP positive effects on climate regulation is likely to contribute to a range of WFD objectives and provide a cumulative positive benefit to the water environment with the RBMP
Water regulation (e.g. flooding)	Land management in the upstream RBD could provide FRM benefits through increasing the storage capacity of the RBD, providing a synergy with the FRMP and reducing the flood risk to the downstream areas of the RBD and the identified communities at risk.
Soil & Erosion regulation	The RBMP will drive improvements to this service, predominantly in the upland RBD however, so distant from the areas of proposed works. However, with the measures proposed in the FRMP and RBMP, there is the potential for a RBD-wide benefit to this service.

Water purification and waste treatment	There is a conflict here with the RBMP, as the primary driver of the RBMP is to deliver water quality improvements. The FRMP will primarily drive reductions in catastrophic contaminant / pollutant release occurrences from flood events, so will work towards improved water quality overall but construction could cause negative effects.
Cultural heritage	There is the potential for a cumulative effect with the RBMPs as they will both involve construction works across the RBD that could potentially damage the cultural heritage resource. Appropriate management must be implemented at an early stage to protect this resource.
Recreation and tourism (accessible blue & green space)	There is the potential for cumulative positive effect from the FRMP and RBMP actions on outdoor recreation, through improvements to access infrastructure and improvements to the naturalness and visual appearance of river channels.
Aesthetic value (e.g. landscape, seascape, tranquillity)	With appropriate design of schemes within the FRMP and RBMP, improvements to the landscape could be delivered in the wider RBD centred around the water courses of the RBD. Where RBMP measures are proposed along channels within the settlements, there could be opportunities for partnership working.
Provision of habitat	Enhancements delivered through FRMP actions should consider RBMP measures and requirements of the WFD water bodies to achieve Good Ecological Status.

Measures proposed in the draft Dee RBMP that are primarily in conflict or synergy with the FRMP are as follows:

Synergies

- **Improvements to fish passage and habitat** – FRMP works on river channels or coastal outfalls could improve fish passage and habitat; and
- **Manage invasive non-native species** – FRMP works would involve treatment of invasive species.

Conflicts

- **Improve fish passage and habitat** – FRMP works may involve construction of hard-bank infrastructure affecting fish habitat, and dredging works could affect fish habitat and cause fish mortality;
- **Mitigate impacts of flood and coastal defences** – FRMP works may involve upstream storage and removal of hard-bank infrastructure;

- **Appropriate coastal process and sediment management** – FRMP works may involve construction of hard-bank infrastructure affecting sedimentation processes;
- **Drainage and water level management** – FRMP works may temporarily raise or lower water levels depending upon requirements leading to a negative effect, or may increase channel capacity; and
- **Fisheries management** – FRMP works will need to have fish passage provision

Summary of Effects

Overall, the plan will have both positive and negative effects on the environment and is anticipated to have the effects on a number of specific ecosystem services:

Provisioning Services

- Food (e.g. crops, fruit, wild collected food)

Regulating Services

- Water Regulation (e.g. flooding)

Cultural Services

- Cultural Heritage
- Recreation and Tourism (including accessible blue and green space)
- Aesthetic Value (e.g. landscape, seascape, tranquillity)

Supporting Services

- Provision of Habitat (e.g. Biodiversity)

The negative effects will largely result from actions that will involve construction on agricultural land, on existing habitats or in settlements. These areas can contain sensitive landscapes and heritage assets and can also provide recreation and tourism services which will be disturbed by construction. The beneficial effect on water regulation will largely come from focussing on activities specifically to regulate water in the RBD. The effects of the plan are summarised in Table 4.2

These effects to the ecosystems services provided within the RBD will have a range of cumulative and indirect effects. The cumulative effects with other plans, policies and programmes are assessed above, and the anticipated indirect effects are also provided in Table 4.2.

Table 4.2: **Potential direct and indirect effects of the Dee FRMP**

Ecosystem Service	Effect of Dee FRMP	Indirect Effect of Dee FRMP
Food (e.g. crops, fruit, wild collected food)	Minor Negative	Minor negative on primary production and photosynthesis
Water Regulation (e.g. flooding)	Minor Positive	Positive effect on erosion regulation, water purification and waste treatment and food services
Cultural Heritage	Minor Negative	Negative effect on recreation and tourism
Recreation and Tourism (including accessible blue and green space)	Minor Negative	No indirect effects anticipated
Aesthetic Value (e.g. landscape, seascape, tranquillity)	Minor Negative	Negative effect on recreation and tourism, and cultural heritage services
Provision of Habitat (e.g. Biodiversity)	Minor Negative	Negative effect on aesthetic value, recreation and tourism, climate regulation and erosion regulation

Cumulative effects with the draft Dee RBMP have also been considered, with the FRMP potentially influencing the delivery of the following RBMP measures:

- Improvements to fish passage and habitat
- Manage invasive non-native species
- Mitigate impacts of flood and coastal defences
- Appropriate coastal process and sediment management
- Drainage and water level management
- Fisheries management

Summary of Mitigation

For the potential negative effects identified in the above assessment sections, the following mitigation is proposed to avoid or reduce these negative effects:

- For the Food service, to mitigate for potential negative effects on this service, the following mitigation should be implemented: Site works away from highest grades of agricultural land (i.e. Grade 1 or 2 ALC land); Inform and engage with affected landowners to minimise potential effects; and Ensure appropriate fish passage, improvements to fish habitats and fish-rescue provisions are developed when undertaking in-river works to ensure the food service in the RBD is maintained.
- For the Cultural Heritage service, to mitigate for the potential negative effects, a cultural heritage assessment of any intrusive works should be undertaken, maximising use of local knowledge, prior implementing the relevant measure. This will ensure all effects on the archaeological or built heritage resource are managed appropriately;
- For the Recreation and Tourism service, in order to mitigate for this potential effect, works must be designed appropriately for the local area, with finishes and working methods agreed with the appropriate governing bodies and consideration given to enhancing the area around the settlements for recreational purposes;
- For the Aesthetic Value service, to mitigate for the effects works must be designed appropriately, with finishes, working methods and visual effects considered at an early stage. Also consideration should be given to the local landscape character of the town and surrounding area; and
- For the Provision of Habitat service, to mitigate for the potential negative effects appropriate ecological survey work would be undertaken to influence the design of schemes and the land-take and habitat loss as a result of any scheme is to be minimised through careful siting of elements. Enhancement planting is also to be provided to mitigate for habitats lost to ensure no net loss.

In addition to these service-specific mitigation measures, presented below are additional safeguards to ensure that the environmental implications are addressed in related future implementation ‘decision making’ processes:

- SEA will be undertaken for plans and strategies developed by risk management authorities. This process will also identify local opportunities to integrate environmental benefits into proposed flood risk management solutions.

- Existing plans have their own governance structures which embed further environmental appraisal. For example, any modifications to shoreline management plans will go through an agreed change process which includes an environmental assessment.
- Environmental impact assessment will be undertaken on projects that are likely to have significant environmental effects.
- Strategic flood risk assessments are produced by local planning authorities. These provide advice on flood risk within the local authority in order to influence decisions on the location of development and the incorporation of measures to avoid exacerbating flood risk, such as the use of SUDS.
- If potential adverse effects are identified and cannot be avoided, scheme specific mitigation will be developed to minimise effects in consultation with the relevant organisations. The following will also be applicable at the project level:
  1) Environmental impact assessment will be undertaken on projects that are likely to have significant environmental effects.
  2) Habitats regulations assessments are undertaken to determine whether a proposed, plan, strategy or scheme is likely to adversely affect the integrity of a European designated site.
  3) Assessment of potential implications for nationally designated sites, areas and landscapes (e.g. SSSIs, AONBs, National Parks, World Heritage Sites), including their setting.
  4) Water framework directive assessments are undertaken to assure compliance with WFD objectives where this is feasible.

5. Monitoring the effects of the plan

This section sets out the monitoring that we propose to understand the significant effects of the plan in practice. The water environment is subject to considerable monitoring activity by the NRW and others and so we propose an approach that takes advantage of this existing activity.

Measures are required to monitor the significant effects that the flood risk management plan is having on the environment. The indicators have to be practical, cost-effective and strategic, and must inform on the effects of the plan itself, rather than on wider trends. The proposed indicators reflect the effects identified as significant by the SEA process and are

set out in table 5.1. Effects of significant individual projects will be monitored according to environmental action/monitoring plans devised during project level environmental impact assessment.

Table 5.1 Proposed sources of information for monitoring significant effects on the environment.

SEA Receptor	Proposed Monitoring Indicator	Source
Water	No additional monitoring proposed	Existing monitoring of water body status and through River Basin Management Plan requirements
Population and human health	No additional monitoring proposed	FRMP will have interim reviews on an annual basis and formal reviews every 6 years. NRW - Angling Numbers - Rod licences sold User numbers for coastal path & visitors to National National Nature Reserves (visitor counters at certain locations) Visitor numbers to National Parks (NPA)
Biodiversity, flora and fauna	Monitoring of capital project habitat delivery will be undertaken and feed in to the NHCP reporting.	Existing monitoring of aquatic inverts and fish through River Basin Management Plan requirements. Annual reporting to WG of the progress of the National Habitat Creation Programme
Cultural heritage	Status of listed and non-listed historic and archaeological features to be monitored at individual project level	Cadw, Welsh Archaeological Trusts

6. What happens now?

This section sets out how to respond to this Environmental Report that accompanies the draft FRMP. It provides the questions to prompt in your response to this consultation on the Environmental Report. It also sets out the next steps in the Strategic Environmental Assessment process to the publication of the final FRMP.

This Environmental Report has been published with the Dee FRMP on 10 October 2014 and is available for consultation for a three month period. Consultation will close on 31 January 2015. In seeking your views on this Environmental Report we have set out some specific consultation questions provided below:

1. **Do you agree with the conclusions of the environmental assessment? (yes / no)**
    a. **If not, please explain why.**

2. **Are there any further significant environmental effects of the draft plan which you think should be covered by this assessment? (yes / no).**
    a. **If yes, please describe what they are.**

3. **As part of the environmental report, we have set out mitigation measures for addressing any significant negative effects on the environment, as well as opportunities to deliver positive effects on the environment.**
    a. **Are there further mitigation measures or opportunities for improving the environment that we should consider for the plan? (yes / no)**
    b. **If yes, please give details.**

How to respond

Natural Resources Wales would prefer you to respond to this consultation by email at: Flood.risk.management.plan@naturalresourceswales.gov.uk

This will allow you to make your comments more effectively, while helping us to gather and summarise responses quickly and accurately. However, if you want to respond in another way, please contact the NRW customer contact centre on 0300 0653000.

Please return written responses by 31 January 2015 to:

Rachel Sion

Natural Resources Wales

29 Newport Road

Cardiff

CF24 0TP

Next steps

The FRMP sets out how we will continue to develop the plans:

- taking into account new information;
- refining the cost benefit analysis; and
- taking into account responses to this consultation.

As the plan evolves we will consider any implications this might have for effects on the environment as part of our strategic environmental assessment requirements. The adopted FRMP will be published in December 2015. This will be accompanied by a Statement of Environmental Particulars which will provide:

- Summary of how environmental considerations have been integrated into the plan.
- Summary of how consultation responses to the draft plan and environmental report have been taken into account (with cross reference to the detailed consultation response report)
- Summary of how the plan has changed since the draft plan and what this means in terms of changes to the environmental effects that were reported in the environmental report.
- The reasons for choosing the plan as adopted in the light of alternatives.
- The measures to be adopted to monitor the effects of the plan.

Annex A: Plans, policies and programmes reviewed for the SEA

Background

SEA requires a good understanding of the strategic and policy context of the Flood Risk Management Plan (FRMP), in order to identify areas of mutual influence and tension with other policies plans and programmes (PPPs) and to contribute to development of the environmental baseline. This helps ensure the FRMP is robust, realistic and SEA Directive compliant.

This information needs to be included in the Environmental Report, whose required contents are set out in Annex I of the SEA Directive and are extracted below followed by interpretive official guidance:

Annex I (a) requires:
"An outline of the contents, main objectives of the plan or programme and relationship with other relevant plans and programmes."

EC guidance: Information on the relationship with other relevant plans or programmes sets the plan or programme in a broader context: it might, for instance, concern its place in the stage of decision-making or its contribution amongst other plans or programmes to changes in the environmental conditions of a certain area. Relevant plans or programmes can thus be those at other levels in a hierarchy which the actual plan or programme forms part of or they can be those drawn up for other sectors affecting the same or adjacent areas.

Annex I (e) requires identification of:
"The environmental protection objectives, established at international, Community or Member State level, which are relevant to the plan or programme and the way those objectives and any environmental considerations have been taken into account during its preparation."
EC guidance: The environmental protection objectives to be dealt with should cover at least the issues listed in paragraph (f)[5]. International and Community objectives are often

[5] *(f) the likely significant effects on the environment, including on issues such as biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage including architectural and archaeological heritage, landscape and the interrelationship between the above factors.*

incorporated in objectives on national, regional and local levels and these could often be sufficient for this purpose. It should be noted that the paragraph concerns objectives that are relevant to the plan or programme, which would imply relevant to its likely significant effects or to issues it raises.

1.2 Methodology

A list of relevant PPPs for review was developed by Natural Resources Wales, based on an initial list set out at the scoping stage and modified following consultation. This prioritises relevant national and regional PPPs. It is a significantly shorter list than usual for this element of SEA and thereby follows the EC guidance above regarding (a) implicit or explicit incorporation of international and EC environmental objectives in national and regional plans and (b) consideration of PPP relevance, bearing in mind the significance of effects around a particular environmental receptor. Local Authority plans were reviewed to extract key spatial planning information with a focus on likely land use of significance at the level of the FRMP. Each PPP was reviewed to identify any relevant links with the draft Plan. PPPs which could operate as drivers for delivery of Floods Directive were highlighted.

A summary of relevant PPPs that were reviewed is presented in Section 2 below and these fall under the following topics:

- Water (water resources, water companies, flooding and coastal erosion);
- Spatial Planning / Population
- Biodiversity
- Recreation
- Geology, Soils and Agriculture
- Material Assets (e.g. transport)
- Waste
- Climate
- Landscape
- Cultural Heritage

The objective was to focus on the most relevant PPPs. Each entry in the summary table below is extracted from a more detailed review of each of the documents listed. The more detailed assessment compiled the following information:

- The title, author and publication date of the specific PPP being reviewed;
- Whether the PPP could assist in the delivery of the FRMP;
- A summary of the aims, objectives and issues within the PPP that were considered to be relevant to the draft Plan;
- A discussion of any influence the PPP could have on the draft Plan;
- A discussion of any influence the draft Plan could have on the PPP;
- A discussion of how the PPP should be factored into the SEA process.

Summary of review of relevant PPPs

Title, author, date	**Objectives**	**Areas of synergy and conflict with respect to the RBMP**
National PPPs		
Water		
Welsh Government (2011) Understanding the risks, empowering communities, building resilience: The national flood and coastal erosion risk management strategy for Wales	Provides the national framework for flood and erosion risk management setting out four overarching objectives: • reducing the consequences for individuals, communities, businesses and the environment from flooding and coastal erosion • raising awareness of and engaging people in the response to flood and coastal erosion risk; • providing an effective and sustained response to flood and coastal erosion events; • prioritising investment in the most at risk communities.	The policy is aligned with the aims and objectives of the FRMP; recognising the importance of engaging with communities and working in partnership for effective flood risk management. The implementation of the FRMPs will help to deliver the policy's objectives for a flood and erosion risk management strategy across Wales.
Welsh Government (2011) Strategic Policy Position on Water	Provides Ofwat, the water companies, regulators and other interested parties a clear steer on the Welsh Government's priorities for water. Highlights areas that will be a priority in the future including	The FRMPs are largely aligned with this policy, in promoting a safe and sustainable water environment. However the FRMP's must ensure that water quality and availability

	drinking water quality, protecting the environment and secure supplies and improving resilience.	is not compromised through management of flood risk.
Welsh Government (2007) Making the Most of Wales' Coast: The ICZ Management Strategy for Wales	Concerned with managing coastal resources in Wales in an integrated and informed way, ensuring that these assets are maintained and enhanced for the benefit of present and future generations.	The strategy aligns with the FRMPs by providing a holistic framework for managing the coastline, including protection of the coastline and further inland from coastal flooding. This will be done whilst also providing other socio-economic and environmental improvements to maximise the potential of Wales' coastline.
Spatial Planning / Population		
Welsh Government (2012) Planning Policy Wales (including Technical advice Notes: Nature Conservation and Planning, Design, Tourism, Development and Flood Risk, Transport, Waste, Renewable Energy, Coastal Planning)	Sets out the land use planning policies of the Welsh Government and key policy objectives for Local Development Plans (LDPs) in Wales, both reflecting the sustainable development agenda	The FRMP's will assist in the achievement of wider Planning Policy Wales aims through enabling the requirements of TAN15 to be met in a greater number of areas. Care must be taken to ensure compliance with TAN15 is not at the cost of non-compliance with other TAN's, such as Nature Conservation and Design.
Welsh Government (2013) The Welsh Government Strategy for Tourism 2013 – 2020. Partnership for Growth	Identifies the priorities to deliver a prosperous and competitive tourism industry in Wales. It sets out how Welsh tourism will be promoted and communicated more effectively and how investment will be directed to improve quality and choice for the consumer.	The FRMPs will ensure tourists, and businesses within tourist areas (notably along the coast) are protected from flooding and damage to their lives, livelihoods and the local area they depend upon, supporting the objectives of the Strategy for Tourism.
Welsh Government (2010) Rural Development Plan for Wales (2007-2013 and 2014-2020)	Sets out measures for rural areas in Wales, including promoting knowledge and improving human potential; restructuring and developing physical potential and promoting innovation; targeting the sustainable use of agricultural land; targeting the sustainable	The FRMPs align with this plan as they will deliver reductions in flood risk and thus promote rural development and empowerment.

	use of forestry land; diversifying the rural economy; and improving the quality of life in rural areas.	Rural development must be implemented considering potential increases in flood risk, or development in existing flood zones.
Welsh Government (2008) People, Places, Future – The Wales Spatial Plan	Integrates the spatial aspects of national strategies for social inclusion and economic development, health, transport and environment, translating the Welsh Government's sustainable development duty into practice.	The FRMP will work in alignment with the Wales Spatial plan to reduce potential adverse consequences of flooding on human health, the environment, cultural heritage and economic activity, thereby assisting in the delivery of the Plan.
Welsh Government (2008) One Wales One Planet: The Sustainable Development Scheme for Wales	Sets out proposals to promote sustainable development, how the Welsh Government will make sustainable development a reality for people in Wales, and the benefits that people will see from this, particularly in less well-off communities.	The FRMP will work in alignment with the Wales Sustainable Development Scheme to reduce potential adverse consequences of flooding on human health, the environment, cultural heritage and economic activity, thereby assisting in the delivery of the plan. Wider socio-economic, environmental and heritage conservation issues need to be considered within the FRMP.
Biodiversity		
Wales Biodiversity Partnership (2010) Wales Biodiversity Framework	Identifies the key practical, policy and legislative drivers for protecting, restoring and enhancing biodiversity in Wales; outlining the mechanisms for promoting positive action and explaining the roles and remit of those responsible for undertaking biodiversity action.	The FRMP's will deliver protection from coastal and fluvial flooding which can lead to habitat and species loss through inundation. However, implementation of the policies of the FRMP must ensure all practicable steps are taken to protect, compensate and enhance biodiversity and habitats to enable alignment with this framework.
Forestry Commission Wales (now Natural Resources Wales) (2009) Woodland Strategy for Wales	The Strategy sets out aims and objectives for all woodlands and trees in Wales and the role of woodlands and trees in delivering social economic and environmental benefits and also the contribution they can make	This strategy aligns with the FRMPs as increased woodland cover across Wales will reduce flood risk through increased catchment storage, aligning with the objectives of the FRMPs.

	towards addressing the impacts of climate change.	
Welsh Government (2008) Wales Fisheries Strategy	Strategy for the management and development of fisheries in Wales covering aquaculture, commercial fisheries, and recreational fisheries for 2020.	Developing fisheries within Wales, through enhancing fish habitat, removing obstacles to passage (dams, weirs etc.) is often in direct conflict with flood risk management, and balances must be sought. The FRMPs must consider ways to sustainably manage fish populations within the rivers and estuaries of Wales whilst delivering their objectives.
Welsh Government (2006) Environment Strategy for Wales	Provides the framework to achieve an environment which is clean, healthy, biologically diverse and valued by the people of Wales.	Key objectives set out within the Environment Strategy for Wales, such as addressing climate change and environmental hazards (flooding) will help to relieve flood risk across many areas and contribute to delivery of the objectives of the FRMPs. care must be taken to ensure that reductions in flood risk through, most notably, improved defence infrastructure projects is not at the expense of ecological, heritage, landscape and other environmental sensitivities and assets.
Welsh Government (2012) Sustaining a Living Wales: A Green Paper on a New Approach to Natural Resource Management in Wales	This consultation resulted in policy commitments that are being taken forward under the Natural Resource management programme. The programme includes natural resource management policy, the Environment Bill, embedding the Ecosystems approach.	The consultation outlines a desire to challenge traditional approaches to managing flood. It puts much greater emphasis on the management of the flood risk as whole, starting with retaining more water in uplands and slowing its rate of movement, allowing more areas of lowland to flood naturally to dissipate impacts. The FRMPs will improve the flood risk service provided by Welsh ecosystems.
Recreation		

Welsh Government (2005) Climbing Higher – The Welsh Government's 20 year strategy for sport and physical activity in Wales	Seeks to maximise the contribution of sport and physical activity to wellbeing in Wales, with one target to increase the percentage of the people in Wales using the Welsh natural environment for outdoor activities from 36% to 60%.	The FRMPs need to take into account the use of Wales' rivers, lakes and coastal waters as an outdoor recreation and health resource. Access to these waters should not be compromised through the achievement of the FRMP objectives so their recreational use is retained.
Geology, Soils and Agriculture		
Welsh Government (2009) Farming, Food and Countryside: Building a Secure future – A New Strategy for Farming	The objective of the strategy is to achieve a sustainable and profitable future for farming families and businesses through the production and processing of farm and forestry products whilst safeguarding the environment	The FRMPs align with this policy as they will protect farmland from flooding in many areas, increasing the security and resilience of agricultural businesses.
Welsh Government (2008) Wales Soils Action Plan - Consultation	Sets out the case for developing a plan to adapt to future pressures on soils including climate change related effects such as changes to soil carbon and soil structure	Flooding can cause extensive erosion of soil and reduce the productivity of land through waterlogging, so a reduction in flood risk can lead to improvements in soil quality. Conversely, good quality soil can allow more infiltration of water than poor quality soil, which can lead to reduced or slower runoff and thus reduced flood risk.
Environment Agency Wales (now Natural Resources Wales) (2002) Metal Mines Strategy for Wales	Strategy developed to assess all the issues at the most polluting historic metal mines in Wales, with the aim of developing remediation options.	There is limited interaction between the FRMPs and this strategy, however the FRMPs, by reducing inundation of land adjacent to rivers whose water and sediment is contaminated by abandoned metal mines, will reduce the contamination risk of these mines and improve the quality of agricultural land.
Welsh Government (2001) Minerals Planning Policy Wales	Sets out the land use planning policy guidance in relation to mineral extraction and related development in Wales.	There is limited interaction between MPPW and the FRMPs, but MPPW does advise sustainable use of minerals so no increase in flood risk should be caused by the implementing of the

		policies. The FRMPs must consider the mineral resource within any areas of proposed works to ensure there is no conflict between the policies.
Material Assets		
Welsh Government (2008) Wales Transport Strategy	Promotes sustainable transport networks that safeguard the environment and strengthen Wales' economic and social life.	The FRMPs will protect critical transport infrastructure from flooding and damage due to flooding, which will enhance the transport network and reduce congestion and delays.
Waste		
Welsh Government (2010) National Waste Strategy for Wales: Towards Zero Waste 2009-2050	The strategy sets out a long-term aim of zero waste by 2050 and a medium term aim of achieving a high recycling society by 2025. This is supported by a range of recycling and other waste management targets including in relation to commercial and industrial waste.	The FRMPs will indirectly reduce waste caused as a result of damage through flooding, resulting in less material going to landfill and fewer new products purchased. A reduction in waste at a national scale will mitigate for climate change in the long-term and will reduce flood risk, contributing to the objectives of the FRMPs.
Climate		
Welsh Government (2010) Low Carbon Wales	Details the process through which the Wales Spatial Plan can serve as a vehicle for transition to a low carbon energy whilst also providing background information and suggestions to enable regions in Wales to select carbon reduction priorities for action.	This plan aligns with the FRMPs as In the long-term, increases in low-carbon energy production will reduce greenhouse gas emissions, global surface temperature warming and thus sea-level rise. This will prevent further increases in flood risk on the coasts and estuaries from sea-level rise and extreme events will be reduced in frequency and magnitude.
Welsh Government (2010) Climate Change Strategy for Wales	States the Welsh Government's policy intentions in relation to climate change and expands on the commitments set out in One Wales. The strategy re-iterates the One Wales commitments to 3 per cent annual carbon reductions and sets out expectations for businesses and society for 2020.	The Strategy will contribute to reductions in flood risk on the coasts and estuaries from sea-level rise and flooding from extreme events will be reduced in frequency and magnitude. The FRMPs will take into account predicted sea level rise and increases in extreme events as a result

		of predicted climate change over the next century and further beyond, therefore will contribute to the required climate change adaptation identified within the Climate Change Strategy for Wales.
Welsh Government (2010) Low Carbon Revolution – the Welsh Government Energy Policy Statement	Sets out the Welsh Government's ambitions for low carbon energy in Wales, with aims including improvements in housing energy efficiency improvements, local energy generation, capturing of offshore and onshore wind, stream and tidal, hydropower, geothermal and biomass energy and installing carbon capture technology on all new fossil fuel power plants	In the long-term, increases in low-carbon energy production will reduce greenhouse gas emissions, global surface temperature warming and thus sea-level rise. This will prevent further increases in flood risk on the coasts and estuaries from sea-level rise and extreme events will be reduced in frequency and magnitude.
Welsh Government (2012) Preparing Wales for Climate Change. Energy Wales A Low Carbon Transition	Aims to enhance the economic, social and environmental wellbeing of the people and communities of Wales – to achieve a better quality of life for this and future generations by creating a sustainable, low carbon economy for Wales.	The FRMPs will take into account predicted sea level rise and increases in extreme events as a result of predicted climate change over the next century and further beyond, therefore will contribute to the required climate change adaptation identified within the Climate Change Strategy for Wales.
Landscape		
Cultural Heritage		
Valuing our Environment Partnership (2010) Valuing the Welsh Historic Environment	The report presents an economic argument that the environment (specifically the historic environment) is fundamental to prosperity in Wales	The document provides background evidence to support the preservation of the historic environment, which can be divergent from the objectives of the FRMP which aim to deliver improvements to flood risk.
Dee Regional PPPs		
Water		
North West and North Wales Coastal Group (2009) North West England and North Wales Shoreline	This plan makes provision for management of the coastline within the Dee River Basin District and beyond, to minimise coastal erosion and flooding whilst also considering coastal communities, existing	The FRMPs align with the SMP2, having mutual objectives to reduce flood risk around the coast of Wales. The FRMPs have a wider scope however, considering

Management Plan (SMP2)	infrastructure, tourist and amenity areas and the natural environment	fluvial and surface water flooding also.
Environment Agency (2013) River Dee Catchment Abstraction Management Strategies (CAMS)	This is a six-year plans detailing how water resources in the River Dee catchment will be managed. CAMS documents set out how much water is available for licensing in each catchment and indicates where catchments are over-abstracted or over-licensed during periods of low flow.	Less abstractions within catchments will increase flood risk, due to higher volumes of water within the channels - conflicting with the aims of the FRMPs. The measures in the FRMPs therefore should consider theis strategy to ensure that adequate protection is in place from a potentially greater level of flood risk.
Environment Agency Wales (now Natural Resources Wales) (2013) Tidal Dee Flood Risk Management Strategy	This strategy provides details of the proposed flood risk management approaches for the Dee Estuary from Abergele, around the Point of Ayr and down the Dee estuary. This area is home to tens of thousands of people and a large number of businesses, vital to the local economy.	The FRMP aligns with the Strategy, having mutual objectives to reduce flood risk around the coast of Wales. The FRMPs have a wider scope however, considering fluvial and surface water flooding also.
Environment Agency Wales (now Natural Resources Wales) (2010) River Dee Catchment Flood Risk Management Plans	This plan gives an overview of the flood risk (except coastal) across the River Dee catchment., taking into account changes to climate and land management. It recommends ways of managing those risks now and over the next 50-100 years	The FRMP aligns with this Catchment Flood Risk Management Plan, having mutual objectives to reduce flood risk from the rivers of Wales. The FRMPs have a wider scope however, considering coastal and surface water flood risk also.
Local Authorities – Various (Various) Surface Water Management Strategies	Outline the preferred surface water management strategy in a given location. In this context surface water flooding describes flooding from sewers, drains, groundwater, and runoff from land, small water courses and ditches that occurs as a result of heavy rainfall.	The FRMP aligns with these SWMPs, having mutual objectives to reduce surface water flood risk in Wales. The FRMPs have a wider scope however, considering coastal and fluvial flood risk also.
Dwr Cymru Welsh Water (DCWW) (2013) Draft Water Resources Management Plan	Provides details how DCWW will ensure that adequate water is available to meet the planned growth in population, housing and economic activity in its supply area, while taking account of climate change and minimising	The plan considers how to sustainably manage the water environment to ensure future water supplies, with some alignment with the FRMP objectives. The FRMP will need to ensure that

	impacts on customers' bills and the environment.	implementation of measures does not compromise future potential to extract water for potable use. The plan could reduce flood risk through greater storage and impoundment of water for use by customers.
DCWW (Unpublished) Drought Plan	This plan sets out the steps that DCWW will take through the stages of developing drought, drought, severe drought and recovery from drought to ensure their supply of water resources	The plan considers how to sustainably manage the water environment to ensure future water supplies and provide water during drought, with some alignment with the FRMP objectives. The FRMP will need to ensure that implementation of measures does not compromise future potential to extract water for potable use. The plan could reduce flood risk through greater storage and impoundment of water for use by customers.
Spatial Planning / Population		
Local Planning Authorities – Various (Various Dates) Development Planning Policy	The plans set out policies to guide the development and use of land. They direct development to appropriate locations, whilst outlining a desire to conserve the natural, built and historic environment. Land is generally allocated for employment, residential or open space purposes.	The FRMPs will deliver objectives of the Local Development Plans through opening new land for potential development, and protecting existing developments from flood risk.
Tourism Partnership North Wales (2010) Tourism Strategy for North Wales	The strategy identifies the priorities to deliver a prosperous and competitive tourism industry in Wales. It sets out how Welsh tourism will be promoted and communicated more effectively and how investment will be directed to improve quality and choice for the consumer.	The FRMPs need to take into account the use of Wales' rivers, lakes and coastal waters as a recreation and tourist resource. FRMPs will ensure a safe water environment for the enjoyment of people. This aligns with the Strategy for Tourism as Wales' rivers, lakes and coastal waters are recognised as outstanding environments for a range of outdoor activities.
Biodiversity		

Environment Agency Wales (now Natural Resources Wales) (Various Dates) Salmon Action Plans	The aim of the action plans is to ensure the objectives set out in the National Salmon Strategy are met. They set out what needs to be done to support and restore salmon populations.	These plans are largely focused on the protection and enhancments of fish populations and habitats, and offer little alignment with the FRMPs key objectives. However, more natural river channels and riparian zones are recognised to reduce the risk of flooding as well as enhancing fish habitat, thereby contributing to achievement of the FRMP's objectives.
Defra (2010) Eel Management plans for the United Kingdom: Dee River Basin District	Eel management plans describe the current status of Eel populations across river basin districts and assesses compliance with targets set out in EU Council Regs 110/2207.	These plans are largely focused on the protection and enhancments of eel populations and habitats, and offer little alignment with the FRMPs key objectives. However, more natural river channels and riparian zones are recognised to reduce the risk of flooding as well as enhancing eel habitat, thereby contributing to achievement of the FRMP's objectives.
Natural Resources Wales / Natural England (2013) The River Dee / Afon Dyfrydwy Site of Special Scientific Interest Restoration Plan	The River Dee SSSI Restoration Plan has developed a restoration vision of the whole river catchment identifying where the main pressures are and outlining restoration measures to help achieve favourable condition	The FRMPs must ensure no deterioration of the SSSI is caused, to remain compliant to the relevant legislation. Therefore, no detriment will be caused to the SSSI, providing general alignment with the objectives of the restoration plan. Works within the SSSI can target improvement to key features where possible.
Recreation		
Geology, Soils and Agriculture		
Material Assets		
Waste		
North Wales Regional Waste Group (2008) North	The vsions and aims of this plan are to provide a land use planning framework for the	The reduction in waste can deliver environmental enhancements, reduce

Wales Regional Waste Plan 1st Review Recommended Draft	sustainable management of wastes and recovery of resources in North Wales, to minimise adverse impacts on the environment, human health, the economy and society whilst maximising opportunities.	pollution and reduce climate change in the long-term, which can indirectly reduce flood risk, aligning with the aims of the FRMPs.
Climate		
Landscape		
Various (2010) Clwydian Range AONB Management Plan 2009-2014	This management plan for the AONB contains actions to ensure the protection and enhancement of the landscape quality of these areas.	This plan is largely focused on the protection of the landscape and natural heritage and offers little alignment with the FRMPs key objectives. However improvements to biodiversity and the wider ecosystems, and thus natural heritage, through increased tree / vegetation cover in catchments, wetland creation and more natural river channels and riparian zones are recognised to reduce the risk of flooding, thereby contributing to achievement of the FRMP's objectives.
Snowdonia National Park Authority (2012) Snowdonia National Park Management Plan 2010-2015	The management plan for Snowdonia National Park contains actions to ensure the protection and enhancement of the landscape and natural environment of the area, conserve and enhance the natural beauty, wildlife and cultural heritage of the area; and to promote opportunities for the understanding and enjoyment of the special qualities of the area by the public	This plan is largely focused on the protection of the landscape and natural heritage and offers little alignment with the FRMPs key objectives. However improvements to biodiversity and the wider ecosystems, and thus natural heritage, through increased tree / vegetation cover in catchments, wetland creation and more natural river channels and riparian zones are recognised to reduce the risk of flooding, thereby contributing to achievement of the FRMP's objectives.
Cultural Heritage		

English Heritage (2013) Heritage at Risk Register North West	Provides an integrated list of all historic sites in need of help to secure their future. The Register includes details on what is being done to reduce the risks to the sites included in it as well as information specific to the area covered by the individual Registers.	This register supports the preservation of the historic environment, which can be divergent from the FRMP, which aims to deliver improvements to flood risk. Care should be taken in the FRMPs to ensure impacts on the historic environment are minimised. The FRMPs will deliver reductions in flood risk, which can reduce the damage to historic assets from flooding.

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