Department for Infrastructure
An Roinn Bonneagair
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Second Cycle

DRAFT NORTHERN IRELAND FLOOD RISK MANAGEMENT PLAN

2021–2027

DECEMBER 2020

CONSULTATION

CONSULTATION

How to Respond

This consultation is an important step in shaping the management of flood risk throughout Northern Ireland over the 6 year life cycle of the Plan. It gives you the chance to influence the approach and for us to take on board any ideas and comments that you might have.

We would welcome your comments on the draft Flood Risk Management Plan 2021-2027 and in particular, we would welcome your views on the following questions.

Questions on the Draft Flood Risk Management Plan 2021-2027

Q1 Do you agree that, using the methodology noted, the draft Plan highlights the most significant flood risk areas in each of the three River Basin Districts?

Q2 Do you understand and agree with the objectives as described in the draft Plan?

Q3 Do you agree that there is the right balance between the social, economic and environmental objectives?

Q4 Do you agree with the proposed measures identified for each of the Areas of Potential Significant Flood Risk (APSFR)?

Q5 What measures do you think should be given the highest priority to manage the flood risk in your area?

Q6 Do you see any ways that you or your community can support and contribute to any of the measures set out in the draft Plan to reduce the flood risk?

Q7 Are there things you think should be done to improve the co-ordination of river basin and flood risk management planning?

Questions on the environmental reports (SEA and HRA)

Q8 Do you agree with the conclusions of the environmental reports?

Q9 Are there any further significant environmental effects of the draft Plan which you think should be considered?

Q10 Are there further mitigations or opportunities that should be considered for the final Plan?

This consultation will be available for public response and comment for a period of 6 months from 22nd December 2020 to 25th June 2021. A Consultation Response Form (CRF) has been developed to assist you in commenting on the content of the draft Flood Risk Management Plan 2021-2027.

The CRF can be accessed online at: https://www.infrastructure-ni.gov.uk/consultations/consultation-draft-flood-risk-management-plan-2021-2027-second-cycle and should be completed in association with this consultation document.

Anyone unable to respond by e-mail should complete the Appendix F - CRF and post responses to:

Flood Risk Management Plan Consultation Response
Department for Infrastructure
Water and Drainage Policy Division
Room 1-22, Clarence Court
10-18 Adelaide Street
BELFAST
BT2 8GB

Email: floods.directive@infrastructure-ni.gov.uk

Please note that responses to the consultation must be received by 17:00 on 25th June 2021. All responses received by this date will be considered.

Further Information

Hard-copies of this document are available on request, and an electronic copy of this document can be found at www.infrastructure-ni.gov.uk/consultations. Copies of this document can be made available on request in alternative formats and other languages.

Freedom of Information Act 2000 - Confidentiality of Responses

The Department may publish a summary of responses following the closing date for receipt of comments. Your response, and all other responses to this publication, may be disclosed on request. The Department can only refuse to disclose information in exceptional circumstances. Before you submit your response, please read the paragraphs below on the confidentiality of responses as this will give you guidance on the legal position about any information given by you in response to this publication.

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- The Department should only accept information from third parties in confidence if it is necessary to obtain that information in connection with the exercise of any of the Department's functions and it would not otherwise be provided.
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- Acceptance by the Department of confidentiality provisions must be for good reasons, capable of being justified to the Information Commissioner.

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If you want the information that you provide to be treated as confidential, please tell us why, but be aware that, under the FOIA or EIR, we cannot guarantee confidentiality.

For information regarding your personal data, please refer to the DfI Privacy Notice at www.infrastructure-ni.gov.uk/dfi-privacy.

For further details on confidentiality, the FOIA and the EIR please refer to www.ico.org.uk.

Screening of Other Potential Impacts

The impact of the proposed Plan was assessed in terms of equality of opportunity and rural needs and the requirement for an Equality Impact Assessment (EQIA) was screened out. A copy of the equality screening form can be viewed on the Department's website at https://www.infrastructure-ni.gov.uk/publications/flood-risk-management-plan-2nd-cycle-screening-form.

What will happen next?

A summary of responses may be published on the DfI website at the following link www.infrastructure-ni.gov.uk/consultations after the closing date for receipt of comments.

FOREWORD

from the Minister Nichola Mallon

FOREWORD

From the Minister
Nichola Mallon

I am pleased to present this consultation on the second cycle draft Flood Risk Management Plan, which is a requirement under The Water Environment (Floods Directive) Regulations (Northern Ireland) 2009.

In recent years, flooding to homes and businesses in Northern Ireland has presented considerable challenges to both people and communities directly affected and to those providing emergency responses to it. Flooding can have potentially devastating impacts, on human life and health, damage to property, pollution to rivers and the sea and severe effects on economic activity, infrastructure and the environment. Flooding is also becoming more frequent and climate projections indicate that changing rainfall patterns, rising sea levels and more severe extreme weather conditions will increase its occurrence in the future.

The implementation of the Floods Directive, through the first six-year cycle of Flood Risk Management Planning, set out a catchment-based approach to the management of flood risk. It provided a more systematic, holistic and sustainable way of assessing, mapping and planning to manage flood risk than had been done previously. This was initiated here by a Preliminary Flood Risk Assessment completed in 2011 (PFRA 2011) followed by preparation of Flood Hazard and Risk Maps in 2014. The information from these two stages culminated in the development of objectives and measures under the headings of Prevention, Protection and Preparedness, in the first cycle Flood Risk Management Plans, published in December 2015.

We are now well into the second cycle of Flood Risk Management Planning, the first stage of which was the Northern Ireland Flood Risk Assessment (NIFRA 2018) , published by my Department in December 2018, which constituted a review of the PFRA 2011. Flood Hazard and Risk Mapping was then reviewed and updated in December 2019. Since then, along with our stakeholders, we have been reviewing, updating and preparing a new draft Flood Risk Management Plan, taking on board changes that have taken place during the first cycle. It is this draft Plan that I now present for public consultation, and would welcome your views on the approach, the objectives and measures being proposed and any additional aspects you may consider should be included.

This second cycle Plan differs from the first cycle Plans in that we now have a single Plan covering the three River Basin Districts (RBD) for the six years from 2021 until 2027. Surface water flooding has been given greater emphasis because of the predominance of flooding from this source in recent years, and because the NIFRA 2018 indicated that potential damages from surface water flooding could be greater than from other main sources.

In preparing this draft Plan my Department has worked in partnership with NI Water, the Department of Agriculture, Environment and Rural Affairs (DAERA) and the Department for the Economy (DfE), to develop a shared understanding of flood risk and to consider and agree roles and responsibilities in managing this risk. The ongoing COVID-19 situation has had an impact on our ability to engage with the public and interested parties, during the development of the draft Plan. However, as an alternative, through this consultation we intend to share the draft Plan widely and will be particularly seeking views and input from flood affected communities, under the umbrella of the Regional Community Resilience Group.

The draft Plan is based on the same River Basin Districts as the River Basin Management Plan, produced under the Water Framework Directive by DAERA and I welcome the opportunities this presents to further develop the synergies between these plans.

I welcome your views on this draft Flood Risk Management Plan 2021-2027, and encourage you to take this opportunity to have your say. This consultation will run for a period of 6 months and will close on 25 June 2021. The final Flood Risk Management Plan will then be developed, and published by December 2021.

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Chapter **1**

INTRODUCTION

1. INTRODUCTION

Flooding in Northern Ireland (NI) in recent years has had significant impacts on communities, businesses, infrastructure and the environment. A changing climate, increasing seasonal and peak rainfall, rising sea levels and more extremes in the weather will lead to more frequent and severe flooding. To manage that risk, it is essential to understand the areas likely to be affected. The Floods Directive requires the establishment of a framework for the assessment and management of flood risk that aims to reduce the adverse consequences of flooding on human health, the environment, cultural heritage and economic activity. This works on a six-year cycle of flood risk assessment, prioritisation, updated flood mapping and planning for flooding.

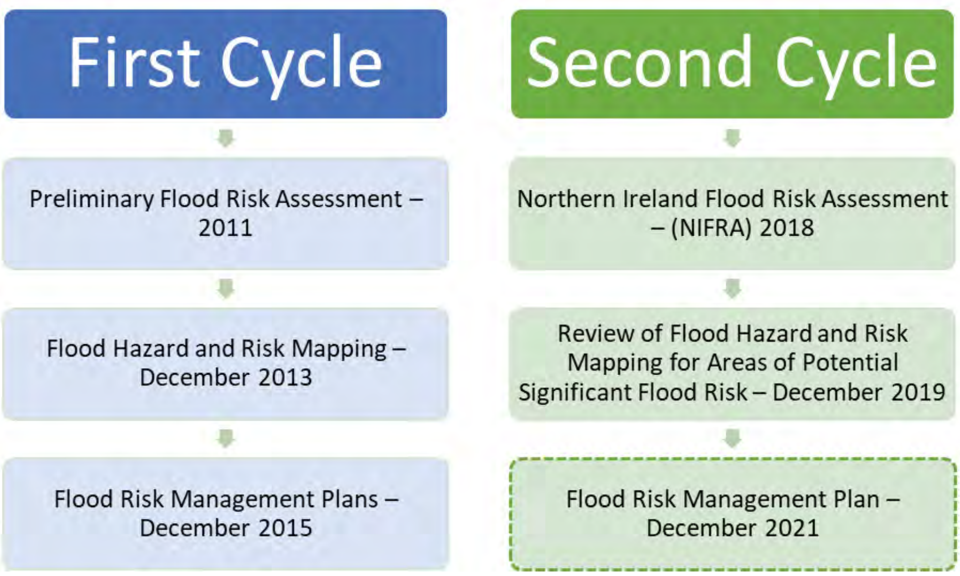
The Directive Timeline is geared to a rolling cycle so its three key stages must be repeated on a cyclical basis (every six years) to ensure that flood risk is managed effectively and that it takes account of new information, changes in risk and new technologies. The first cycle of this work took place between 2009 and 2015, when the initial Flood Risk Management Plans (FRMPs) for the North Eastern River Basin District (RBD) and the North Western and Neagh Bann International River Basin Districts (IRBD) were published.

Protecting the community from the risk and impact of flooding is at the heart of the Floods Directive. Citizens and communities will benefit from a greater knowledge of current and future flood risk through the FRMP process. Some areas will also benefit from enhanced flood protection, as a result of the measures included within the Plan. Taking account of the likely impacts of Climate Change is an integral part of flood risk management planning and adaptation measures in the Plan will help to address future increased flood risk.

This report is the second cycle Floods Directive FRMP for NI. It fulfils the requirements of The Water Environment (Floods Directive) Regulations (Northern Ireland) 2009.

Figure 1.1 shows the six-year cycle of assessment, mapping and planning for the Floods Directive and the work that has been undertaken for the second cycle in NI.

Figure 1-1: Six-year cycle of Flood Risk Management Planning in Northern Ireland



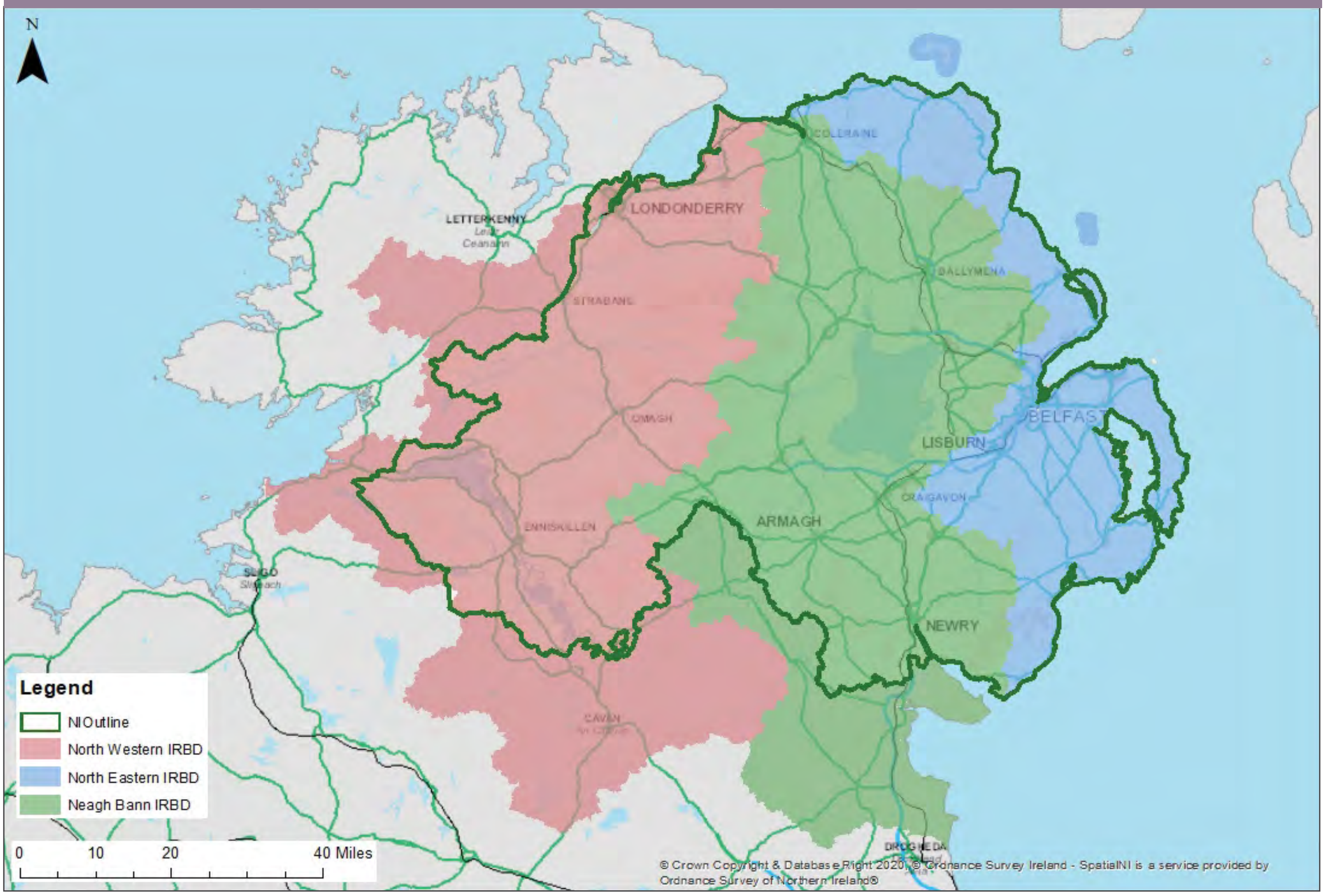
1.1 First Cycle Floods Directive

In NI, the Department of Agriculture and Rural Development (DARD) Rivers Agency (now Department for Infrastructure (DfI) Rivers) completed the Preliminary Flood Risk Assessment (PFRA) for River Basin Districts in December 2011. The PFRA 2011 brought together information on the likelihood of flooding from rivers and the sea and the consequences of such flooding to identify Areas of Potential Significant Flood Risk (APSFR). For the first cycle these were known in the NI context as Significant Flood Risk Areas (SFRA). The PFRA 2011 identified 20 SFRAs and 49 Areas for Further Study (AFS).

Detailed Flood Hazard and Flood Risk Maps (FHRM) for flooding from rivers and the sea, and further strategic mapping for surface water flooding, were published in December 2013 for these 69 areas.

The first cycle FRMPs for the North Eastern RBD and North Western and Neagh Bann IRBDs were published in December 2015 which focussed on measures to manage flood risk in the SFRAs. The Plans identified the measures to be undertaken, subject to resources and other competing priorities, between 2015 and 2021 and beyond, and set out how the relevant authorities would work together and with communities to reduce the flood risk.

Figure 1-2: River Basin Districts across Northern Ireland and the Republic of Ireland



1.2 Second Cycle Floods Directive

The legislation requires the PFRA 2011 to be reviewed every six years and so the Department for Infrastructure (DfI) developed the Northern Ireland Flood Risk Assessment 2018 (NIFRA 2018) which was published in December 2018 and used the latest flood mapping for river, coastal and surface water flooding to review and revise the flood risk areas. The 2018 methodology differed in some aspects from that adopted in 2011 when less data was available relating to flood modelling. For NIFRA 2018 the effect of existing flood defences and culverts was taken into account and surface water (pluvial) flooding was included in the identification of APSFR. The NIFRA 2018 identified 12 areas in NI as APSFR for the second cycle of Floods Directive work. Nine areas, which were all identified as SFRAs through the initial PFRA 2011, have been designated as Transitional Areas of Potential Significant Flood Risk (TAPSFR) to ensure continuity for addressing the delivery of measures set out for these areas in the first cycle FRMPs.

Whereas, strategic mapping was used for the PFRA 2011, more detailed fluvial and coastal FHRMs have been developed since that time for the 20 areas identified to be SFRA and the 49 areas determined as AFS. In total 69 areas have been modelled and mapped in detail for fluvial and coastal flooding. A significant advance from the first cycle of Flood Hazard and Flood Risk Mapping is that surface water mapping is now included in addition to fluvial and coastal mapping. Although the surface water model used is currently for a broad scale strategic assessment and similar to the models used by the other flood authorities within the UK and Ireland, it is acknowledged that it is strategic in nature and further consideration of this area is necessary.

Figure 1-3: Areas of Potential Significant Flood Risk (APSFR) and Transitional Areas of Potential Significant Flood Risk (TAPSFR) as defined through the NIFRA 2018

In accordance with the regulations, a Timetable and Work Programme for the preparation of the NI FRMP 2021 – 2027 was produced in December 2018. This document outlines the proposed work programme for the preparation of the second cycle FRMP and details the key deliverables and their deadlines. The Department undertook a public consultation exercise from December 2018 to June 2019 to seek views on the Timetable.

Following on from the NIFRA 2018, the Flood Hazard and Flood Risk Mapping for NI was reviewed by December 2019 and where necessary, mapping was updated and published online on the Flood Maps (NI) web portal. Flood Maps (NI) shows the areas in NI that have flooded from rivers, the sea and surface water in the past and those which may be prone to flooding now and in the future. Flood Maps (NI) also includes flood maps of predicted Climate Change and shows where existing flood defences are located and highlights the areas that benefit from their protection.

1.3 Purpose of the Second Cycle Flood Risk Management Plan

This FRMP 2021-27 has taken account of the NIFRA 2018 assessment and the recently updated methodology for the calculation of damages. It highlights the flood hazards and risks from rivers, the sea and surface water and sets out how the relevant authorities will work together and with local communities to manage flood risk. Although three FRMPs were produced for the first cycle of the Flood Directive, the second cycle FRMP covers all of NI, encompassing the North Eastern RBD and North Western and Neagh Bann IRBDs in one FRMP.

This Plan focusses on the 12 APSFR identified in the NIFRA 2018, drawing information from Flood Maps (NI) as well as from stakeholder engagement, through the Floods Directive Technical Stakeholder Group (FDTSG), to plan for measures to manage flood risk in those areas between 2021 and 2027. It also reports on how the measures in the first cycle FRMPs have been implemented, where these are not yet completed and how these will be taken forward in the future.

However, it should be noted that our understanding of flood risk is continually evolving taking account of new and updated information, hydraulic modelling techniques, flood events and ongoing analysis. Flood risk is continually reassessed to identify new objectives and measures which will be applicable to all at risk areas of NI and can be taken into account in future plans. Table 1-1 sets out how this current Plan is presented.

Table 1-1: Guide to the Northern Ireland Flood Risk Management Plans 2021-27

Chapter	Title	Contents
Chapter 1	INTRODUCTION	Purpose and requirements of the FRMP
Chapter 2	FLOOD RISK MANAGEMENT IN NORTHERN IRELAND	This section provides an overview of how flood risk is managed in NI, including an overview of the roles and responsibilities of the organisations involved
Chapter 3	FLOODS DIRECTIVE WORK TO DATE	This section provides further background on the first cycle FRMPs and reports on progress for TAPSFR. It provides further information on the different approach taken for the second cycle Floods Directive work. There is further information on the main findings of the NIFRA 2018 and a summary of the updates to Flood Maps (NI)
Chapter 4	OBJECTIVES AND MEASURES FOR MANAGING FLOOD RISK	This section sets out the vision and objectives for the second cycle FRMP. It covers how measures have been developed for the Plan and those that are applicable across the whole of NI and not specific to APSFRs; these are known as 'regional measures'
Chapter 5	AREAS OF POTENTIAL SIGNIFICANT FLOOD RISK	For each of the twelve APSFR, this section provides information on: • The area covered by the APSFR; • Flood history; • Catchment background; • Sources of flooding; • How flood risk is currently managed; • Progress on measures since the first cycle FRMP; and • Proposed measures for the second cycle FRMP that are APSFR specific.
Chapter 6	COSTS OF IMPLEMENTING THE FLOOD RISK MANAGEMENT PLAN	This section provides information on the resources, funding and initiatives which are in place to support the objectives and measures proposed over the Flood Risk Management Planning cycle 2021-2027
Chapter 7	ENVIRONMENTAL ASSESSMENT	This section provides an overview of the Strategic Environmental Assessment (SEA) Screening, SEA Monitoring and Habitats Regulations Assessment (HRA)
Chapter 8	MONITORING AND REVIEW	This section sets out how the FRMP will be implemented and reviewed, including setting out the next cycle timescales

The Floods Directive encourages the active involvement of interested parties in the production of the FRMP. The steps taken to provide opportunities for the general public, statutory consultees and other interested parties to participate in the exchange of information or views in preparing the FRMP have been impacted upon due to the COVID-19 crisis. Public meetings regarding the drafting of the FRMP have not been feasible during this time. However, through the formal Public Consultation process from December 2020 until June 2021 on the draft FRMP 2021-27, all parties in a wide circulation will still have the opportunity to provide input to the process prior to the finalisation and publication of the FRMP in December 2021. A key vehicle for communicating the FRMP directly to communities and individuals who are at risk from flooding will be the Regional Community Resilience Group (RCRG). The draft Plan is being circulated to RCRG and its at-risk communities at the time of publication. The Key Infrastructure Group, which comprises members of organisations who manage critical infrastructure and services in NI, will also be informed of the draft Plan publication and members are encouraged to provide their views. A Questionnaire is being included with the FRMP to aid responses from Consultees.

The North Western and Neagh-Bann are shared IRBDs with the Republic of Ireland. In addition, a small area of the Shannon IRBD covers NI, although there is no history of flooding and there are no APSFR within the Shannon IRBD in NI. The Department continues to work closely with the Office of Public Works (OPW) in the Republic of Ireland (RoI) to ensure that measures undertaken in either jurisdiction do not increase flood risk and are mutually beneficial. Arrangements for cooperation and coordination in the implementation of the Floods Directive between the two Competent Authorities are covered in Section 2.3.

Chapter **2**

FLOOD RISK MANAGEMENT IN NORTHERN IRELAND

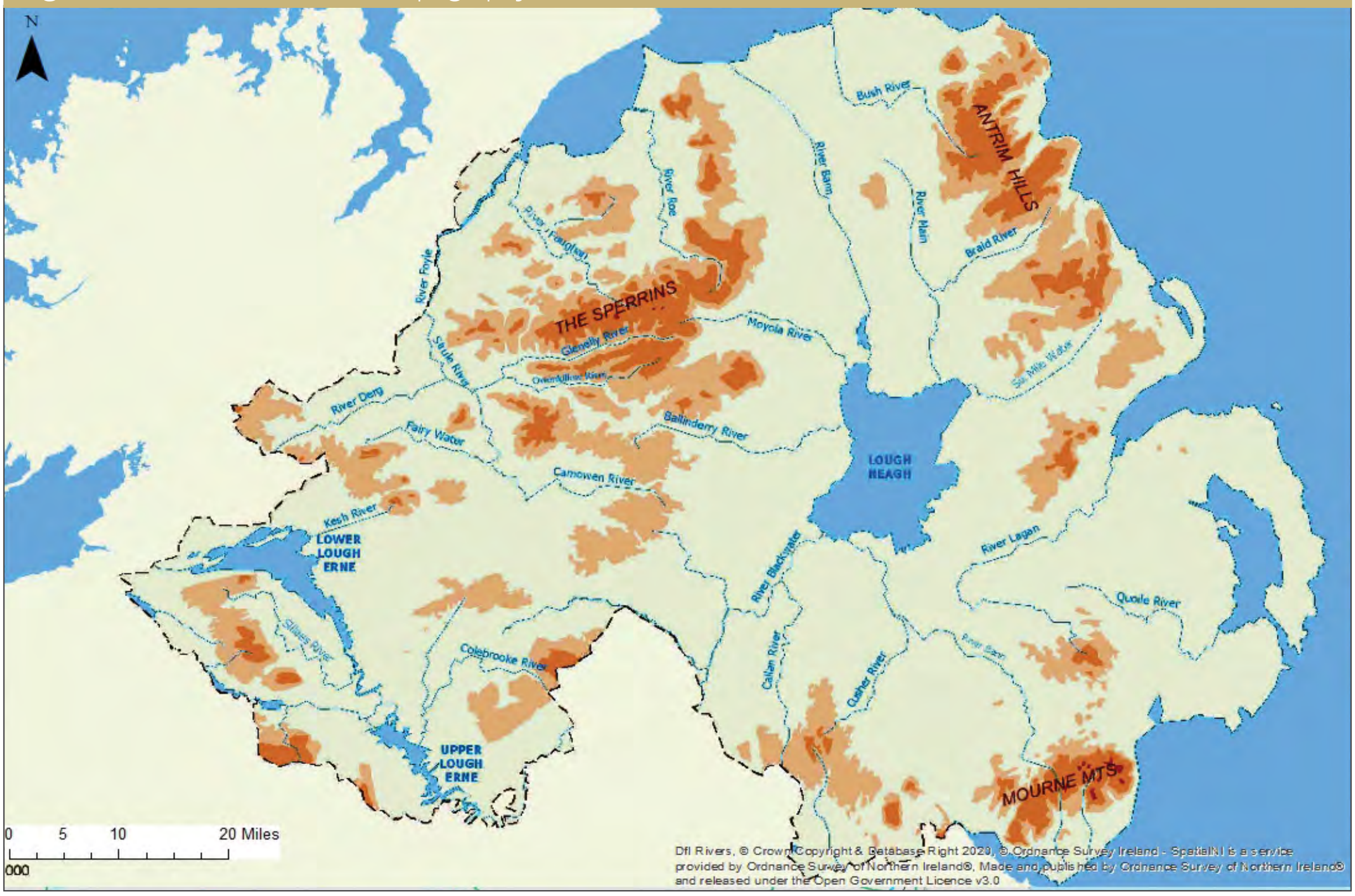
2. FLOOD RISK MANAGEMENT IN NORTHERN IRELAND

NI covers an area of 14,130 km² and has a diverse landscape and topography including a long and varied coastline. The highest point in NI is Slieve Donard in the Mourne mountains, in the south-east at 850 m above sea level. There are a number of large inland lakes, with Lough Neagh 20 km to the west of Belfast, the largest in the UK at 391 km². There are also 4 main coastal sea loughs, with Strangford Lough the largest at 150 km². The longest river systems in the respective NI RBDs are:

- North-Eastern RBD - the River Lagan, which outfalls through Belfast;
- North-Western IRBD - the River Foyle system, which outfalls through Londonderry and also includes the River Mourne (which has the highest gauged flows in NI) and the Erne River system which flows from Cavan in RoI, through Co. Fermanagh and outfalls into Donegal Bay in RoI; and
- Neagh-Bann IRBD - the River Bann system, flowing from the north side of the Mourne mountains through Lough Neagh and the Lower Bann, flows northwards to outfall at the north coast near Castlerock.

The NIFRA 2018 identified that the main sources of flooding in NI are rivers, the sea and overland surface water flows.

Figure 2-1: Northern Ireland Topography



2.1 Sources of flooding

The NIFRA 2018 identified that approximately 45,000 or 5 % of the properties in NI are at risk of flooding from rivers, the sea or overland surface water flows. When Climate Change for the 2080s epoch (time period towards the end of the century) is taken into consideration it is estimated that there will be an increase of approximately 14,800 properties at risk.

Flooding from rivers is known as fluvial flooding and occurs when the river channel capacity is exceeded, with water overtopping the banks and flowing across the natural floodplain of a river. River flood defences in locations such as those on the River Strule at Omagh, help to reduce the likelihood of flooding occurring, although residual risk remains of them being overtopped in an event that is more extreme than their design capability, or being breached due to structural failure. The most recent major fluvial flood events happened in winter 2015-16 affecting many areas, but predominately around Lough Neagh and Lough Erne, in August 2017 from the Rivers Foyle and Faughan in the North West and in August 2020 from the Shimna River in Newcastle.

Flooding from the sea is known as coastal flooding on the open coast and tidal flooding where this causes flooding inland on the lower sections of rivers and estuaries that are tidally influenced, although both terms are sometimes used interchangeably. Significant coastal flooding is relatively rare in NI but has the potential to cause major damage in low lying areas. The long term economic and environmental damage is generally higher due to the effects of saltwater inundation. The highest tidal surge recorded within Belfast Harbour occurred in January 2014. While some coastal locations around NI were affected by flooding, the existing defences and quayside in Belfast were not overtopped and this event was regarded as a 'near miss' and has heightened concerns with respect to NI's susceptibility to coastal flooding.

Figure 2-2: Flooding around Lough Neagh - January 2016

Figure 2-3: Emergency Sand Bag Flood Protection on the Connswater at Sydenham - January 2014

Surface water flooding, also known as pluvial flooding, occurs as a result of rainfall which has not yet reached and/or has overwhelmed man-made drainage systems resulting in water flowing overland and ponding in low-lying areas. In urban areas it can be exacerbated by extensive areas of impermeable hard standing such as roads, car parks and buildings. It is often very complex in nature with water passing in and out of overland flowpaths, road drains, sewers and smaller watercourses. In rural areas it can be exacerbated by the type of soil and the way that land is managed or crops are sown. A major event occurred in Belfast in June 2012 when around 1,600 properties were affected by flooding from surface water and small urban drainage systems.

Sewer flooding can occur when foul, combined or surface water escapes from the public sewerage system into a property and enters a building or passes below a suspended floor. Sewer flooding generally occurs through a combination of events and responsibility can lie with a number of different parties. It is typically a localised issue. Possible reasons for sewer flooding can include:

- Blocked or overloaded drains and sewers overflow across roads, gardens and into property;
- The capacity (size) of the sewer is too small for the flows it receives and causes sewers to backflow into a property.

There is also a risk of flooding from reservoirs. This source of flooding is not specifically addressed within this FRMP because it is covered by other legislation. The Reservoirs Act (Northern Ireland) 2015 makes provision for a proportionate regulatory reservoir safety framework for all Controlled Reservoirs (i.e. those reservoirs capable of holding 10,000m3 or more of water above the natural level of any part of the surrounding ground). Subject to Ministerial and NI Assembly approval, the secondary legislation necessary to introduce the regulatory reservoir safety framework will be in operation in this Flood Risk Management Planning cycle. Outline inundation maps for each Controlled Reservoir were published by the Department in 2016 (link to Reservoir Flood Mappings). These maps show the areas that could be flooded if Controlled Reservoirs were to fail and release the water they hold. The maps are used by reservoir managers, government bodies, organisations and others dealing with flood risk from reservoirs, particularly those engaged in development planning and emergency planning.

In addition, there may be a risk of flooding from groundwater, although there is little known of this in the local context as groundwater flooding can often be masked by fluvial or surface water flood events. The rise of groundwater in superficial aquifers under normal circumstances has the potential to discharge at surface level in the form of natural springs. At times of abnormally high rainfall, in some instances the aquifers can become surcharged resulting in subsoils becoming water logged and more extensive discharges at surface level. Elsewhere in the UK and Ireland studies have been undertaken by the competent authorities to assess the extent and susceptibility of aquifers to groundwater flooding. It is recognised that further consideration of this area needs to be carried out to establish if there are significant risks associated with this source of flooding in NI.

2.2 Increasing likelihood of flood events

The latest Climate Change projections from the UK Met Office, UKCP18, forecast a rise in sea level, increased winter precipitation and an increase in the frequency and intensity of extreme rainfall events, which will further increase flood risk in NI. In particular, UKCP18 predicts higher increases in Sea Level Rise than previous UKCP09 information because potential polar ice sheet melting is now taken into account. NI sea levels are predicted to rise by between 33 – 94 cm by the year 2100; Precipitation rates for winter are predicted to increase by 20 % to 30 % in the same period. NI has a climate more aligned with the west of Scotland and is more influenced by an Atlantic climate than that of the continent of Europe.

The way that land is managed can also have an adverse effect on the likelihood of flooding. Increasing development and paving-over gardens and driveways (known as 'urban creep') and any increase in land drainage or reclamation could change the ability of land to absorb rainfall. This will exacerbate local surface water flooding issues and cumulatively increase fluvial flood risk further downstream.

Although Flood Risk has historically been addressed reactively by providing local engineered solutions to solve repeated flooding, the Floods Directive's approach to flood risk management is pro-active. The Directive's 6 year cyclical stages of assessment, flood mapping and flood risk management planning followed by review, allow for change and take account of catchment-wide processes. Taking care not to place new development in areas which are at risk now, or which may become at risk in the future, is much more effective than building defences after properties have flooded. Managing catchments naturally and effectively, may combat the effects of a changing climate.

2.3 Flood Risk Management Organisations

Flood risk in NI is managed by a number of organisations, many of which come under the umbrella of the DfI. A summary of their role in flood risk management is shown in Table 2-1.

Table 2-1: Organisational roles for flood risk management in Northern Ireland

Risk Management Authority	Key role in Flood Risk Management
DfI Water and Drainage Policy Division (WDPD)	• Development of flood risk management policy; and • Coordinating the implementation of the Floods Directive.
DfI Rivers	• Undertakes maintenance of designated watercourses; • Undertakes inspection and maintenance of designated river and coastal flood defences; • Manages a capital flood alleviation scheme programme; • Manages flood mapping and modelling activities; • Statutory Consultee for the Planning Authorities on flood risk; • Liaises with Met Office and UKCMF regarding severe weather information; and • Lead Government Department for the Strategic Coordination of Flooding Emergencies.
DfI Roads	• Maintains all public roads and related drainage systems; • Manages a programme of highway drainage improvements; • Deals with impacts of highways flooding, including actions to alleviate; flooding such as closing roads and clearing blockages; and • Takes action to protect property that may be affected by flooding of the highway.
Northern Ireland Water (NI Water)	• Provides water and sewerage services across Northern Ireland; • Maintains surface water, foul and combined sewers; • Manages a programme of sewer flooding improvements; • Deals with impacts of sewer flooding; and • Takes action to protect property that may be affected by sewer flooding.
DfI Planning	• Preparation of Regional Development Strategy; • Northern Ireland wide planning legislation and policy; • Processes regionally significant planning applications; and • Scrutinises Council Local Development Plans.
Local Councils	• Development Planning - Preparation of Local Development Plans (LDP); Process most planning applications, Enforce planning decisions; and • Emergency planning, response and recovery – when required, coordinate and support the emergency response to flooding; when approved, administer Scheme of Emergency Financial Assistance (SEFA).

Office of Public Works, Republic of Ireland

The OPW is the lead State body for the coordination and implementation of Government policy on the management of flood risk in the RoI. The OPW has a long history of working closely with the DfI on areas of common interest. As both organisations are the competent authority in their respective jurisdictions for the implementation of the Floods Directive, they share information and coordinate activities on the development of FRMP 2021-27 for the three shared IRBDs (Neagh Bann, North Western and the Shannon). This is essential to ensure that any flood mitigation measures proposed by NI do not significantly increase the flood risk in the RoI and vice versa. To facilitate cooperation and coordination, DfI and OPW have established the following main Groups:

- OPW / DfI Cross Border Implementation Group

This is a forum where staff at a senior level meet to discuss flood risk management policy issues of mutual interest;

- DfI / OPW Operations / Technical Working Group

This has been established to discuss cross-border operational and technical flood risk management issues of mutual interest; and

- RoI National Floods Directive Coordination Group

DfI has a position on this Republic of Ireland Steering Group which continues to operate during the second cycle of the Directive.

We consider that these three fora are sufficient to maintain the necessary cooperation and coordination and enable resolution of any cross-border flood risk management issues that may arise during the second cycle of the Floods Directive.

2.4 Flood Risk Management Partnership Groups

To facilitate the cooperation and interaction between the Flood Risk Management Organisations, a number of groups have been established to take forward various combined initiatives, both at strategic and operational levels. These are shown on Table 2-2.

Table 2-2: Flood risk management partnership groups in Northern Ireland

Flood Risk Management Partnership Group	Role	Membership
Flood Investment and Planning Group (FIPG)	• Provide a co-ordinated approach to the identification of flooding issues to be addressed on a multi-agency basis; • Identify and agree flooding issues to be addressed and proposals for investigations; • Agree the division of responsibilities between parties including the lead; • Help make the case for wider investment in flood mitigation; and • Advise the Flood Strategy Steering Group of operational and other flood issue; and • Provide input to the development of policy in relation to flood and drainage issues.	• DfI WDPD • DfI Rivers • DfI Roads • NI Water

Stormwater Management Group (SMG)	• Ensure a strong cross-agency/cross-departmental commitment which will co-ordinate and oversee the development and implementation of sustainable stormwater management systems within Northern Ireland; and
	• Assist in the increased use of SuDS within Northern Ireland in order to:
	  • Reduce flood risk;
	  • Improve water quality;
	  • Facilitate sustainable economic development;
	  • Adapt to Climate Change; and
	  • Provide increased amenity value.
		• DfI WDPD
		• DfI Rivers
		• NI Water
		• Utility Regulator
		• NIEA

Civil Contingencies Group (CCG)	• Strategic co-ordination group responsible for setting the overarching strategy for the NI Administration's response to an emergency;
	• Directs the emergency response and commits resources across the Northern Ireland Civil Service CCG(NI)'s; and
	• Strategic decision-making role includes:
	  • Directing and co-ordinating the efforts of NI departments in responding to an emergency.
	  • Assessing the wider impacts of events and decisions on infrastructure, systems and people.
	  • Identifying the key issues for consequence management and long-term recovery.
		• Relevant NI Departments
		• Northern Ireland Office
		• Emergency Services,
		• District Councils
		• Other key organisations as appropriate.

Flood Risk Management Partnership Group	Role	Membership
Flood Strategy Steering Group (FSSG)	• Provide strategic direction and coordination on flooding preparedness and wider support for implementation of the Floods Directive; • Develop strategies to improve flood response; • Provide steer to Emergency Planning Groups; Regional Community Resilience Group and the Floods Directive Technical Stakeholder Group; • Monitor and review effectiveness of response following major events; • Ensure effective communication between responders to flooding at a strategic level; and • Ensure alignment of the Group's activities with the Climate Change agenda.	• DfI WDPD • DfI Rivers • DfI Roads • NI Water • DfI Core • DfI Planning • TEO • DAERA • NI Direct • Local Government • PSNI • NIFRS
Floods Directive Technical Stakeholder Group (FDTSG)	• Support senior management in addressing Floods Directive requirements including the delivery of the 2nd Cycle of Flood Risk Management Plans; • Provision of advice, guidance and recommendations on policy issues; • Consideration of technical issues e.g. data system management/GIS aspects and development of solutions; and • Development of action plans and delivery of work packages.	• DfI WDPD • DfI Rivers • DfI Roads • NI Water • DAERA
Regional Community Resilience Group (RCRG)	• Support communities in relation to understanding flood risk, flood warning and informing, self-help and limitations of infrastructure; • Develop consistent approaches to community engagement and development of Community Resilience activities across Northern Ireland; and • Work on a multi-agency basis to facilitate sufficient planning and preparation to allow for community response and recovery to cope with emergency incidents in pre-identified communities.	• DfI Rivers, • DfI Roads • NI Water • Local Government • PSNI • NIFRS • Red Cross • NIHE • NIE • Met Office • Consumer Council • MOD • Education Authority • DAERA
Living With Water Programme Board (LWWP)	• Produce a Strategic Drainage Infrastructure Plan for the greater Belfast area; • Produce an Integrated Drainage Investment Planning Guide for NI; • Develop plans to facilitate an integrated approach to drainage and wastewater management; and • Promote schemes and concepts to manage water in an integrated way across the catchment to mitigate flood risk.	• DfI LWWP • DfI WDPD • DfI Rivers • DfI Roads • NI Water • Utility Regulator • Belfast City Council • NIEA

2.5 Other Related Legislation

2.5.1 The Water Framework Directive

The Water Framework Directive (WFD) introduced in 2000 and as amended, established a new integrated approach to the protection of the water environment. The WFD provides a common framework for assessing water quality in designated 'waterbodies' and planning for and monitoring water quality improvement works based on a six-year rolling planning cycle. The WFD is transposed in NI through the Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2017.

The aim of the Department of Agriculture, Environment and Rural Affairs (DAERA) (the WFD competent authority) is to work with partners to achieve 'good status' in all waters; from groundwater to rivers and lakes, through to estuaries and coastal waters. This is delivered through a number of statutory instruments that transposed the requirements of the European Commission's WFD into NI legislation. The WFD has linkage with the Floods Directive. The objectives of the local regulations are: to get polluted waters clean again, to ensure that clean waters are kept clean and to ensure that sufficient water is available to support the environment as well as for all of its users. DAERA is responsible for development and implementation of the River Basin Management Plans (RBMP), which is based around the same RBDs as the Floods Directive and reviewed on the same six-year cyclical basis. This provides opportunities for Government and stakeholders to dovetail the activities of both Directives to achieve better integration and coherence in the implementation of both Directives.

The RBMPs identify the condition of the water environment and set out objectives for the improvement, or the prevention of deterioration, of individual waterbodies for the three river basin planning cycles ending in 2015, 2021 and 2027. A Programme of Measures was published in the RBMPs setting out actions required to meet the objectives of improving the status of all waterbodies. A new RBMP is being developed for 2021-27 as part of the third cycle of the WFD implementation.

The NIEA River Basin web viewer provides an easy reference source of Waterbody Status information.

2.5.2 Interactions between Flood Risk Management Plans and River Basin Management Plans

The Plans developed under the Water Framework and Floods Directives form part of integrated river basin management and therefore provide opportunities to identify catchment wide measures to improve both flood risk management and water quality.

There is continued engagement between the DfI and NIEA through the interdepartmental Floods Strategy Steering Group (FSSG) and the FDTSG for implementing Floods Directive activities. Similarly, DfI Rivers engages with NIEA on the Strategic Planning And Resources group (SPAR) for delivering WFD outcomes. DfI Rivers and NIEA also collaborate on an inter-agency basis to develop a catchment wide view of river restoration/enhancement projects, with the aim to develop projects at the catchment and local level, through partnership working. In this way, both funding and benefits can be shared, providing better value for money, and developing the idea of adapting and delivering measures that fulfil a number of drivers.

The FRMP 2021-27 focuses primarily on areas which have been identified as being at potential significant flood risk. As these are predominately urban areas, any reduction in flooding may also reduce the risk of pollution incidents given that flooding often results in pollution problems (e.g. from oil tanks, sewerage overflows, etc.). The development and implementation of measures proposed under the Plan also provides potential opportunities for more natural flood risk management, including during capital works (e.g. improving floodplain storage, re-establishing connectivity between rivers and floodplains, fish passage, sediment continuity, morphological and other enhancement of watercourses etc.) as well as wider catchment based supporting strategies.

It is anticipated that measures within the draft third cycle RBMP 2021-27 will highlight the need for multi-agency working at a catchment level to deliver wider benefits for water status, morphology, flooding and fisheries through a coordinated approach. The coordination of river basin management planning and flood risk management planning is therefore important in delivering the objectives and measures under both Directives.

2.5.3 Strategic Environmental Assessment (SEA) and Habitats Regulations Assessment (HRA)

The Strategic Environmental Assessment (SEA) Directive (2001/42/EC) introduced in 2001 provides a framework for assessing the effects that certain overarching plans and programmes may have on the environment. It was ratified in NI through The Environmental Assessment of Plans and Programmes Regulations (Northern Ireland) 2004 (S.R. 280/2004).

The Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995 ('the Habitats Regulations') transpose the requirements of the Habitats Directive (1992) and aspects of the Wild Birds Directive (1979, amended 2009) and provides the framework for the legal protection of species and habitats of European importance. The Habitats Directive therefore has a much narrower focus than the SEA. A Habitats Regulations Assessment (HRA) under that legislation is undertaken in order to determine whether a plan or programme will have an adverse effect on the integrity of sites designated at an international level (European Designated Site) for their nature conservation value.

Both SEA and HRA were carried out for the first cycle of FRMPs (2015-2021); with the outputs of an Environmental Report and an HRA Report produced to accompany the draft Plans. These environmental assessments have been reviewed in relation to the FRMP 2021-27 to determine if they remain valid or whether full SEA and HRA would be necessary.

SEA Monitoring, SEA Screening and HRA Screening were initially undertaken for the second cycle FRMP, during its development. Following consultation with the environmental consultee for SEA in Northern Ireland (DAERA) and the transboundary environmental consultees for SEA in the Republic of Ireland, it was agreed that as the second cycle FRMP is considered to be a modification of the first cycle FRMPs, with no additional physical actions or measures being proposed, the SEA for the first cycle FRMPs remains valid, with no need to undertake a full new SEA. It was however recommended that an updated HRA is completed.

More information on the SEA Monitoring Report, the SEA Screening Report and the HRA Report for the second cycle FRMP is provided in Chapter 7 of this Plan. The Environmental Report from the first cycle FRMPs, the SEA Monitoring Report, the SEA Screening Report and the HRA Report will accompany the draft FRMP (2021-2027) for public consultation.

2.6 Broader Legislative and Policy context

In addition to, but outside the direct legislative requirements of the Floods Directive, it should be noted that work is ongoing on a number of other policy/legislative initiatives which will, over time, contribute to the longer-term management of flood risk in NI. As well as legislative requirements, we need to continue to meet our long-term obligations and challenges for managing flood risk by developing policies and strategies that can be delivered in the longer term. These include:

- Sustainable Water - Long Term Water Strategy for Northern Ireland (2015-2040): The Executive's Long Term Water Strategy gives a long-term vision for the sustainable development of the water sector. It highlights the need to manage flood risk in relation to integrated drainage systems and sets out a Flood Risk Management Strategy structured around five key aims:
    - Deliver sustainable Flood resilient development;
    - Manage the catchment to reduce Flood risk;
    - Provide sustainable integrated drainage in rural and urban areas;
    - Improve Flood resistance and resilience in high Flood risk areas; and
    - Be prepared for extreme weather events.

Each of these aims has a number of associated policy proposals that will contribute towards the delivery of the overall Strategy. In order to ensure that the Strategy remains up-to-date and relevant, it will be subject to review every six years. It is likely that a fulsome review will commence in 2022.

The Strategy also encourages the use of Sustainable Drainage Systems (SuDS) as the preferred means of surface water management, where feasible, to reduce diffuse pollution and to reduce the quantity of run-off to surface waters and, therefore, the potential for flooding, by mimicking a more natural water cycle. SuDS in urban areas can provide storage for excess surface water run-off and reduce loadings on existing drains, which may be liable to flooding.

- Living With Water Programme: It is acknowledged that Belfast's drainage infrastructure requires significant future capital investment in order to enhance the water environment, reduce the risk of flooding and allow for the continued economic growth of the city. In order to facilitate the development of optimum solutions it was agreed by the NI Executive in July 2014 that the Department of Regional Development (now DfI) should set up an inter-departmental group to produce a Strategic Drainage Infrastructure Plan (SDIP) for the city. This plan is being developed by the Living With Water Programme (LWWP) which is being progressed through a series of interlinked work packages. The LWWP Board includes representatives from DfI Living With Water Programme Division, DfI Water and Drainage Policy Division, NI Water, DfI Roads and Rivers, Belfast City Council, the NIEA, and the Utility Regulator. All of these organisations will contribute to the development of the resulting plan entitled Living With Water in Belfast, An Integrated Plan for Drainage and Wastewater Management in the Greater Belfast Area.

- Reservoirs Act: As indicated in the PFRA 2011 and the NIFRA 2018, legislation to regulate reservoirs was required. This legislation was enacted in July 2015 as the Reservoirs Act (Northern Ireland) 2015. The Act contains similar provisions as is provided in reservoir safety legislation elsewhere in the UK. Subject to the transfer of the statutory function of the Act to DfI and Ministerial approval, it is proposed that implementation of the Act will commence in 2021/22. The Act places a legal responsibility on the managers of controlled reservoirs (i.e. 10,000 cubic meters or more capacity above the natural level of the surrounding land) to effectively manage controlled reservoirs and therefore any associated flood risk. Outline inundation maps for each controlled reservoir were published by DfI in 2016. These maps show the areas that could be flooded if controlled reservoirs were to fail and release the water they hold. The maps will be used by reservoir managers, government bodies, organisations and others dealing with flood risk from reservoirs, particularly those engaged in planning and emergency response.
- Northern Ireland Climate Change Adaptation Programme 2 (NICCAP2): The NICCAP2 was published in September 2019 and covers the period 2019-2024, so this Programme overlaps the first and second cycles of the Flood Directive. It contains the government's response to the risks and opportunities relevant to NI as identified in the UK Climate Change Risk Assessment 2017 (CCRA 2017). The supporting CCRA-2017 Evidence Report contains a summary for each of the devolved administrations, including a summary of Climate Change risks specific to NI. NICCAP2 has identified actions which contribute towards adaptation to Climate Change. The completion of measures within FRMPs also contributes towards the NICCAP2 objectives. The review of the PFRA (documented in NIFRA 2018) and implementation of the FRMPs contribute towards NICCAP2 delivery plans.
- Climate Change Risk Assessment 2022 (CCRA 2022): The 3rd Climate Change Risk Assessment for the UK is currently underway, due for publication in 2022. DfI contributed to the flooding-related aspects of this assessment by providing datasets and information for NI for one of the key CCRA 2022 projects, 'Future Flood Risk' - Projections of Future Flood Risk in the UK - being prepared by consultants, Sayers and Partners. The Department has also contributed to reviewing the main chapters of CCRA 2022. During the Floods Directive second cycle (2021-2027) and following the publication of the CCRA 2022 documentation, the 3rd NICCAP will be prepared by DAERA. As with NICCAP2, measures within second cycle FRMPs which relate to adapting to Climate Change, will contribute towards NICCAP3 objectives.

- Natural Flood Management: DfI will consider the use of Natural Flood Management (NFM) practices on all flood alleviation schemes / works to complement the traditional hard engineered solutions, implementing industry best practice guidance techniques in doing so.
    - Whilst no formal policy currently exists in NI governing the use of NFM techniques, DfI Rivers is engaging with CIRIA in relation to developing NFM guidance.
    - DfI has provided input to the draft UK Forestry Standard Practice Guide - Designing and managing forests to reduce flood risk research. When finalised, this publication will provide a realistic view of situations where forest planting can be used to alleviate flooding and where afforestation, or associated forestry management practices, may have no effect or in particular situations, may actually increase flood risk. (this Guide is still in draft 7/10/2020). DfI has also had input to other reports concerning woodland and flood risk such as Opportunity for Woodland Creation to reduce Flood Risk in Northern Ireland and Quantifying Hydrological Effects of Woodland Creation in the Camowen and Drumragh Catchments in Omagh. Also, the Natural Environment Research Council (NERC) is currently undertaking a research project Quantifying the likely magnitude of nature-based flood mitigation effects across large catchments NERC (Q-NFM). However, at this time, there are no plans to take forward specific NFM woodland planting measures in NI related to these reports but it is possible that such measures could be developed within the timeframe of this FRMP.
    - Regarding the development of, and opportunities for, Blue/Green Infrastructure, when considered holistically, existing green spaces and blue corridors such as rivers, can form an extensive network of blue/green infrastructure that can drain, absorb and retain water. The Connswater Community Greenway / E. Belfast Flood Alleviation Scheme which was constructed by Belfast City Council, DfI Rivers and Eastside Partnership, is a notable example of such infrastructure. Opportunities for using blue/green infrastructure are being considered through the LWWP. Blue/green infrastructure offers many more benefits to communities than just drainage by providing new opportunities for walking and cycling and acting as a catalyst for cultural change in the way we live and travel.

Chapter **3**

FLOODS DIRECTIVE WORK TO DATE

3. FLOODS DIRECTIVE WORK TO DATE

This section provides further background on the first cycle FRMPs, the work to date and further information on the different approach taken for the second cycle Floods Directive work. It also includes further information on the main findings of the NIFRA 2018 and a summary of the approach to updating Flood Maps (NI).

3.1 Significant changes since the First Cycle of the Floods Directive

Since the first cycle Plans were published in 2015 our understanding of flood risk has continued to evolve, taking account of new and updated information, flood events and ongoing analysis. A number of changes have occurred which are set out on Table 3-1.

Table 3-1: Changes since the First Cycle Floods Directive work in Northern Ireland

Change	Description
Methodology for assessing flood risk	Improvements following technological advances in flood risk mapping and assessment (i.e. more detailed mapping and modelling).
Datasets used to assess flood risk	Improvements to flooding datasets as PFRA 2011 was based on strategic data. Improved data on historical flooding.
Understanding of the sources and likelihood of flooding	NIFRA 2018 takes account of the effectiveness of existing flood defences and culverts in reducing flood risk and places more emphasis on, surface water flooding.
Understanding of the consequences of flooding	A greater emphasis on the environment and cultural heritage in addition to flood damages and human health (i.e. risk to life), which were the dominant considerations in PFRA 2011.
Understanding of Climate Change	Climate Change analysis for the medium probability scenario for each source was modelled for the 2080s Epoch.
Identification of Areas of Potentially Significant Flood Risk	Refinement of the APSFR boundaries from PFRA 2011 to NIFRA 2018. 12 APSFR and 9 TAPSFR were identified in the NIFRA 2018 compared to 20 SFRAs in the PFRA 2011.
Strategic links to other plans and strategies	Enhanced focus on Floods Directive / Water Framework Directive synergy and catchment planning. Alignment with Sustainable Water – A Long Term Water Strategy for Northern Ireland (2015-2040) and NI Regional Development Strategy 2035.
Governance arrangements	Government reorganisation with 'competent authority' responsibility for delivering the second cycle Floods Directive work moving to DfI.

3.2 Northern Ireland Flood Risk Assessment (completed 22 December 2018)

The Floods Directive required each European Member State to undertake a review of the PFRA for its respective territory by 22 December 2018.

The principal objective of the NIFRA 2018 was to review and update the PFRA 2011 analysis of flood risk for NI and determine for the second cycle, which areas should be identified as APSFR.

The identification of APSFR is a critical milestone in the implementation of the Floods Directive as these are the only areas for which there is a requirement to produce detailed FHRMs and FRMPs. However, our approach has been to produce detailed mapping for the 69 areas identified in the PFRA 2011.

The assessment for determining the APSFR required a detailed understanding of the flood mechanisms from each source of flooding along with the magnitude and probability of a flood event occurring. This was compared against the scale of the potential adverse consequences arising from these events, including the economic damages measured as Aggregated Annual Average Damages (AAAD). The extent of the potential future flood hazards from rivers, sea and surface water for a range of return periods was predicted using digital flood models developed by DfI Rivers and its consultants. The flood outlines for each source of flooding were then analysed spatially using Geographic Information System (GIS) software to determine the potential impacts on a wide range of readily available 'Flood Receptors' (i.e. properties, key infrastructure, natural environment and cultural heritage). Examples of the Flood Receptors used in the assessment include:

- Properties
  - Residential (based on 2.5 persons per residential property); and
  - Non-Residential.
- Key Infrastructure
  - Transport (Roads, Railways, Airports and Sea Ports);
  - Water Utilities;
  - Power Generation / Electricity substations;
  - Emergency Services (fire, police, hospitals, public services etc.); and
  - Telecommunications Infrastructure.
- Natural Environment
  - Designated Sites (ASSIs, SPAs and SAC Sites); and
  - Integrated Pollution Prevention Control sites (IPPC).
- Cultural Heritage
  - Listed Buildings, Historic Parks & Gardens, Sites & Monuments Records and Sites of Archaeological Interest.

Based on this analysis, 12 APSFR were identified within NI and reported to the European Commission. The AAAD in respect of Fluvial, Coastal and Surface Water flooding has been used as a basis to identify the APSFR and an AAAD value of £1 million was judged as an appropriate threshold at which flood risk areas should be identified as 'significant' in the context of NI, at that time. The names of the APSFR along with the RBD/IRBD in which they are located are listed below in Table 3-2 and they are shown on Figure 1-3.

Table 3-2: Areas of Potential Significant Flood Risk

Area Name	River Basin District	Page No.
Belfast	North Eastern RBD	45
Londonderry	North Western IRBD	69
Newry	Neagh Bann IRBD	89
Lurgan	Neagh Bann IRBD	109
Glengormley and Mallusk	Neagh Bann IRBD	126
Larne	North Eastern RBD	143
Bangor	North Eastern RBD	158
Portadown and Craigavon	Neagh Bann IRBD	174
Omagh	North Western IRBD	192
Newtownabbey	North Eastern RBD	209
Carrickfergus	North Eastern RBD	226
Ballymena	Neagh Bann IRBD	242

In addition to the APSFR identified, the Department has determined some areas to be TAPSFR. These are areas that were identified in the PFRA 2011 as SFRA but have not been identified as APSFR in the NIFRA 2018. However, they have been classified as TAPSFR to ensure continuity between FRMP cycles and to facilitate the implementation of any outstanding commitments arising from delivery of objectives and measures within the first cycle FRMPs. The TAPSFR along with the RBD/IRBD in which they are located are listed below in Table 3-3 and they are shown on Figure 1-3.

Table 3-3: Transitional Areas of Potential Significant Flood Risk

Area Name	River Basin District
Strabane	North Western IRBD
Dundonald	North Eastern RBD
Newtownards	North Eastern RBD
Newcastle	North Eastern RBD
Banbridge	Neagh Bann IRBD
Antrim	Neagh Bann IRBD
Downpatrick	North Eastern RBD
Coleraine	Neagh Bann IRBD
Warrenpoint	Neagh Bann IRBD

In undertaking analysis of flood risk in NI, the NIFRA 2018 identified 45 FRAs as opposed to the 69 areas (20 SFRA and 49 AFS) which had been identified through the PFRA 2011. During the first cycle of Floods Directive work, detailed flood models were developed for all 69 areas identified in the PFRA 2011. These models have been developed to the same standard as those produced for the APSFR and have been used to prepare FHRM which are available publically through Flood Maps (NI).

Although the flood risk management of the areas not identified as APSFR is not specifically addressed through measures within this second cycle FRMP, the detailed modelling developed during the first cycle will support assessment of smaller scale localised schemes. Where it is economically viable, this assessment may lead to the development of flood alleviation schemes in FRAs which may be taken forward through the normal business of the drainage authority responsible. The detailed flood maps produced will also be used for the purposes of development planning, emergency planning and emergency response. They also serve to increase awareness among the general public, local authorities and other organisations, of the likelihood of flooding and to encourage them to take appropriate actions to manage the risk.

3.3 Flooding in Other Areas

While flood mapping and assessment methodologies provide a high degree of certainty in determining which areas are at greatest risk, there is still the chance that incidences of serious flooding could occur in areas outside the 45 FRAs identified in NIFRA 2018. Should major flooding occur elsewhere in NI outside of the identified FRAs, then measures to address such flooding may be developed and prioritised alongside those currently included within the second cycle FRMP.

3.4 Flood Maps (NI)

Rivers Agency (now DfI Rivers) in conjunction with Planning NI, first published the online Strategic Flood Maps for NI in October 2008. This first generation of indicative maps was developed to provide a general indication of the areas that may be at risk of flooding from rivers and the sea and was used mainly to inform the development planning process. A strategic surface water flood map was subsequently published in December 2011.

The Floods Directive requires the preparation of FHRMs, to cover the geographical areas within each of the APSFR that could flood in high, medium and low probability events. Within NI the following flood return periods have been used for preparing the maps for this range of probability scenarios:

Table 3-4: Return periods for high, medium and low probability

Probability	Surface Water	Fluvial	Tidal
High	3.33 % AEP (1 in 30 yr)	10 % AEP (1 in 10 yr)	10 % AEP (1 in 10 yr)
Medium	0.5 % AEP (1 in 200 yr)	1 % AEP (1 in 100 yr)	0.5 % AEP (1 in 200 yr)
Low	0.1 % AEP (1 in 1000 yr)	0.1 % AEP (1 in 1000 yr)	0.1 % AEP (1 in 1000 yr)

The following changes that influence the production of second cycle FRMP have occurred as a result of the updates and review of the Flood Hazard and Flood Risk Maps:

- FHRM were reviewed and where necessary updated for FRAs including the 12 APSFR identified in NIFRA 2018;
- Effectiveness of existing Flood defences taken account of in NIFRA 2018 and included in FHRM;
- Refinement of the APSFR boundaries from PFRA 2011 to NIFRA 2018;
- Climate Change data for all sources reflecting 2080s Epoch included on the maps; and
- Integrated Pollution Prevention Control (IPPC) sites updated.

3.4.1 Flood Hazard Maps

Flood Hazard Maps essentially describe the characteristics of the predicted flood for each of the flood event scenarios and include information such as the:

- Geographical extent of the estimated flood inundation areas;
- The floodwater depth and level; and
- The flow, direction and velocity of the floodwater.

Flood Hazard Maps have been derived from hydrological assessments of each catchment area with flood events simulated within detailed hydraulic flood models. The models contain a 3D terrain model of each catchment area which includes all flood infrastructure such as flood walls/culverts and provide accurate predictions of flood water flows.

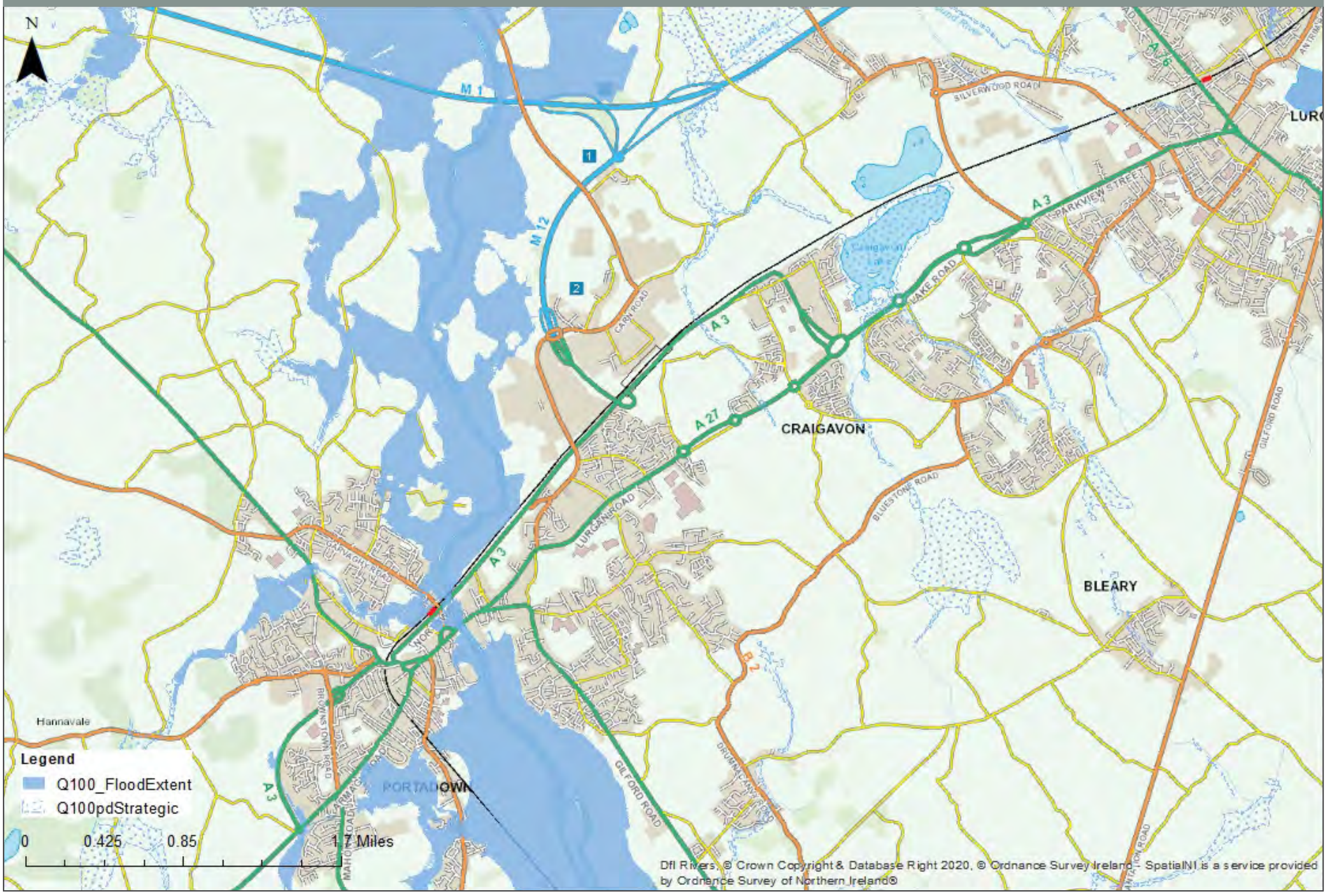
The detailed Flood Hazard Maps for the 69 areas identified in the PFRA 2011 are available to the general public through [Flood Maps (NI)] which is an interactive online map-viewer that enables users to access the latest flood hazard information available from government. Flood Hazard Map coverage throughout NI is extensive and continues to increase. Flood Maps (NI) will continue to display the strategic flood maps for the geographical areas that are not covered by the FRAs.

The difference in the uncertainty between the 'strategic' and 'detailed' hazard maps is reflected in how they are displayed within Flood Maps (NI). The detailed hazard maps are published at 1 in 5,000 scale to enable the identification of individual properties at risk of flooding, whereas strategic maps are displayed at 1 in 10,000 scale which is more appropriate for assessing the risk to a street/community.

The publication of the flood maps is designed to:

- Enable flood risk management organisations, infrastructure providers and others to manage their work to reduce flood risk;
- Encourage people living and working in areas prone to flooding to take appropriate action; and
- Inform anyone applying for planning permission if flooding is likely to be a material consideration.

Figure 3-1: Examples of Detailed and Strategic Level Flood Hazard Mapping



3.4.2 Flood Risk Maps

The Flood Risk Maps essentially describe the main adverse consequences of the predicted flood for each of the scenarios listed in Table 3-4. The specific information that is required to be included in Flood Risk Maps is:

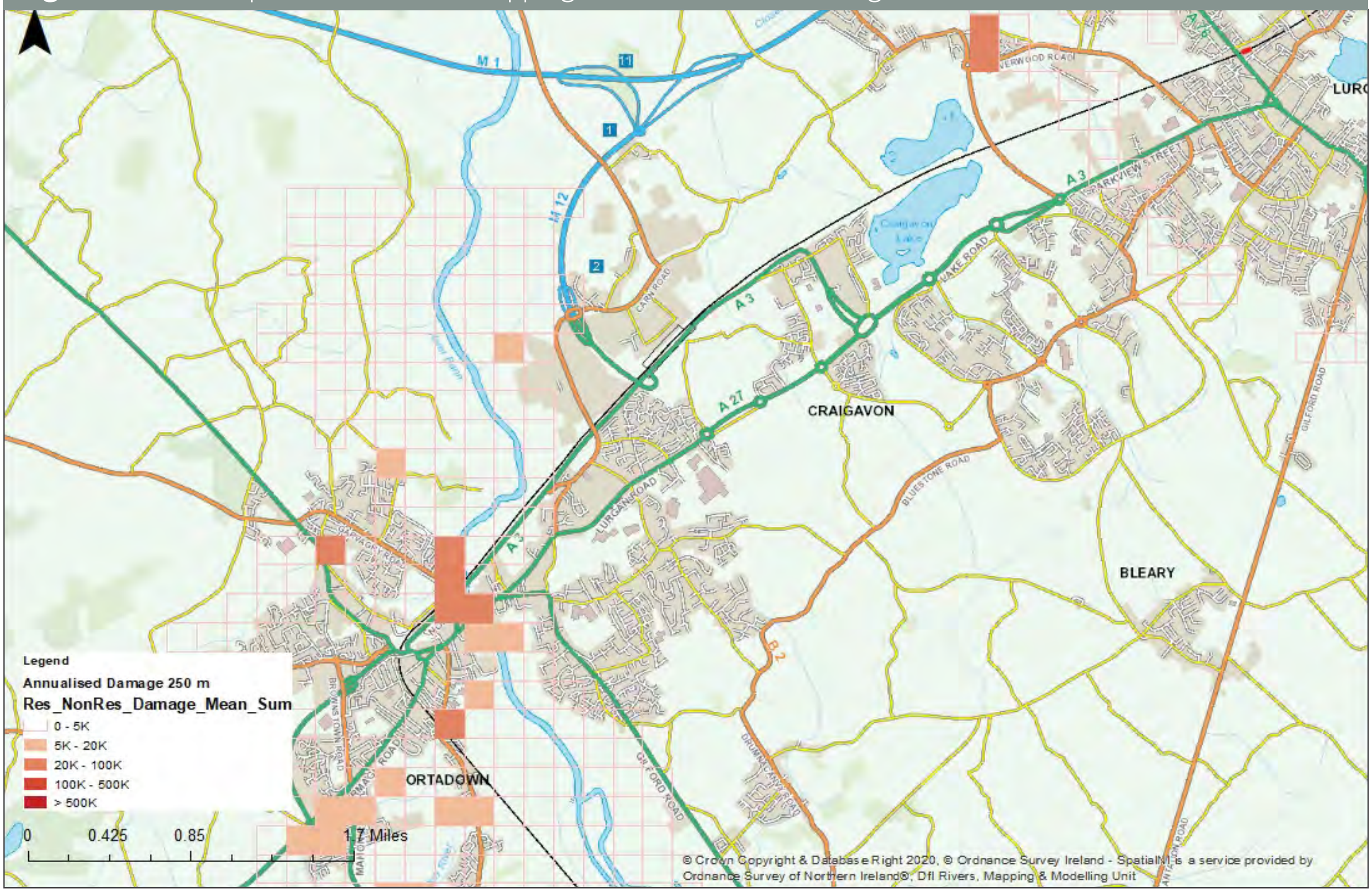
- The number of inhabitants that could be affected;
- The effect on economic activity; and
- The areas within nationally important environmentally designated sites that could be flooded, particularly those which could be accidentally polluted from an IPPC site.

The Flood Risk Maps prepared for NI collate and display this information on a 250 m grid. The published Flood Risk Maps show the impact of high, medium and low probability flood events for fluvial, coastal and surface water sources.

3.4.3 Surface Water flood mapping

The surface water flood mapping for the APSFR continues to be strategic in nature. These surface water maps simply highlight the low spots and depressions in the landscape that may fill with water if the local engineered drainage systems are overwhelmed. The surface water maps are suitable for the purposes of emergency planning and are used by the planning authority to advise applicants of potential surface water flood risk to proposed developments that must be considered and mitigated were appropriate. Importantly, the surface water maps within Flood Maps (NI) are not currently suitable for decision making in regard to capital investment on infrastructure for the purposes of flood alleviation. Further study will be required to refine the understanding of surface water flood risk to inform these capital investment decisions.

Figure 3-2: Examples of Flood Risk Mapping for Portadown and Craigavon



3.4.4 Mapping for Climate Change

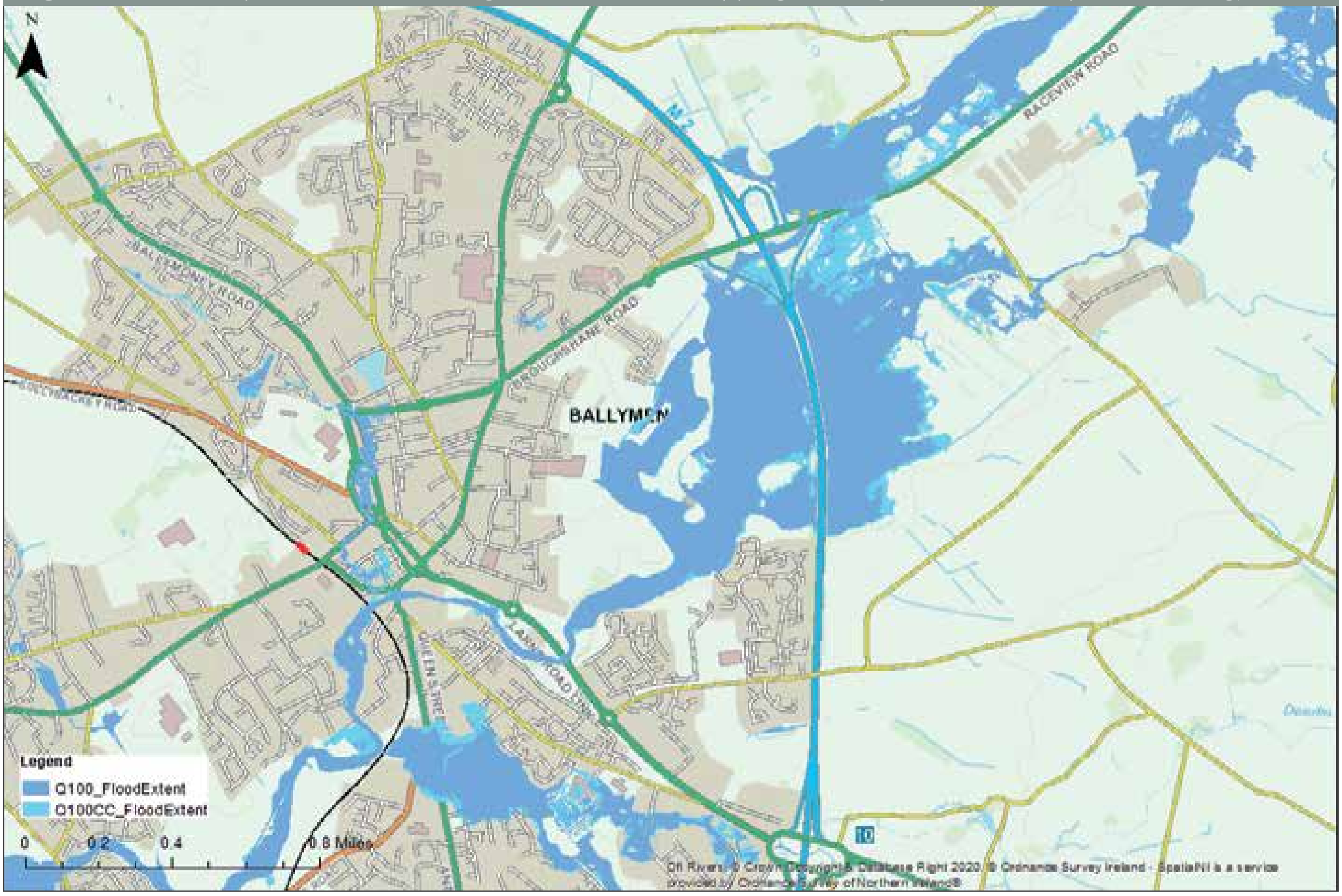
The Floods Directive and specifically for the second and future cycles, requires that Climate Change is taken into account in the assessment of flood risk. DfI has produced 'Technical Flood Risk Guidance in relation to Allowances for Climate Change in Northern Ireland (Feb 2019)' which consolidates and where appropriate, updates existing guidance on allowances for Climate Change. This guidance is designed to support engineers and other professionals in taking appropriate consideration of Climate Change for future development and in managing flood risk. This is particularly important for decisions in relation to the provision of flood defences and development planning. Therefore, to inform these important decisions DfI has prepared a range of Climate Change flood hazard maps. These maps, which are currently based on UKCP09 information, illustrate the estimated floodplains for the 2080s epoch (end of this century) and are based on the best available predictions for the meteorological conditions and sea levels for that time. The medium probability Climate Change (2080s epoch) flood maps for each of the main flood sources are available through Flood Maps (NI). During the second cycle, new Climate Change mapping will be developed to take account of UKCP18 information.

DfI now provides the planning authorities with updated Climate Change flood mapping based on a 2080s epoch. This information will allow the planning authorities to consult with DfI Rivers regarding potential developments that fall within these Climate Change extents, as well as within present day extents. The updated Climate Change flood maps are available on the Flood Maps NI website and will soon be made available to planning authorities, on the planning portal.

Current regional planning policy, within the Strategic Planning Policy Statement (SPPS) and revised Planning Policy Statement (PPS 15), is not based on the 2080s epoch but on the present day 1 in 100 year fluvial and the 1 in 200 present day coastal floodplain as the floodplain definition for planning purposes. Where a development lies within the 2080s epoch floodplain extent, DfI Rivers will advise the planning authorities of the extent to which the proposed development will be impacted by the Climate Change floodplain. This will allow the planning authorities to take the most up-to-date information on flood risk into account , together with all other material considerations, including regional planning policy, in making planning determinations. It is expected that the definition of floodplains in the Department's regional planning policy will be updated, to include Climate Change, as soon as practicable.

Furthermore, in relation to local operational planning policies, DfI Rivers has been involved in extensive consultation with the Local Planning Authorities in the development of their Local Development Plans (LDPs). Once adopted, LDPs will be given primacy in the determination of planning applications unless material considerations indicate otherwise. It is expected that new LDPs will provide appropriately worded and suitably future proofed floodplain definitions to enable the continued implementation of the presumption against development in both present day and Climate Change flood map areas.

Figure 3-3: Example of Climate Change Flood Hazard Mapping for Ballymena (see turquoise shading)



3.4.5 Reservoir Inundation maps

DfI Rivers has developed predictive flood models for each of the Controlled Reservoirs that have been identified in NI. This facilitates the implementation of the Reservoirs Act (Northern Ireland) 2015 and, in particular, will assist in the reservoir designation process. The maps highlighting the potential flood inundation areas resulting from an uncontrolled release of water from these reservoirs are available through (link to Reservoir Flood Maps).

3.5 Progression of Measures and Actions from First Cycle

Ongoing monitoring on progress has been carried out on the measures and actions from the first cycle FRMPs. Chapter 5 of this Plan includes specific details of progress in respect of the 12 APSFR, identified in the NIFRA 2018. Appendix A provides details of the progression of the measures and actions in the 9 TAPSFR. Appendix B provides details of the progression of the Regional Measures.

In general, good progress has been made with the implementation of measures during the first FRMP cycle, which in turn has contributed towards the achievement of the Plans' overall objectives. The Regional Measures from the first cycle Plans remain valid, and these along with uncompleted RBD Measures will, where appropriate, transition into the second cycle Plan.

Figure 3-4: Example of Reservoir Inundation Mapping

Chapter **4**

OBJECTIVES AND MEASURES FOR MANAGING FLOOD RISK

4. OBJECTIVES AND MEASURES FOR MANAGING FLOOD RISK

4.1 The Flood Risk Management Plan Objectives

The FRMP is required to set objectives for the management of flood risks for the APSFR, focusing on the reduction of potential adverse consequences of flooding for human health, economic activity, the environment and cultural heritage; and identify measures to achieve those objectives.

The following objectives have been set to meet these requirements. These are detailed in Table 4-1.

4.2 Flood Risk Management Plan – Measures

Measures are the specific actions that contribute to the delivery of the FRMP Objectives. In line with the Floods Directive, the measures identified in this FRMP give consideration to:

- Prevention of increased flood risk through appropriate land use planning;
- Protection of communities and the environment by provision of schemes and approaches to reduce the likelihood and severity of flooding; and
- Preparedness arrangements to improve dealing with flooding when it occurs.

There is more detail on the linkage between the objectives and measures in Appendix C.

Table 4-1: Flood Risk Management Plan objectives

Reference	Objective
Human Health	
1	To reduce the risk to life, health and wellbeing
2	To increase awareness and understanding of flooding and its adverse consequences and improve community resilience
3	To reduce the impact on people caused by the disruption to essential infrastructure and services
4	To improve recreation and public amenities (when the opportunity arises when undertaking measures)
Economic Activity	
5	To reduce the cost of potential future flood damages to properties and infrastructure
6	To reduce the economic costs caused by the disruption to essential infrastructure and services
7	To optimise the economic return on flood risk management investment
Environment and Cultural Heritage	
8	To consider the impact of Climate Change for the main sources of flooding
9	To support the objectives of the Water Framework Directive and contribute to the achievement of good ecological potential/status for waterbodies
10	To protect and enhance the natural environment and cultural heritage

The following information has been used to inform the development of the measures:

- the NIFRA 2018 (the review of PFRA 2011);
- Flood Maps (NI) (the second cycle FHRMs);
- the environmental objectives of the WFD;
- the forward work programmes for DfI Rivers, DfI Roads and NI Water;
- the costs and benefits of the various scheme options for managing flood risk;
- the opportunity for Natural Flood Management;
- the impacts of Climate Change, and
- other relevant plans, policies, guidance and strategies that set out the long-term strategy for flood risk and environmental management in NI.

Some measures apply across all of NI, supporting the sustainable management of flood risk for both APSFR and the wider IRBD/RBD. These are known as 'regional' measures and include policy approaches, the day to day work of flood management organisations and programmes of work that apply RBD wide. These measures are set out in this section.

There are also specific and targeted measures for individual APSFR which are set out in Chapter 5.

4.3 Regional Measures

Regional measures to manage flood risk apply across all of NI (both within and outside of APSFR). This section outlines the approaches that are taken to manage flood risk across NI.

4.3.1 Prevention

The Strategic Planning Policy Statement for NI (SPPS) is the overarching strategic planning framework for the reformed two-tier planning system that came into operation on 1 April 2015. It must be taken into account by councils in the preparation of new LDPs and in determining individual planning applications. Sustainable development is at the heart of the SPPS and it directs the planning system to support development which will mitigate and adapt to Climate Change. The aim of the SPPS in relation to 'Flood Risk' is to prevent future development that may be at risk from flooding or that may increase the risk of flooding elsewhere.

The spread of urbanisation has increased the risk of flash flooding occurring after heavy downpours. As green (vegetated) areas are developed and replaced by impermeable, roofed or paved areas or where gardens and other permeable areas are covered with paving and building extensions, the land loses its ability to absorb rainwater. In some instances, rainfall may be directed into combined sewers, often overloading them in times of heavy rainfall, resulting in out-of-sewer flooding and pollution to watercourses. Surface water flooding can be reduced by the use of SuDS in new developments and retrofitting these in existing urban areas. SuDS aim to mimic natural drainage, significantly reduce surface water runoff and improve water quality. Typical SuDS measures include permeable paving and natural features, such as swales, ponds, rainwater harvesting and landscaped attenuation areas that only hold water after rainfall.

Table 4-2: The key approaches in terms of Prevention

Approach	Description
Keep development outside of flood risk areas	DfI will engage with councils bringing forward new Local Development Plans (LDPs) that must take account of all relevant guidance to direct new development away from flood risk areas (i.e. the SPPS and any other policies or advice and guidance issued by the Department, such as DfI Rivers' guidance on the preparation of LDP policies for flood risk management). The priority will be to discourage inappropriate development within flood risk areas in APSFRs but the policy applies across NI. DfI will share the most up to date flood risk information with Local Councils and support them to take a precautionary approach and ensure new zonings within LDPs are located outside flood risk areas. For new development, as a Statutory Consultee to the Local Planning Authorities, DfI Rivers provides advice in line with current flood risk policies.
Ensure new development within flood risk areas is suitably managed	As a Statutory Consultee to planning applications in Flood Risk Areas, DfI will seek to influence both the location and layout of new developments. DfI will support Councils to ensure that any new development which has been located, "by exception", in flood risk areas is built with adequate flood resistance/resilience measures and that the development does not cause increased flood risk elsewhere. All proposed development applications within flood risk areas are to be accompanied by a flood risk or drainage assessment.
Surface water management	Surface Water Management involves a range of options to manage surface water. Techniques include the removal of surface water from combined sewers (which is called "storm separation"), and the creation of preferential flood pathways to direct flow away from areas of high consequence when the capacity of the infrastructure has been exceeded (which is called "designing for exceedance"). NI Water has proposed ambitious targets within the Price Control 21 (PC21) investment period for the removal of impermeable area discharging storm water to the combined sewerage network. All developments that require a new connection to the NI Water public sewer network are now required to construct foul sewers and storm water sewers to ensure the flows remain separate, with storm water discharging directly to watercourses which will provide associated benefits for the environment. In addition, developers are required to take surface water flood risk into account for planning applications and overland flow paths must be taken into account.
Sustainable Drainage Systems	SuDS are systems designed to reduce the quantity and/or rate of runoff into drainage systems and watercourses; there are four key aspects to a SuDS system which include: • Water Quantity – SuDS can manage the quantity of run off by slowing down the release of stormwater flows which reduces the flood risk both within the development site and/or downstream of it; • Water Quality – SuDS can help to manage the quality by naturally filtering the water and helping to reduce the risk of pollution. This helps protect watercourses and ground water. • Amenity – SuDS can create and sustain better places for people to work and live by helping to improve the attractiveness of an area; and • Biodiversity – SuDS can help to create additional areas of biodiversity within urban areas which help create and sustain better places for nature.

4.3.2. Protection

Flood protection measures aim to protect existing properties in flood risk areas. These include both measures that reduce the likelihood and consequences of flooding and work in the wider catchment to reduce flood risk downstream. The traditional approach to flood risk has been to protect people and property by building flood defences. As the construction of flood defences can be very expensive and may defend only specific localised areas, there is widespread interest in working with natural processes upstream of flood risk areas to hold water back. This includes changes in how land is managed, creating new wetland habitats and restoring damaged habitats such as bogs, woodland planting and restoring watercourses that have been heavily modified. This approach, often referred to as NFM, meets the objectives of both the WFD and the FD. DfI Rivers' current study proposals for Newry include consideration of upstream storage in river catchments flowing towards the town as part of a solution along with more conventional defences, to manage flooding in the town. The LWWP includes development of solutions to alleviate flooding through developing upstream storage capabilities in catchments where flooding can occur. Such solutions may individually be small in scale but when combined, may provide substantial flood alleviation benefits and contribute towards water quality and environmental benefits.

Table 4-3: The key approaches in terms of Protection

Approach	Description
Maintenance of the Existing Drainage and Flood Defence Network	Maintenance responsibilities are split between the different flood management organisations in NI. Between 2021 and 2027: • DfI Rivers will continue to implement a prioritised programme of maintenance of designated watercourses, flood defences, sea defences and grilles; • DfI Rivers also regulate maintenance of undesignated watercourses under the Drainage (Northern Ireland) Order 1973; • NI Water will continue to implement a prioritised programme of maintenance of public sewer and drainage infrastructure; and • DfI Roads will continue to implement a prioritised programme of maintenance of road drainage infrastructure.
New Flood Alleviation Schemes	Flood alleviation schemes for river and coastal/ tidal flooding are led by DfI Rivers. Between 2021 and 2027 the DfI Rivers will: • Continue to carry out feasibility studies to identify cost beneficial flood alleviation schemes in relation to property and communities at flood risk (including addressing the impacts of Climate Change); and • Continue to implement a prioritised programme of cost-beneficial flood alleviation schemes. From schemes identified in each APSFR and additional schemes located outside these areas, DfI Rivers will review the outline assessment of flood damages against potential scheme costs to determine if there are realistic scheme solutions that can provide flood alleviation at below these damage costs estimates. All schemes are then scored and ranked in priority on the 10yr Capital Works Programme.

<table>
<tr><th>Approach</th><th>Description</th></tr>
<tr><td>New Flood Alleviation Schemes</td><td>As funding allows, schemes on the Capital Works Programme proceed through scheme development as follows:
• Progress to Feasibility Stage;
• Progress to Detailed Design Stage;
• Progress to Works Procurement; and
• Progress to Construction Stage.
In relation to road flooding, DfI Roads will continue to implement a prioritised programme of works to address flood risk to roads. This will include implementing sustainable drainage, where appropriate, in the construction of Roads' projects.
Through the LWWP, NI Water will continue to develop Enhanced Drainage Area Plans for the APSFR to facilitate a targeted and prioritised approach to improving drainage infrastructure, including integrated surface water drainage schemes and works to separate surface water systems from combined sewer systems. The development of Integrated Drainage and Catchment Modelling for Belfast is also included. They also continue to take prioritised action to directly address internal sewer flooding at specific properties relative to frequency and impact.
The LWWP covers the Greater Belfast Area and will promote schemes and concepts to manage water in an integrated way across its catchments to mitigate flood risk.
Schemes and concepts will include:
• Policy and legislative changes;
• Improved WwTW and sewerage network alterations;
• NFM, attenuation and SuDS; and
• Integration of blue/green infrastructure to public open spaces.
These are set out in the draft plan, Living With Water in Belfast, which was published for consultation in November 2020.</td></tr>
<tr><td>Catchment Based Natural Flood Management</td><td>DfI will create opportunities to work with others, through partnership arrangements, to deliver sustainable flood risk management measures at a catchment level. These measures include NFM in rural areas and retrofitting SuDS as part of wider environmental improvements in urban areas. In particular DfI will:
• Continue to engage with CIRIA in the development of NFM guidance;
• Work with others through partnership arrangements to progress measures that deliver multiple benefits for flood risk, Climate Change adaptation, water quality and biodiversity;
• Work with DAERA to consider how future agricultural and land support measures may include flood risk management options;
• Consider the use of NFM practices on all flood alleviation schemes / works to complement the traditional hard engineered solutions, implementing industry best practice guidance techniques in doing so; and
• Undertake a study to develop a better understanding of the potential for groundwater flooding in NI.</td></tr>
</table>

Approach	Description
Catchment Based Natural Flood Management	In addition, the Sustainable Catchment Area Management Programme Northern Ireland (SCaMP NI) was initiated in 2013 and aims to improve the quality and reliability of the raw water received at NI Water's raw water abstraction points. The SCaMP improvements are to be achieved through sustainable catchment-based solutions that focus on protecting the natural environment delivering favourable condition and habitat improvements and there can also be beneficial effects for downstream water flows (and flooding) as the project includes activities to retain groundwater in upland peat restorations. The planting of riparian strips on river banks, where this does not hinder watercourse maintenance, also assists in slowing overland flows.

4.3.3 Preparedness

It is not possible to prevent or protect against all flooding. Even where flood defences exist, in an extreme event, it is possible that these could be over-topped or fail, and flooding could still occur. Consequently, there is a need to be prepared for flooding. The provision of an effective emergency response from Government is a key feature of Preparedness. Communities at risk also have a key role in working with Government so that they are better prepared to deal with flooding when it occurs.

Through the Civil Contingencies arrangements in NI, the Met Office in co-operation with DfI, produces and communicates up to date weather warning information to DfI, RCRG, other emergency responders and to communities at risk. This approach is considered to be suitable for NI and provides considerable benefits towards preparedness of responders and communities for flooding and to the reduction of flood risk. In addition, DfI Rivers currently operates an internet web-based system which is able to provide government users and the general public with access to live water level information.

Table 4-4: The key approaches in terms of Preparedness

Approach	Description
Flood Emergency Planning and Response	As the Lead Government Department for the Coordination of Flooding Emergencies, DfI will: • Continue to engage with other responsible bodies on identifying local flooding hotspots and co-ordination of response procedures along with Blue Light responders; • Continue to prepare and engage with other responders on multi-agency flood emergency response plans to those areas at known flood risk, e.g. coastal flood response plans; • Continue to engage with local communities in those areas of known flood risk; • Continue to test emergency response plans through multi-agency 'Exercising'; • Continue to work with Co responders in line with Flood Emergency Response "Best Practice Guidelines"; and Civil Contingencies Multi-Agency Preparedness Structures with a role in Flooding Emergencies can be found online.
Flood Warning and Informing	DfI will continue to develop and improve a consistent approach to flood warning and informing activities across NI. This includes: • Formal engagement with the Met Office in a 'partnering' approach to better inform the impact assessment of Severe Weather Warnings; • Ensuring adequate 'Informing' in relation to flood risk through community engagement; • Public dissemination of water level information. This includes the use of River level text warnings, where these are likely to be beneficial; and • Continue to explore the development of targeted flood forecasting/warning in areas with significant flood risk.
Community Engagement – Informing and Building Resilience	DfI will continue to work with Drainage Organisations, the Emergency Services, Local Government, NIHE, Red Cross, Consumer Council, Met Office, etc., to develop and maintain a consistent approach to flood warning and informing activities across NI. The RCRG, which was established in 2013, will continue to co-ordinate self-help activities, (including preparation of Community and Household Flood Plans, the pre-deployment of sandbags and other preparatory activities at areas known to flood and the installation, where appropriate, of river level text alert equipment). The priority will be to ensure that there are established groups where there is a need in the APSFR.
Communication of Flood Risk	DfI will: • Continue to engage with communities to facilitate the informing aspect of 'Flood Warning and Information' proposals; • Continue to update and improve flood risk information on the Flood Maps (NI); • Continue to improve information on flooding on the NI Direct Website; • Continue to work with NI Direct in the development of the Flooding Incident Line (FIL); • Continue to consult with communities and stakeholders to make them aware of their roles and responsibilities in assessing and managing flood risk; and • Seek to issue timely media messages to inform the Public of significant flooding events.

Approach	Description
Individual Property Protection	DfI currently operates a Grant Scheme for Property Level Flood Protection in Northern Ireland. The scheme which is entitled the 'Homeowner Flood Protection Grant Scheme' is designed to encourage the owners of residential properties that have flooded before and/or are located within known flood prone areas, to have their properties modified through the installation of Property Flood Protection products, to make them more resistant to flooding. The Grant Scheme is specifically aimed at residential properties that have flooded internally in the past and which continue to be exposed to frequent flooding and are unlikely to be protected by a viable community flood protection scheme. The scheme is currently a 'pilot' and an evaluation of the scheme has been completed, which has demonstrated both the need for and the benefit from the scheme. The existing scheme remains open to new applications, while work is undertaken to inform the next steps.
Flood Recovery, Welfare and Insurance Issues	In the aftermath of flooding, which extends well beyond the actual event which causes the damage to property, DfI with others will: • Continue to carry out or contribute to post flood investigations to gather information and improve knowledge and action on future flood events; • Continue to report significant flood events, as required by the Floods Directive Regulations; • Continue to work with Councils and local communities at risk of flooding in providing advice and information to aid recovery after a flood event; • Continue to engage and work with voluntary sector organisations in providing Welfare Support; and • Continue to work with the insurance industry and with FloodRe on insurance matters relating to flood insurance in NI including long term flood insurance affordability issues.

4.3.4 Regional Measures for the Second Cycle FRMP 2021-2027

To achieve the objectives of the FRMP, specific measures have been developed at both a regional and APSFR level reflecting the Prevention, Protection and Preparedness actions which can be undertaken to reduce the risk and impact of flooding. APSFR specific measures are addressed in Chapter 5. However, the Regional Measures which apply to all APSFR and to NI as a whole are identified below.

Regional measures for the period 2021-2027 are shown on Table 4-5.

Table 4-5: Proposed Regional Measures for the Second Cycle Flood Risk Management Plan

Measures	Measures Type	Measures Activities
Flood Prevention	Keep new development outside Flood Risk Areas	• Provide timely advice to planning authorities to inform decisions to ensure that new zonings are located outside flood risk areas; • Provide timely advice to planning authorities to inform decisions to ensure that individual applications are located outside flood risk areas; and • Continue to update information on Climate Change to inform advice to planning authorities, for example, incorporating UKCP18 guidance into Flood mapping.
	Ensure new development within Flood Risk Areas is suitably constructed	• In accordance with Planning Policy Advice aim to ensure that any development which is located "by exception" in flood risk areas is appropriately built with flood resistance/resilience measures, and • In accordance with Planning Policy Advice proposed development applications will be accompanied by a Flood Risk Assessment or Drainage Assessment.
	Surface Water Management	• In accordance with the Long Term Water Strategy, promote the use of SuDS, as the preferred means of surface water management, for all new developments, where feasible; • Advance and identify SuDS pilot schemes; • Continue to utilise SuDS, where appropriate, in the construction of DfI Roads' projects; • Develop enhanced Drainage Area Plans for all APSFR; and • Take forward a study to consider if predictive surface water flood models can be improved, used to develop more accurate flood mapping and are cost effective.
Flood Protection	Maintenance of Existing Drainage and Flood Defence Networks	• Continue to Inspect and maintain designated watercourse grilles, road gullies as appropriate and as funding allows; • Continue to regularly inspect the condition of all Drainage and Flood Defence Assets; • Continue to implement a prioritised programme of works for the maintenance of all Drainage Assets and Flood Defence Assets; • Continue to implement a prioritised programme of works for the maintenance of public sewers and storm drainage systems; • Complete a Rivers' Asset Management Plan to identify the amount of funding required for future maintenance; and • Continue to work collaboratively through the Flood Investment and Planning Group to provide a co-ordinated approach to address difficult flooding issues on a multi-agency basis.

Measures	Measures Type	Measures Activities
Flood Protection	New Flood Alleviation and Drainage Schemes	• Continue to carry out feasibility studies to identify viable solutions; • Continue to implement a prioritised programme of works of flood defence and flood alleviation schemes; • Continue to implement a prioritised programme of works of integrated surface water drainage schemes; and • Continue to implement a prioritised programme of works to separate surface water systems from combined sewer systems.
	Catchment Based Management	• Continue to work collaboratively through the LWWP to develop plans to facilitate an integrated approach to drainage and wastewater management through the production and implementation of: · a Strategic Drainage Infrastructure Plan for the greater Belfast area; and · an Integrated Drainage Investment Planning Guide for NI • Work with others collaboratively to progress measures that deliver multiple benefits for flood risk, Climate Change adaptation, water quality and biodiversity; • Engage with DAERA on how future agricultural and land support measures may incorporate flood risk management options; • Develop policy / guidance on approaches to Natural Flood Management; and • Undertake a study to improve understanding of the potential for groundwater flooding in NI.
Flood Preparedness	Flood Emergency Response	• Continue to engage with other responsible bodies on identifying local flooding hotspots and co-ordination of response procedures along with Blue Light responders; • Continue to engage with local communities in areas of known flood risk where there is an interest in developing community resilience measures; • Continue to test emergency response plans through multi-agency 'Exercising'; and • Continue to work with Co responders in line with Flood Emergency Response "Best Practice Guidelines".
	Flood Warning and Informing suitable for NI	• Maintain the formal engagement with the Met Office in a 'partnering' approach to better inform the impact assessment of National Severe Weather Warnings for heavy rainfall; • Ensuring adequate 'Informing' in relation to flood risk through community engagement; • Public dissemination of water level information. This includes the use of River level text warnings, where these are likely to be beneficial; and • Continue to explore the development of targeted flood forecasting/ warning in areas with significant flood risk.

Measures	Measures Type	Measures Activities
Flood Preparedness	Community Engagement	• Continue to work with the other local government, drainage agencies, the emergency services, NIHE, Red Cross, Consumer Council, Met Office, etc., to develop and establish a consistent approach to flood warning and informing activities across NI; and • Continue to work with partners, through the RCRG, to further develop communication with communities at risk of flooding.
	Communication of Flood Risk	• Continue to engage with communities to facilitate the informing aspect of 'Flood Warning and Information' proposals; • Continue to update and improve flood risk information on the Flood Maps (NI); • Maintain and improve information on flooding on the NI Direct Website; • Continue to work with NI Direct in the development of the Flooding Incident Line (FIL); • Continue to consult with stakeholders to make them aware of their roles and responsibilities in assessing and managing flood risk; and • Seek to issue timely media messages to inform the Public of significant flooding events.
	Individual Property Protection	• A Pilot scheme for grant aiding Individual Property Protection is currently operating. Eligibility is assessed on the likelihood of future flooding and the frequency of past flooding events.
	Flood Recovery, Welfare and Insurance Issues	• Continue to carry out and contribute to flood investigations to gather information and improve knowledge and action on future flood events; • Continue to work with Councils and local communities at flood risk in providing advice and information to aid recovery after a flood event; • Continue to engage and work with voluntary sector organisations such as the Red Cross in providing Welfare Support; and • Continue to work with the insurance industry with respect to flood insurance issues, including "FloodRe" in NI, to help address long term flood insurance affordability issues.

Chapter **5**

AREAS OF POTENTIAL SIGNIFICANT FLOOD RISK **(APSFR)**

5.1

BELFAST

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5.1.1 SUMMARY

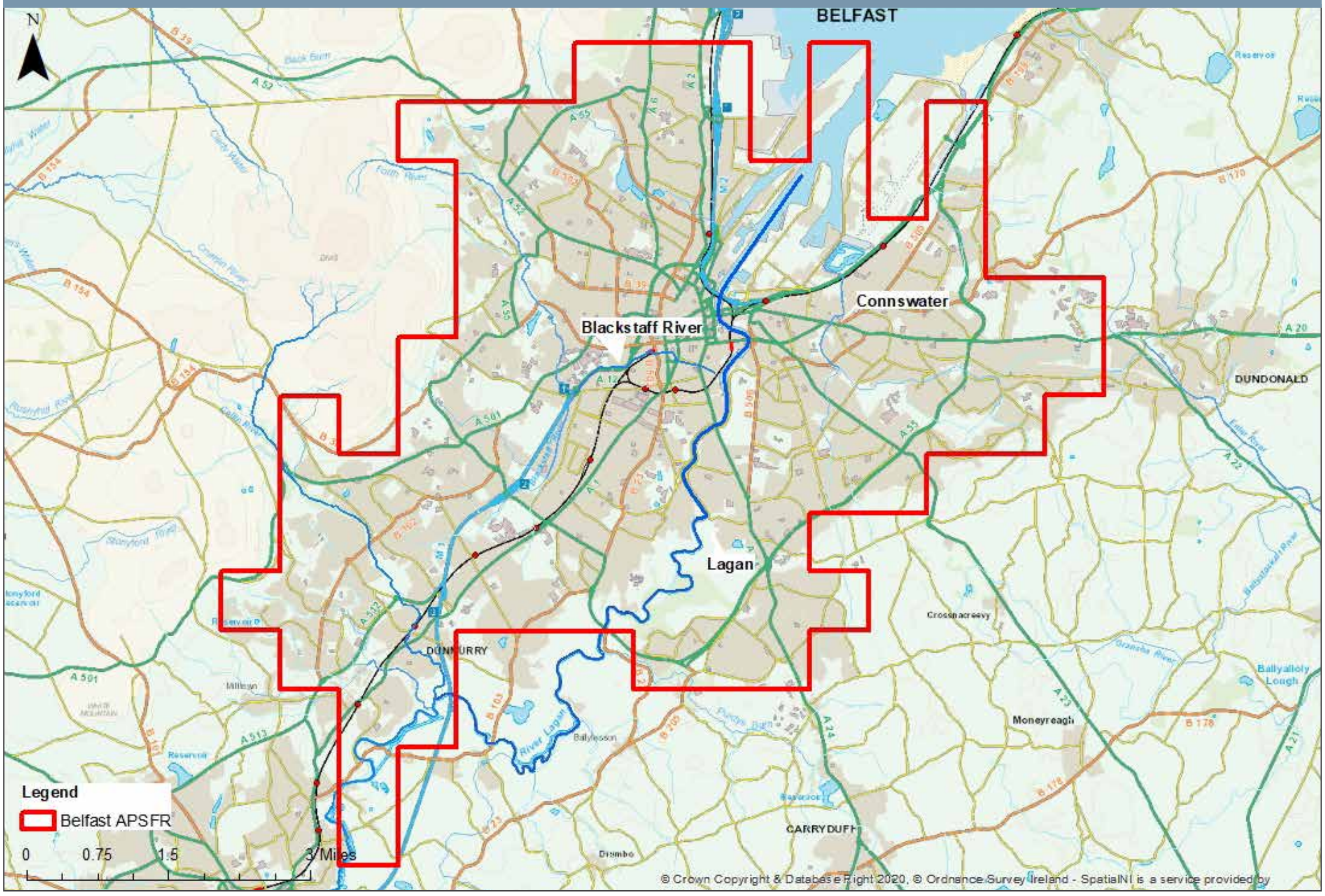
5.1.1.1 Flood risk area overview

Belfast APSFR is situated in the North Eastern RBD and is at risk of flooding from surface water, fluvial and tidal sources. In the most extreme events 0.1 % AEP (1 in 1000 year), surface water flooding poses a risk to approximately 30,000 properties in Belfast, with approximately 10,000 at fluvial risk and approximately 3,000 properties at tidal risk. Belfast's population according to the 2011 census was 280,211.

Major flooding occurred across Belfast in June 2012 due to extreme rainfall and there is also a threat of tidal flooding to some areas of the city close to Belfast Lough and the tidal Rivers – Lagan and Connswater. These watercourses are shown in Figure 5.1-1 below. This risk was illustrated during the tidal surge of January 2014, which affected the Belfast Harbour area and challenged defences in the Sydenham area of East Belfast.

The Belfast APSFR is mainly located within the Belfast Lough and Tidal Lagan Local Flood Management Area and to a lesser extent the Lagan Local Flood Management Area.

Figure 5.1-1: Location and boundary of Belfast APSFR and key watercourses



5.1.1.2 Northern Ireland Flood Risk Assessment (NIFRA) 2018

The NIFRA 2018 identified Belfast as the largest APSFR in NI at 105 km^2.

Its boundaries have been extended to include an area to the south-west of the River Lagan, further upstream around Milltown Road, to the north, the harbour area and some smaller areas to the west.

5.1.2 HISTORY

5.1.2.1 Summary of flooding history

The earliest photographs of flooding across Belfast date back to 1902 where poor drainage influenced by tides, flooded the streets of Belfast City Centre. Extensive flooding has also been recorded over the last two decades; in June 2007 affecting over 600 properties, August 2008 affecting the Greater Belfast area and main arterial roads, August 2009 affecting the Ravenhill and Ormeau areas and more recently in June 2012, January 2014 and November 2019.

Significant flooding occurred in June 2012 as pictured in Figure 5.1-2 below, this was primarily a surface water event caused by extreme rainfall which led to 1600 residential and non-residential properties across Belfast suffering damage. It was reported that 44 mm of rain fell within a 3-hour period.

In January 2014, Belfast Lough was predicted to be affected by its highest tidal surge in history, initially threatening around 3000 properties, mainly in the centre and east of the city. The UK Coastal Monitoring and Forecasting Service, which provides tidal information and level alerts to DfI Rivers, gave advance warning of a predicted extreme tidal surge for Belfast Lough and the rest of the NI coastline. This alert triggered a major flood emergency response to prepare for the possibility of serious tidal flooding. High tides and strong winds caused difficult driving conditions, damage to roads and properties particularly on NI's eastern coastline and posed a significant threat to Belfast city centre. In this instance a major flood event was narrowly averted due to the forecast surge peak not coinciding with the peak of the spring tide. The tide peaked at around 2.75 m Ordnance Datum which is only a few centimetres below the top of the various sections of the walls and embankments which act as a form of coastal defence to low lying areas of the city centre.

Figure 5.1-2: Flooding at Ladas Drive, Belfast, June 2012

5.1.2.2 Flood events since 2015

Since 2015 there have been pockets of localised flooding although there have been no significant events. In November 2019, roads were flooded around parts of NI due to heavy rain, including Townsend Street in West Belfast and the A2 road between Bangor and Belfast.

Figure 5.1-3: Tidal Flooding of low lying areas at Belfast Harbour Estate, January 2014

5.1.3 CATCHMENT

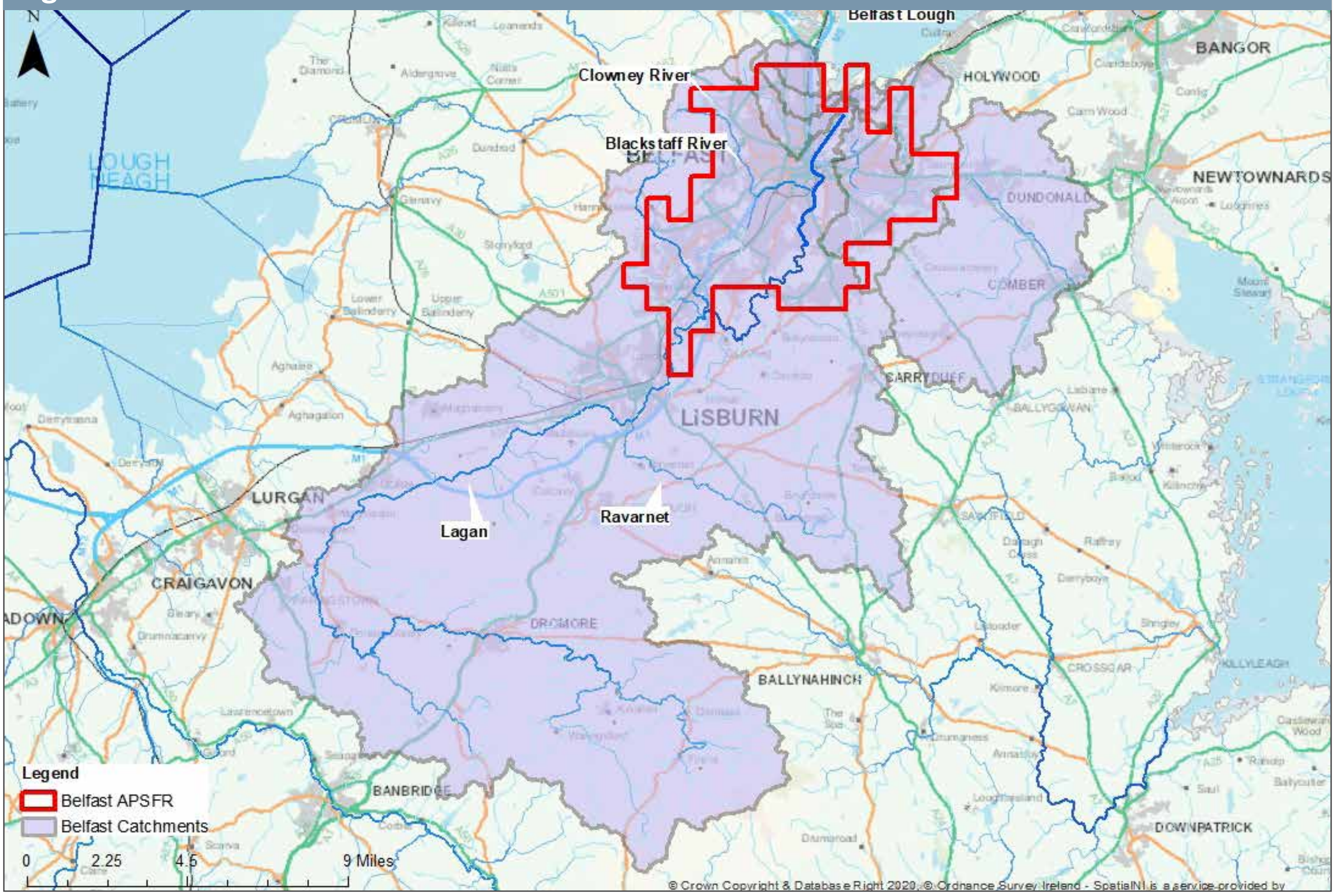
5.1.3.1 Catchment characteristics and tributaries

The River Lagan is the largest river that flows through Belfast where it discharges into Belfast Lough. Flows from the Lagan itself do not pose a major flood risk to the City as they are heavily attenuated, during major fluvial events, higher upstream in the catchment in a substantial rural floodplain above the City of Lisburn. Flood risk is influenced by its large upstream catchment and the tidal characteristics of its lower reaches near the City Centre. The River Lagan rises on the slopes of Slieve Croob approximately 30 km south of Belfast in County Down and drains over 600 km2 before entering Belfast Lough. The Lagan flows through the Lagan Valley Country Park from the outskirts of the City to the Stranmillis Weir; here it benefits from a 'green' floodplain where the river can flood with little risk to property. Downstream of Stranmillis Weir the river becomes tidally influenced. However, outflows from urban tributaries and storm drainage can be affected by high Lagan water levels, and tidal inundation is a risk along its lower reaches through the City.

Other designated watercourses contribute substantially to the overall flood risk to property in Belfast and these include the Connswater River and its tributaries, the Knock and Loop Rivers, in the east of the City and the Blackstaff, Clowney and Farset Rivers and their tributaries in the west. These are smaller and more urbanised systems than the Lagan and they react quickly to intense rainfall. They also flow inwards, towards the City Centre and consequently, outward urban expansion of the City has affected flows and therefore the flood risk has increased along the inner city reaches of these watercourses.

Figure 5.1-4 below shows the wider catchments of the watercourses through the Belfast APSFR, which mostly consists of the large Lagan catchment and its tributaries.

Figure 5.1-4: Catchments in relation to the Belfast APSFR



5.1.3.2 Urban drainage and wastewater network

NI Water is responsible for the clean drinking water supply, foul and storm water sewerage networks throughout NI.

Over 1300 km of the drainage network within the Belfast APSFR consists of combined sewers, with the length of separate storm and foul water sewerage networks being comparatively smaller at approximately 500 km and 370 km respectively.

There are four WwTW within the Belfast APSFR; one at the harbour and a further two at Newtownbreda and Dunmurry to the south of Belfast which are all operated by NI Water. Further upstream on the River Lagan there is a fourth WwTW at Lisburn. A further WwTW serving the Belfast APSFR is situated to the north-east, just outside the APSFR boundary at Kinnegar near Holywood.

NI Water also has 36 pumping stations currently in service within the Belfast APSFR boundary, and a further three sludge treatment works within the APSFR boundary, one upstream at Lisburn, one at Newtownbreda and one at Dunmurry. In addition, the Main Sludge Treatment Centre in Belfast, located at Belfast WwTW, is operated by Veolia Water on behalf of NI Water.

NI Water has a programme of work to remove properties on the DG5 register that are subject to internal flooding. Within PC15, the regulatory target is to remove 62 properties from the risk register across NI. The following list of areas within the Belfast APSFR have been considered for solutions during PC15, and where solutions have been determined economically viable, they have been implemented:

- Henderson Avenue;
- Camberwell Terrace;
- EdenvalePark;
- Eastleigh Dale/Pasadena Gardens;
- Roddens Crescent Sewer;
- Glenmachan Strategic Project - Phase 1A Sicily and Marguerite Park;
- Glenmachan Strategic Project - Phase 1B Greystown Avenue and Upper Malone Road;
- Maryville Avenue;
- Ravenhill Avenue;
- Upper Newtownards Road.

5.1.3.3 Environment

The Belfast APSFR encompasses the following WFD waterbodies:

Table 5.1-1: Waterbodies classification in and around the Belfast APSFR

Waterbody name	2015 Classification	2018 Classification	2021 Objective	Reason for failure
UKGBNI1NE050505126: Blackstaff (Belfast) River	Moderate Ecological Potential	Moderate Ecological Potential	Moderate Ecological Potential	Macrophytes Biological Oxygen Demand (BOD) Soluble Reactive Phosphorus Ammonia
UKGBNI1NE050503117: Collin Glen River	Moderate	Good	Good	Macrophytes
UKGBNI5NE100010: Lagan Estuary	Poor Ecological Potential		Moderate Ecological Potential	Benthic Invertebrates Dissolved Inorganic Nitrogen Fish Priority Hazardous Substances
UKGBNI1NE050503104: Derriaghy River	Moderate Ecological Potential	Moderate Ecological Potential	Moderate Ecological Potential	Benthic Invertebrates Macrophytes Phytobenthos BOD Soluble Reactive Phosphorus
UKGBNI1NE050503106: Brookmount Stream	Moderate	Poor	Good	Benthic Invertebrates Phytobenthos Soluble Reactive Phosphorus
UKGBNI1NE050503108: River Lagan (Stranmillis)	Moderate Ecological Potential	Moderate Ecological Potential	Moderate Ecological Potential	Macrophytes Phytobenthos Fish Soluble Reactive Phosphorus Cypermethrin Permethrin Fluorranthere Hexachlorocyclohexane (total)

Waterbody name	2015 Classification	2018 Classification	2021 Objective	Reason for failure
UKGBNI1NE050503071: Ravernet Tributary	Moderate	Moderate	Good	Phytobenthos BOD Soluble Reactive Phosphorus
UKGBNI1NE050503088: Minnowburn	Poor	Moderate	Moderate	Benthic Invertebrates Soluble Reactive Phosphorus Mercury(biota)
UKGBNI1NE050502083: Crawfordsburn River	Moderate	Moderate	Good	Benthic Invertebrates Soluble Reactive Phosphorus
UKGBNI1NE050503087: Connswater	Poor Ecological Potential	Poor Ecological Potential	Moderate Ecological Potential	Benthic Invertebrates Macrophytes Soluble Reactive Phosphorus
UKGBNI6NE180: Belfast Harbour	Moderate Ecological Potential		Moderate Ecological Potential	Benthic Invertebrates Dissolved Inorganic Nitrogen Fish Specific Pollutants
UKGBNI6NE090: Belfast Lough Inner	Moderate		Moderate	Alien Species Priority Hazardous Substances
UKGBNI6NE080: Belfast Lough Outer	Good		Good	Alien Species

More information about status and individual objectives can be viewed at the NIEA Information Request Viewer.

Belfast Lough and its peripheral waterbodies suffer from acute and chronic pollution that is impacting upon their ecological status.

Flood alleviation works such as reducing run off within the catchment, improving the sewerage network by separating the foul and surface drainage and the establishment of blue / green infrastructure such as SuDS could all play a positive role in achieving WFD objectives within these waterbodies.

5.1.4 GEOLOGY

5.1.4.1 Bedrock Geology

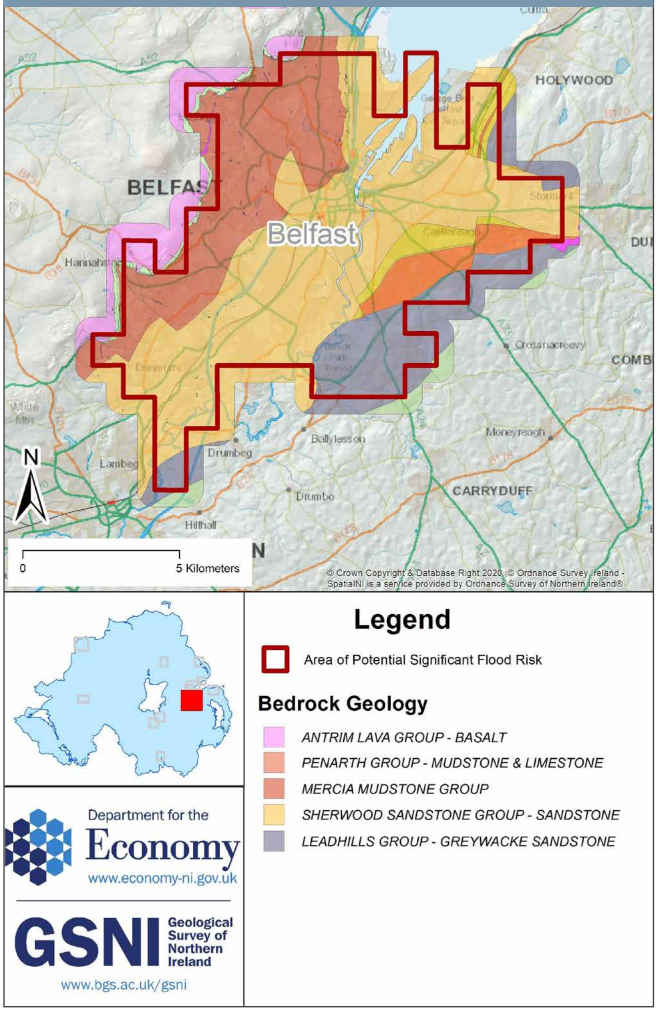


Figure 5.1-5: Bedrock geology of Belfast

From west to east, the bedrock beneath the Belfast APSFR includes:

- mudstone of the Mercia Mudstone Group;
- sandstone of the Sherwood Sandstone Group;
- limestone and mudstone of the Belfast Group;
- breccia and sandstone of the Enler Group and;
- greywacke sandstone of the Leadhills Group.

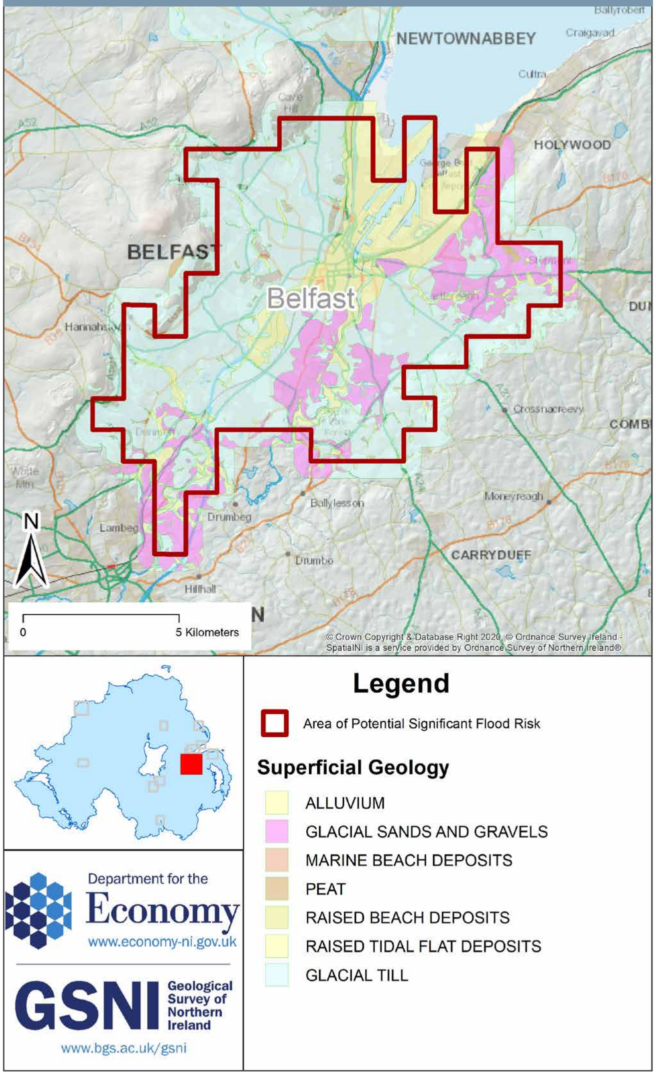
In the west, impermeable Mercia Mudstone Group occurs under much of the escarpment of the Antrim Plateau, whilst under Belfast and the Lagan and Enler valleys, highly porous and permeable sandstone of the Sherwood Sandstone Group is found. Where exposed, sandstones of the Sherwood Sandstone Group are likely to take in some surface water. Moving east, the Belfast and Enler Groups include low porosity and permeability limestone and mudstone with more porous breccia and sandstone. Furthest east, indurated sandstone of the Leadhills Group is present.

5.1.4.2 Superficial Geology

Glacial till is the dominant superficial deposit covering bedrock across the area. Its character will vary depending on whether it was derived from mudstone or sandstone, such that mudstone derived till found above the Mercia Mudstone Group will be clay dominated, whereas a till derived from the Sherwood Sandstone Group will be silt and sand dominated. Regardless of character, the glacial till in this area will have very low permeability, and therefore will do virtually nothing to alleviate surface water flooding by allowing water to infiltrate into it or the underlying geology.

In the Lagan and Enler (near Dundonald) valleys in the south and east of the APSFR, there are large areas of glacial sand and gravel that will have high porosity and permeability. Such deposits can readily absorb rain and surface water, and so where they are uncovered by impermeable man-made surfaces, will have a mitigating effect on surface water flooding. However, once the storage within these deposits approaches capacity, it is possible that they could start to be a source of longer duration groundwater flooding especially in low lying valley floor areas. Significant areas of river alluvium associated with the Lagan are typically composed of sand, silt and cobbles. When not fully saturated, alluvium can take in rain water and help alleviate flooding. However, river alluvium tends to be quite thin and low lying, and these are the first areas to flood in response to rising river levels. The Lagan valley in south Belfast lies within a country park where potential groundwater flooding effects are not likely to be damaging. Occupying much of central Belfast and the docks area are raised and active estuarine deposits of clay that are impermeable so they will not alleviate surface water flooding by allowing water to infiltrate into them or the underlying geology.

Figure 5.1-6: Superficial geology of Belfast



5.1.5 SOURCES OF FLOODING

5.1.5.1 Risk to buildings and infrastructure by source

According to NIFRA 2018 the City of Belfast, in terms of potential adverse consequences of flooding, is ranked highest of the 45 FRAs within NI.

DfI has undertaken detailed predictive computer mapping and modelling of flooding from rivers and sea, and further strategic mapping for surface water flooding. The results of this mapping can be found on Flood Maps (NI). An analysis of the potential consequences from flooding shows the predominant flood risk is from surface water flooding.

Figure 5.1-7 shows the predicted annual average damages (AAD) by tidal, fluvial and surface water flood sources. Predicted surface water AAD are just under £17.5 million and tidal AAD just over £6 million. Fluvial AAD are the lowest at just over £4 million. AAD in the Belfast APSFR accounts for 25% of the total predicted AAD across all of the APSFR. It should be noted, however, that the surface water modelling does include some of the floodplains of smaller watercourses.

Figure 5.1-7: Annual Average Damages (£m) by flood source

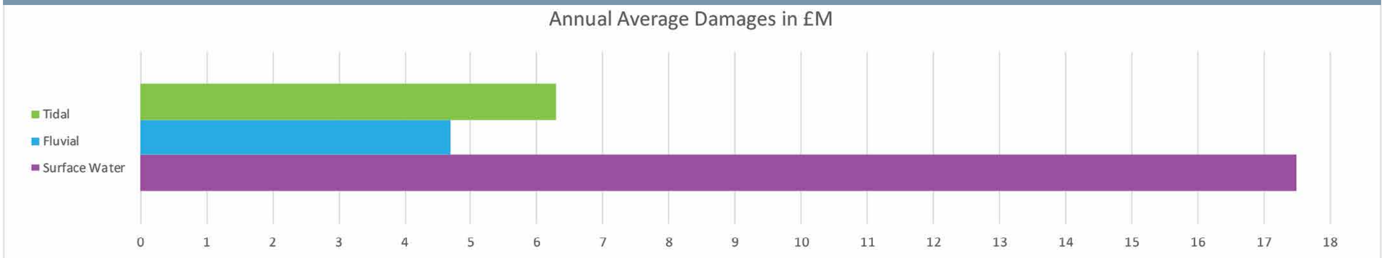
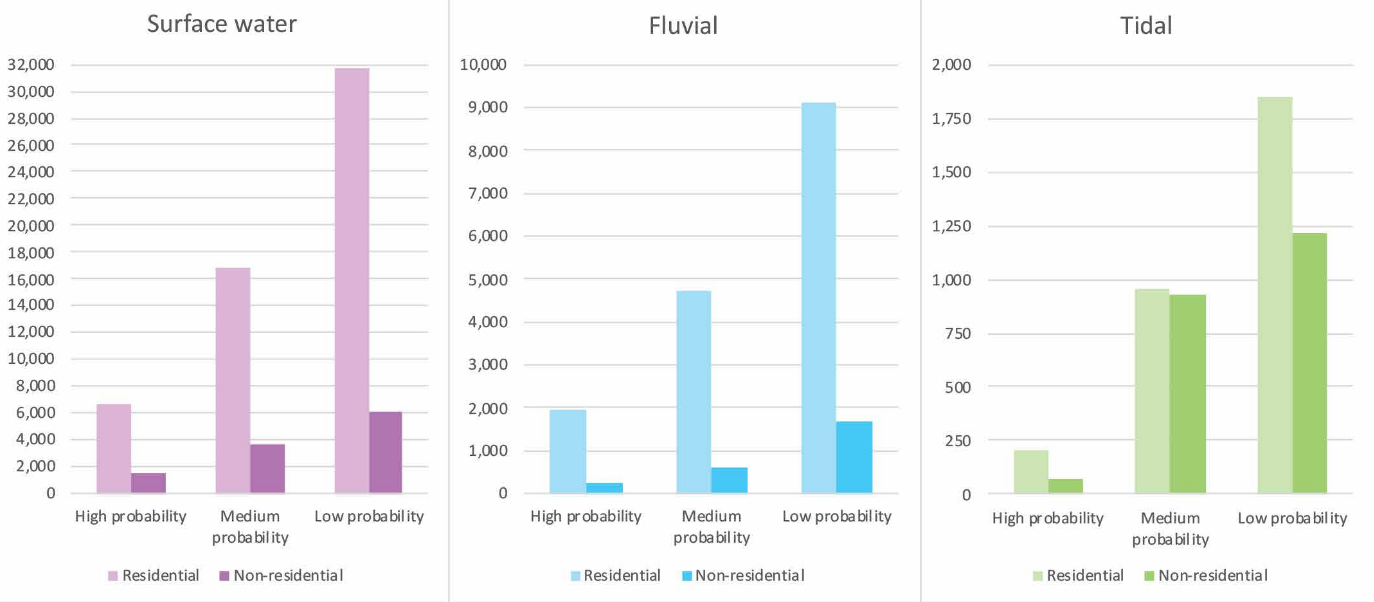


Figure 5.1-8 below shows a similar trend to Figure 5.1-7 in that predicted surface water has the highest number of residential buildings flooded compared to tidal and fluvial sources. Table 5.1-2 shows the return periods which have been assessed as high, medium and low probability events for surface water, fluvial and tidal flooding.

Table 5.1-2: Return periods for high, medium and low probability

Probability	Surface water	Fluvial	Tidal
High	3.33 % AEP (1 in 30 year)	10 % AEP (1 in 10 year)	10 % AEP (1 in 10 year)
Medium	0.5 % AEP (1 in 200 year)	1 % AEP (1 in 100 year)	0.5 % AEP (1 in 200 year)
Low	0.1 % AEP (1 in 1000 year)	0.1 % AEP (1 in 1000 year)	0.1 % AEP (1 in 1000 year)

Figure 5.1-8: Number of buildings located within the modelled flood extent



Note that the scale for surface water on Figure 5.1-8 above is different to account for significantly higher values than those for fluvial and tidal.

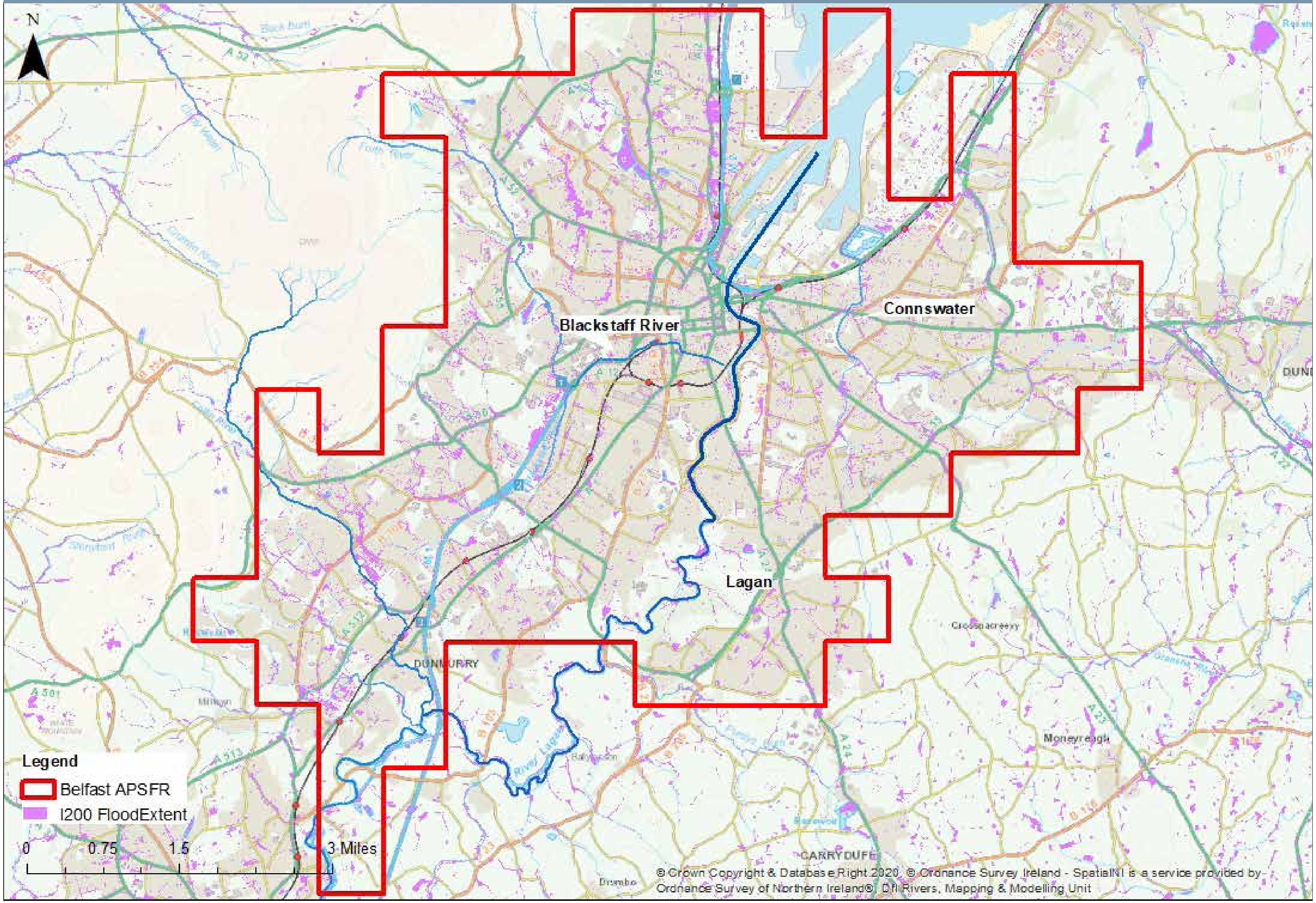
5.1.5.2 Surface water (Pluvial)

Surface water flooding is dispersed in pockets through the APSFR as shown below in Figure 5.1-9, and key surface water flow routes often coincide with the floodplains of urban watercourses.

Key areas at risk are commercial and industrial areas on the north side of the harbour estate, the Shore Road area, and homes in the Ardoyne area in the west of the city.

Infrastructure at risk from surface water flood events up to 0.1 % AEP (1 in 1000 year) in the Belfast APSFR are IPPC sites, care homes, GP surgeries, a fire station, hospitals, police stations, schools, a pumping station, electricity substations, environmental designated sites and built heritage sites. A detailed breakdown of this is included in Appendix D.

Figure 5.1-9: Overview of surface water hazard mapping for a 0.5 % AEP (1 in 200 year) flood event



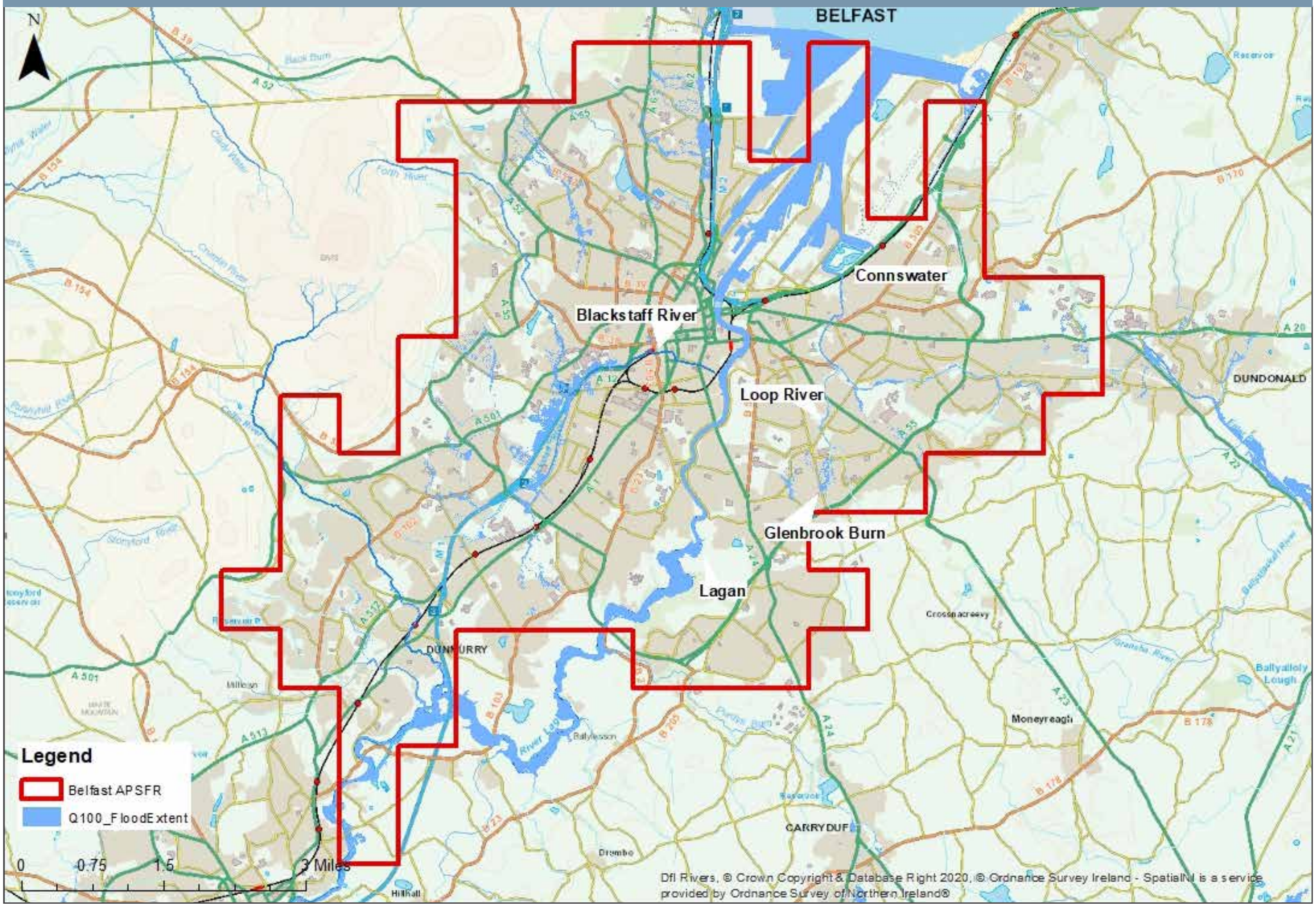
5.1.5.3 Fluvial

An overview of the fluvial flooding at a 1 % AEP (1 in 100 year) flood event across the Belfast APSFR is shown below in Figure 5.1-10. Key areas at risk from fluvial flooding are;

- Commercial and industrial area of Shore Road;
- Ballysillan/Ardoyne residential area around the upstream tributaries of the Glenwood River;
- Castlereagh area around the upper reaches of the Loop River and Glenbrook Burn;
- Belfast hospital/retail park to the west of the M1/A12 interchange.

Infrastructure at risk from fluvial flood events up to 0.1 % AEP (1 in 1000 year) in the Belfast APSFR are IPPC sites, care homes, GP surgeries, police stations, schools, pumping stations, electricity substations, environmental designated sites and built heritage sites. A detailed breakdown of this is included in Appendix D.

Figure 5.1-10: Overview of fluvial hazard mapping for a 1 % AEP (1 in 100 year) flood event



5.1.5.4 Tidal

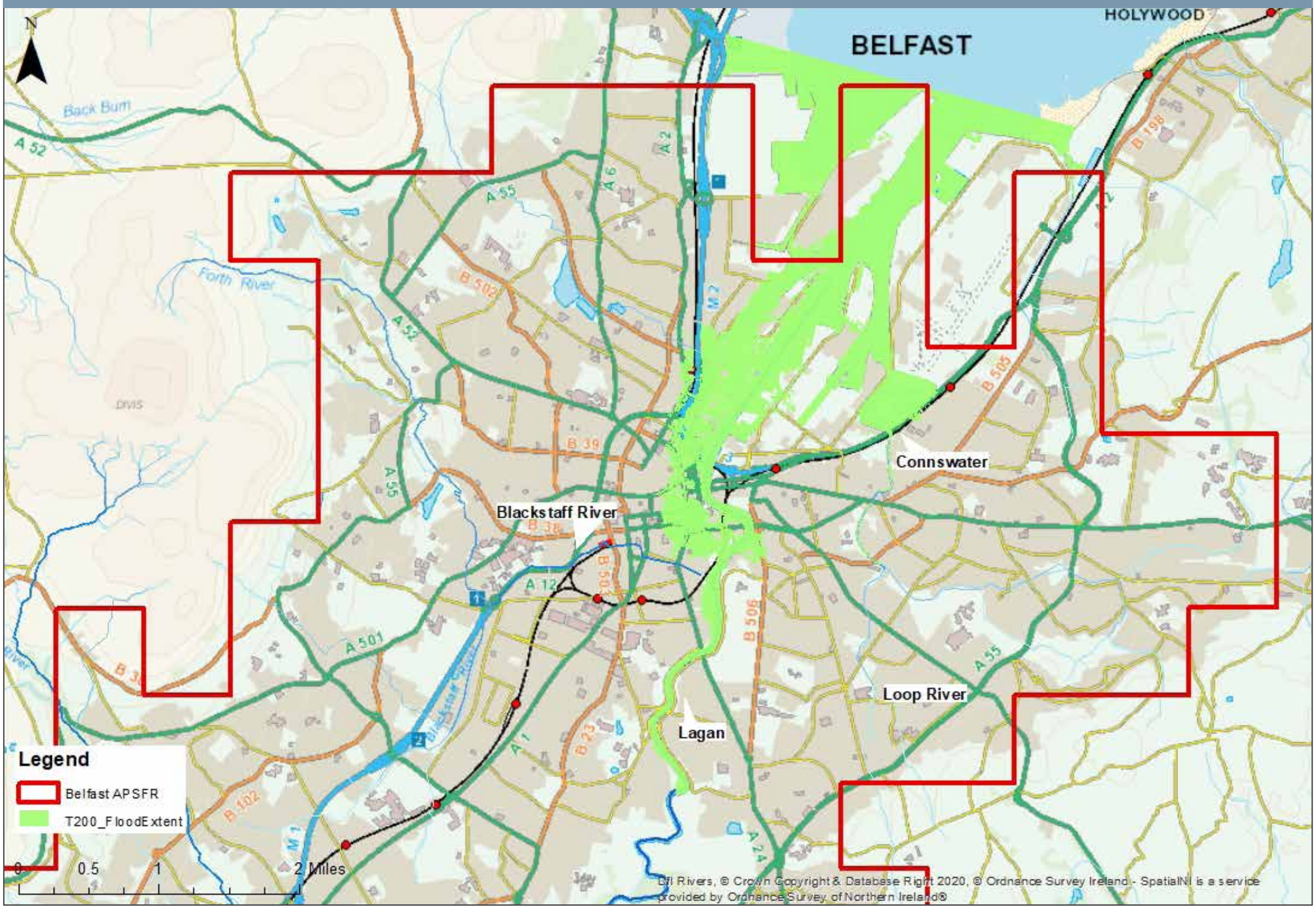
Much of the Belfast city centre is between 1 m to 2 m below extreme tide levels, therefore in a tidal flood event there could be serious disruption to the city centre's commerce, infrastructure and key services.

In a 0.5 % AEP (1 in 200-year) flood event, as shown in Figure 5.1-11 below, tidal flooding is predicted around the Belfast Harbour Estate and further upstream in the city centre and around the banks of the River Lagan.

The area of central Belfast around Victoria Street and May Street are particularly susceptible. Tidal flooding within the Harbour Estate is shown to extend westwards, as far inland as York Street.

Infrastructure at risk from coastal flood events up to 0.1 % AEP (1 in 1000 year) in the Belfast APSFR are IPPC sites, a care home, a fire station, police station, school, pumping station, electricity substations, environmental designated sites and built heritage sites. A detailed breakdown of this is included in Appendix D.

Figure 5.1-11: Overview of tidal hazard mapping for a 0.5 % AEP (1 in 200 year) flood event



5.1.6 CURRENT FLOOD RISK MITIGATION

5.1.6.1 Planning

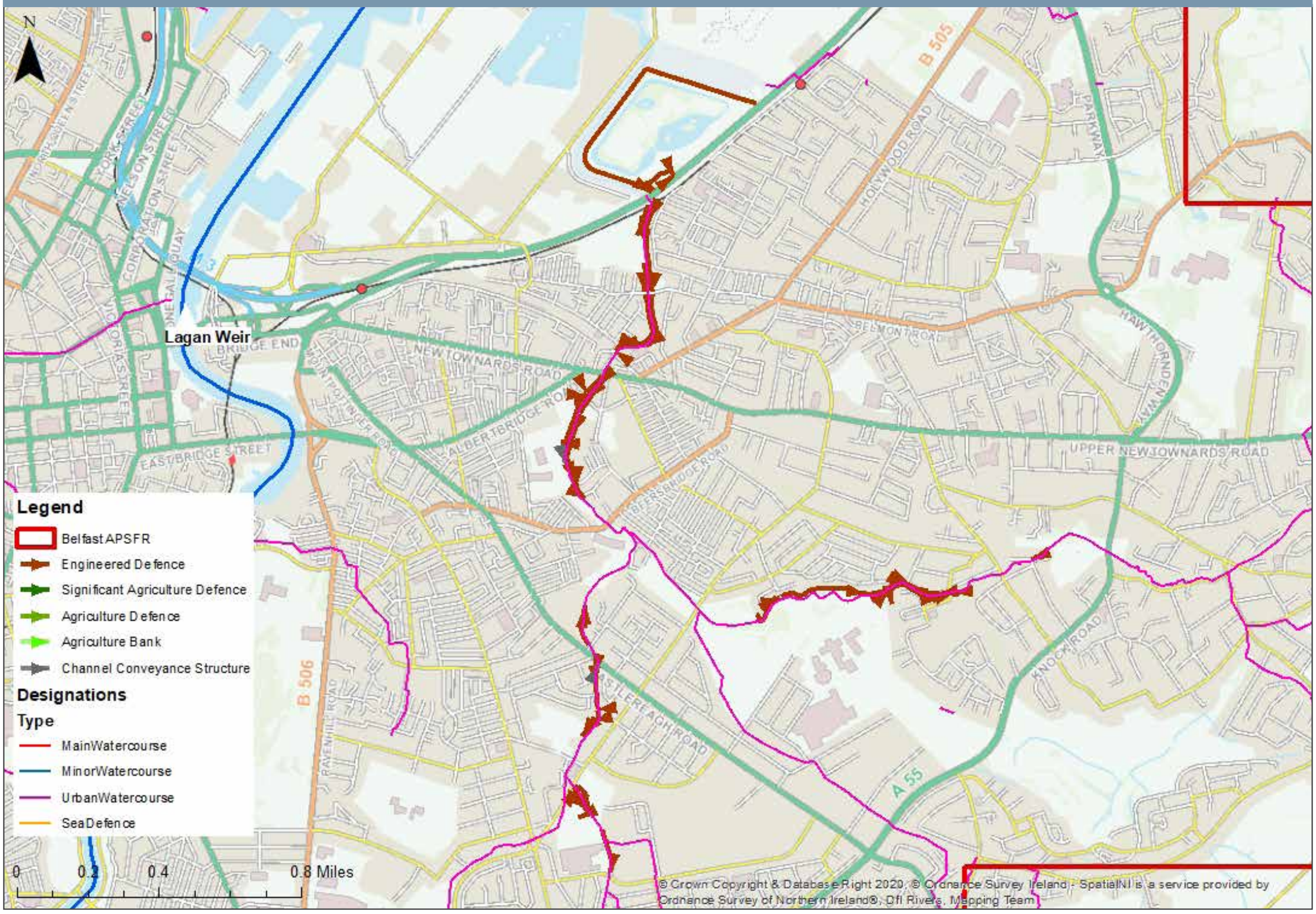
In addition to national planning policy and advice, DfI Rivers will advise against bringing forward sites or the zoning of any land in preparation for the new Belfast Local Development Plan, particularly for built development, that has been identified from the flood maps as being within the 1 % AEP (1 in 100 year) fluvial floodplain, 0.5 % AEP (1 in 200 year) tidal floodplain/ reservoir inundation area, or is susceptible to surface water flooding.

5.1.6.2 Flood defences

Flood defences in East Belfast are described below and shown in Figure 5.1-12;

- The East Belfast Flood Alleviation Scheme Defences, which extend along the Knock, Loop and Connswater Rivers, are a combination of clay core embankments, steel sheet piled walls and concrete flood walls providing protection from fluvial risk;
- Victoria Park Sea Defence provides protection from tidal flooding to residents around the Sydenham area of East Belfast.

Figure 5.1-12: Flood defences in the eastern section of the Belfast APSFR

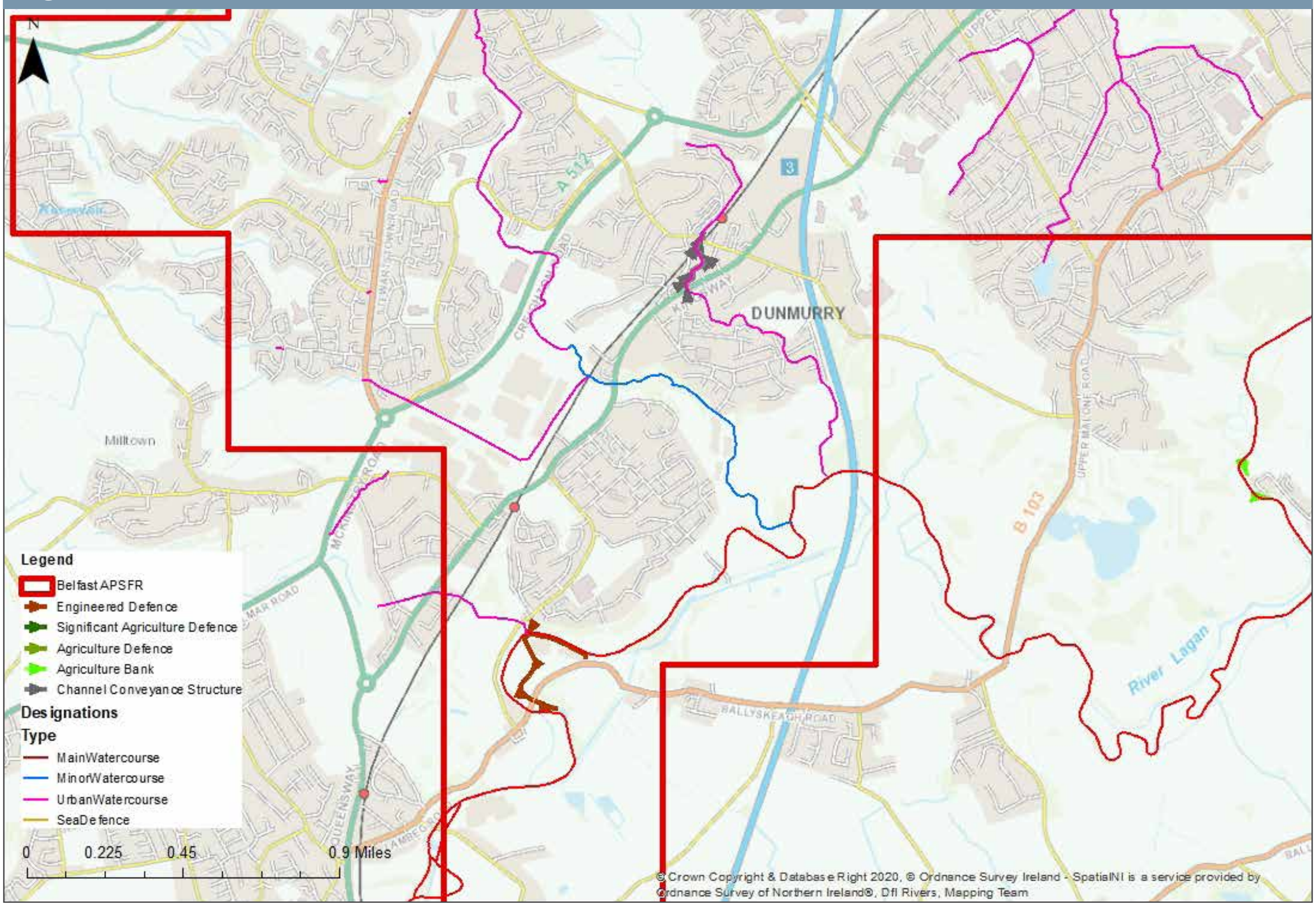


Flood defences in the southern section of the Belfast APSFR are described below and shown in Figure 5.1-13;

- In Dunmurry, the Glen River fluvial flood defences are classed as channel conveyance structures. They are comprised of reinforced concrete walls and channel structures which extend along a short reach of the Glen River near the centre of Dunmurry;
- The River Lagan fluvial flood defences at Ballyskeagh are made up of two hard engineering components; clay core embankments and sheet piled walls which were designed to protect adjacent commercial premises.

The Lagan Weir is located in the Harbour area between the Queen Elizabeth Bridge and the M3 Bridge and was constructed in 1994. It should be noted that the Weir, which straddles the River Lagan in the form of 5 no. controllable weir gates, is not designed as a flood defence and its purpose is to impound water to control / maintain water levels within the tidal Lagan Basin. During normal tidal and river flow conditions the Weir gates are raised on each falling tide to impound the river upstream. The gates are then lowered when, on the next tidal cycle, the sea level rises above the impounded control level for the river. The Weir gates create an impoundment between Donegall Quay and Stranmillis Weir which reduces the tidal range from 3.1 m to around 1.2 m for spring tides.

Figure 5.1-13: Flood defences in the southern section of the Belfast APSFR



There is currently an Emergency Plan for the deployment of temporary flood defences for Belfast to manage tidal flooding until permanent defences are constructed.

5.1.6.3 Dredging the tidal reach of the River Lagan

A Department for Communities (DfC) project to dredge the tidal River Lagan has been carried out in phases from Stranmillis Weir to Lagan Weir, and was completed by March 2020. This was essentially done to maintain the navigation between the Lagan Weir and Stranmillis Weir. However, this should ensure that fluvial flood risk does not increase and should enhance the water quality and habitats, and benefit those who use this reach of the river.

5.1.6.4 Drainage in Belfast

The Belfast Sewers Project has been operational since 2010 to reduce pollution of the River Lagan, reduce flooding and facilitate future development. The project cost £160 million and involved the rehabilitation of existing sewers and the construction of over 9.5 km of storm tunnels up to 4 metres in diameter. However, sewerage upgrades alone cannot be used to deal with all future drainage needs due to expense of operation, ongoing pumping and treatment and the energy and chemicals required to do this. In the long-term, surface water should be managed prior to entering sewerage systems.

5.1.6.5 NI Coastal Flood Response Plan

Due to the tidal flood risk in Belfast, the APSFR is included in the Northern Ireland Coastal Flood Response Plan, published in January 2019.

The NI Coastal Flood Response Plan was developed by the Flooding and Severe Weather Working Group of the 3 NI Emergency Preparedness Groups (EPGs). Its aim is to provide a pre-planned response to warnings of coastal flooding and to outline the graduated incident and co-ordinated inter-agency response to a potential or actual tidal flooding event affecting NI. The Plan was completed and tested in early 2017 and it includes coastal areas in the vicinity of Belfast. The Plan remains a living document to incorporate any changes to the area and to ensure it is up to date.

5.1.7 ACTIONS IN THE FIRST CYCLE FLOOD RISK MANAGEMENT PLAN

In the first cycle FRMP, there were seven measures set out specifically for the Belfast APSFR.

Good progress has been made on the Belfast APSFR measures, with the completion of the Coastal Emergency Response Plan and significant progress on the Capital Works Schemes. The East Belfast FAS and Phase 1B of the Glenmachan Project have both been completed. Detailed design of the Belfast Tidal has been completed and Phase 1A of the Glenmachan Project is ongoing. The draft Strategic Drainage Infrastructure Programme entitled 'Living With Water in Belfast' was published for consultation in November 2020.

The Preparedness measure to establish the Cregagh local community resilience group has been completed and progress on other local community resilience groups is ongoing. Table 5.1-3 shows a summary of measures within the Belfast APSFR and their progress.

Table 5.1-3: Progress tracking for Flood Risk Management Plan measures 2015-2021

Category	Measure code from First Cycle FRMPs	Measure description	Progress
PROTECTION	UKNI_NE_APSFR_01_01	Belfast Tidal Flood Risk Study - FAS	Outline design complete.
	UKNI_NE_APSFR_01_03	East Belfast FAS	Complete.
	UKNI_NE_APSFR_01_04	Glenmachan Project - Phase 1A (Sicily Park/ Marguerite Park) & Phase 1B (Greystown/ Upper Malone)	Phase 1B complete. Phase 1A Design ongoing.
	UKNI_NE_APSFR_01_05	Living with Water Programme - Strategic Drainage Infrastructure Programme (SDIP) for Belfast	The draft SDIP 'Living With Water in Belfast' was published for consultation in November 2020.
PREPAREDNESS	UKNI_NE_APSFR_01_02	Develop and implement Coastal Emergency Response Plan	Complete.
	UKNI_NE_APSFR_01_06	Cregagh - Establishment of Local Community Resilience Group	Complete.
	UKNI_NE_APSFR_01_07	Establishment of Local Community Resilience Groups	Ongoing.

5.1.7.1 Prevention

No particular Prevention measures specific to Belfast were set out in the first cycle FRMP.

As outlined in Chapter 4, DfI Rivers advises on planning applications regarding the risk of flooding. The basis of this advice is to avoid inappropriate development in areas which are at risk of flooding and to ensure that any development does not increase flood risk elsewhere.

5.1.7.1.1 Planning policy

Development planning proposals for Belfast are currently set out in the BMAP, under the Belfast District. The BMAP proposals identify the key considerations that will be taken into account in determining planning applications within the Plan Area.

A new LDP for Belfast for the period up to 2035 is being prepared and due to be adopted in late 2023, during the second FRMP cycle. It will comprise:

- a Plan Strategy to define strategic objectives for future development, including strategic policies and a spatial strategy;
- a Local Policies Plan which will include site-specific proposals, designations and zoning to deliver the Strategy.

On adoption, the new LDP will replace the current Plans for Belfast and operational planning policies that were produced by the previous Department of the Environment.

5.1.7.2 Protection

Of the flood alleviation schemes to progress which were set out in the first cycle FRMP, the major East Belfast Flood Alleviation Scheme has been completed by DfI Rivers. This was integrated with the construction of Belfast City Council's award winning Connswater Community Greenway Environmental Scheme to connect green spaces along 9 km of urban river corridors. It provides a national standard of fluvial and tidal flood protection to a significant number of at-risk properties adjacent to the Connswater, Knock and Loop Rivers in East Belfast. This flood alleviation scheme involved the upgrading and realignment of existing river culverts and open channels and the construction of new hard and soft flood defences along low-lying banks of the watercourses.

The joint scheme to address flooding in the areas of Sicily Park and Marguerite Park (Phase 1A) and Greystown and Upper Malone (Phase 1B) has been partially completed. The section led by DfI Rivers was completed after construction began in early 2019, although the section led by NI Water is more difficult to resolve and cannot proceed in full until the Belfast Stormwater sewerage upgrade is extended.

An outline design has been agreed for the Belfast Tidal Flood Alleviation scheme. This will consist of both permanent and temporary defences along a stretch of the tidal Lagan from Belfast Harbour to Stranmillis Weir to help defend the centre of Belfast from tidal flooding and from the impacts of Climate Change on sea levels. Construction is planned to be completed during the second cycle FRMP.

The Homeowner Flood Protection Grant Scheme (HFPGS) for Property Level Protection (PLP) is available to those residents who have experienced property flooding and has been taken up for 11 properties throughout the city.

DfI Roads is developing a scheme to address a major bottleneck on the strategic road network, replacing the existing signalised junctions at York Street with direct links between West link, M2 and M3, the three busiest roads in NI. The scheme will integrate sustainable drainage systems into improvements to the York Street

Interchange to alleviate surface water flooding. The delivery programme for the project is under review and will be subject to further scheme development and the availability of funding.

The Living With Water Programme (LWWP) has developed a draft Strategic Drainage Infrastructure Plan (SDIP), which was published for consultation in November 2020. The geographical scope of the project has been extended since the first cycle FRMPs to include the neighbouring areas of Belfast including; Carrickfergus, Newtownabbey, and Glengormley and Mallusk.

5.1.7.3 Preparedness

The Coastal Emergency Response Plan measure was completed and tested in early 2017. The Plan remains a living document which will be adapted to changing flood risk in Belfast, for example, following construction of the Belfast Tidal Scheme.

The community resilience group at Cregagh has been successfully established, contacts have been confirmed with key residents, and they have been equipped with resources to improve the community's own response to flooding e.g. sandbag storage, information in the form of flood planning and extreme weather alerts. Community resilience has been progressed in some other locations to meet the seventh measure (01_07) set out through the first cycle FRMP, although this is on hold as flooding has not been experienced in a number of years and in consultation with local government officials it appears as though demand for this work is currently limited.

DfI continues to engage with other responders on flooding hotspots, flood response plans and testing of these plans through the 3 local Northern, Southern and Belfast Emergency Preparedness Groups.

5.1.8 UPDATED PROGRAMME FOR SECOND CYCLE FLOOD RISK MANAGEMENT PLAN

5.1.8.1 Key Messages

Although there are no specific measures set out under Prevention for the Belfast APSFR in the first cycle FRMP, the Belfast City Council LDP is scheduled to be finalised early in the second cycle FRMP. The LDP, alongside current advice on Planning from DfI Rivers, will support mitigation of flood risk in the council area in relation to both new development and redevelopment proposals from the LDPs adoption and through the second FRMP cycle. This will be taken forwards as a measure for the second cycle FRMP for DfI Rivers to work with the council to update the flood risk policy within the new LDP.

There has been a focus on large flood alleviation schemes across Belfast, and while some have been completed, others have experienced delays. Those which have been delayed have transitioned to the second cycle FRMP where a viable option has been identified.

5.1.8.2 Living With Water Programme (LWWP)

The LWWP area covers the Greater Belfast Area and will promote an integrated approach to drainage and wastewater management across the catchment through the production of a SDIP. The aims of the SDIP are to help protect people and properties at risk from flooding, enhance the natural environment and help grow the local economy. The SDIP will include schemes and concepts to manage water in an integrated way across the catchment. These will include;

- Policy and legislative changes;
- Improved WwTW and sewerage network alterations;
- Natural flood management, attenuation and SuDS;
- Integration of blue/green infrastructure to public open spaces.

These are set out in the draft plan, Living With Water in Belfast, which was published for consultation in November 2020.

5.1.8.3 Enhanced Drainage Area Plan

NI Water is currently taking forward modelling in the form of DAPs across NI for drainage areas with populations typically above 2000. The traditional approach is for all combined and foul sewers to be modelled. For the period April 2021 – March 2027 NI Water, through the LWWP, will be conducting Enhanced DAPs in each of the APSFR that fall within the scope of the Belfast SDIP. These Enhanced DAPs extend modelling to include the NI Water storm sewers. Through the LWWP, NI Water is also taking forward Integrated Drainage and Catchment Modelling within the Belfast APSFR area that will look at the interaction between watercourses and NI Water's sewerage and storm networks.

Table 5.1-4 below sets out the measures and timescales for the Belfast APSFR in the second cycle FRMP.

Table 5.1-4: Proposed measures for Flood Risk Management Plan cycle 2021-2027

Category	Measure summary	Lead authority	Specific measure	Timescale
PREVENTION	Enhanced Drainage Area Plan	NI Water	By 31st March 2027, NI Water will produce an Enhanced DAP for Belfast that sets out actions to mitigate integrated flooding issues.	2027
	Influence local planning policy for development and flood risk	DfI Rivers	By 2023, DfI Rivers will work with Belfast City Council to update flood risk policy in the Local Development Plan and complete the Sustainable Drainage Systems Supplementary Planning Document	2023
	Living With Water Programme	DfI	By 2021, DfI will develop 'Living With Water in Belfast', an integrated Plan for Drainage and Wastewater Management in Greater Belfast. This Strategic Drainage Infrastructure Plan will set out an integrated approach to drainage and wastewater management.	2021
PROTECTION	Flood alleviation works	DfI Rivers	By 2021, DfI Rivers will undertake detailed design work for the Belfast Tidal flood alleviation scheme, after which the scheme will be constructed. DfI Rivers are also undertaking a review of any further drainage needs on the landward side of the defence.	2021
	Flood alleviation works (will form part of LWWP)	NI Water	By 2027, NI Water will construct flood alleviation schemes for the Glenmachan area to reduce the risk of internal surface water flooding focused on Boucher Road and Sicily Park. Other work is planned to follow in the next cycle.	2027
	Flood alleviation works	DfI Rivers	By 2022, DfI Rivers will refurbish Stranmillis Weir to manage the risk of fluvial flooding.	2022

Category	Measure summary	Lead authority	Specific measure	Timescale
PROTECTION	Flood alleviation works (will form part of LWWP)	DfI Rivers	By 2022, DfI Rivers will undertake feasibility work with regards to a flood alleviation scheme for the Merok Burn Tributaries, East Belfast. Should this identify a viable scheme this will be followed by detailed design and construction.	2022
	Flood alleviation works (will form part of LWWP)	DfI Rivers	By 2021, DfI Rivers will undertake detailed design work for the Glenbrook River, East Belfast flood alleviation scheme, after which the scheme will be constructed.	2021
	Flood alleviation works (will form part of LWWP)	DfI Rivers	By 2021, DfI Rivers will undertake detailed design work for the Riverdale Park East flood alleviation scheme, after which the scheme will be constructed.	2021
	Flood alleviation works (will form part of LWWP)	DfI Rivers	By 2022, DfI Rivers will undertake feasibility work with regards to a flood alleviation scheme for the Knock River, East Belfast. Should this identify a viable scheme this will be followed by detailed design and construction.	2022
	Flood alleviation works (will form part of LWWP)	DfI Rivers	By 2022, DfI Rivers will undertake feasibility work with regards to a flood alleviation scheme for the Premier Drive area. Should this identify a viable scheme this will be followed by detailed design and construction.	2022
	Flood alleviation works (will form part of LWWP)	DfI Roads	DfI Roads will integrate sustainable drainage systems into improvements to the York Street Interchange to alleviate surface water flooding.	TBC
PREPAREDNESS	Community engagement	RCRG	The RCRG will progress engagement in further local community groups, as appropriate or as required, to increase community resilience to flooding.	2027

5.2

LONDONDERRY

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5.2.1 SUMMARY

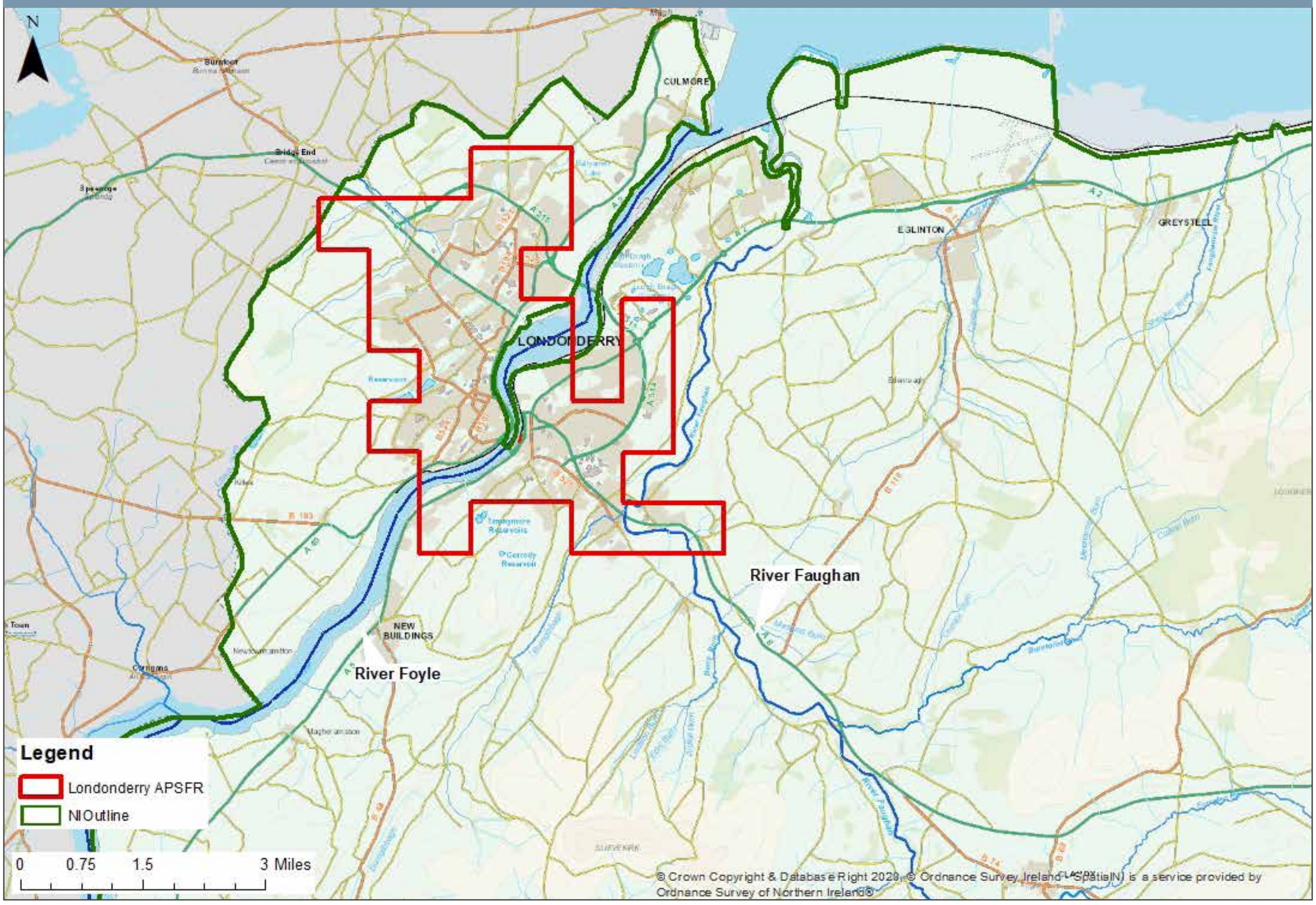
5.2.1.1 Flood risk area overview

Londonderry is situated in the North Western IRBD. According to the 2011 census, the city has a population of over 247,000. People and properties are at risk from fluvial, surface water and tidal sources of flooding due to the city's situation on the coast and its proximity to the main rivers Foyle and Faughan, as shown below in Figure 5.2-1. The most recent significant event was the North West flooding of August 2017, which was due to prolonged and extreme heavy rainfall. The Londonderry APSFR is located within the River Foyle and the River Faughan Local Flood Management Areas.

5.2.1.2 Northern Ireland Flood Risk Assessment (NIFRA) 2018

The NIFRA identified a slight boundary change for the Londonderry APSFR from the first cycle FRMP, although this has no significant impact on the measures for managing flood risk in this APSFR.

Figure 5.2-1: Location and boundary of Londonderry APSFR and key watercourses



5.2.2 HISTORY

5.2.2.1 Summary of flooding history

Historically, Londonderry has suffered from severe flooding in 1987 and 2004.

In August 2004, 30 mm of rain fell on the city centre in less than an hour, overwhelming the drainage systems and flooding both commercial and residential properties. The main areas affected were Dunluce Road, Strand Road and Shantallow.

A notable heavy rainfall event also occurred on 6th July 2015 when, according to Transport NI (now DfI Roads), the Bogside, Creggan, Foyle Road and Strand Road areas were among the worst affected parts of the city. In addition to reports of both internal and external property flooding in these areas, roads were closed due to surface water including major routes such as Lone Moor Road, Greenhaw Road and Rossville Street.

DfI Roads has responded to other isolated incidents due to either blocked gullies or insufficient capacity in the combined drainage system which have resulted in pockets of localised surface water flooding on the roads.

5.2.2.2 Flood events since 2015

The most significant event to occur since 2015 was in August 2017. The flooding on 22 and 23 August 2017 has been described as the worst flooding to affect the North West in over 30 years. During the evening of the 22nd and morning of the 23rd August 2017, the North West of NI experienced 60-70 mm of rain, equivalent to 63 % of the average August rainfall, within the space of 8-9 hours. Watercourses such as the River Faughan, the Muff River at nearby Eglinton village and the Burndennett River (14 km to the south of Londonderry) exceeded their previous highest levels which had been recorded in 1987, with some watercourses greatly exceeding their predicted 1 % AEP (1 in 100yr) flood level. The River Faughan peaked at over 5.1 m which was assessed as being a 0.36 % AEP (1 in 280yr) flood event.

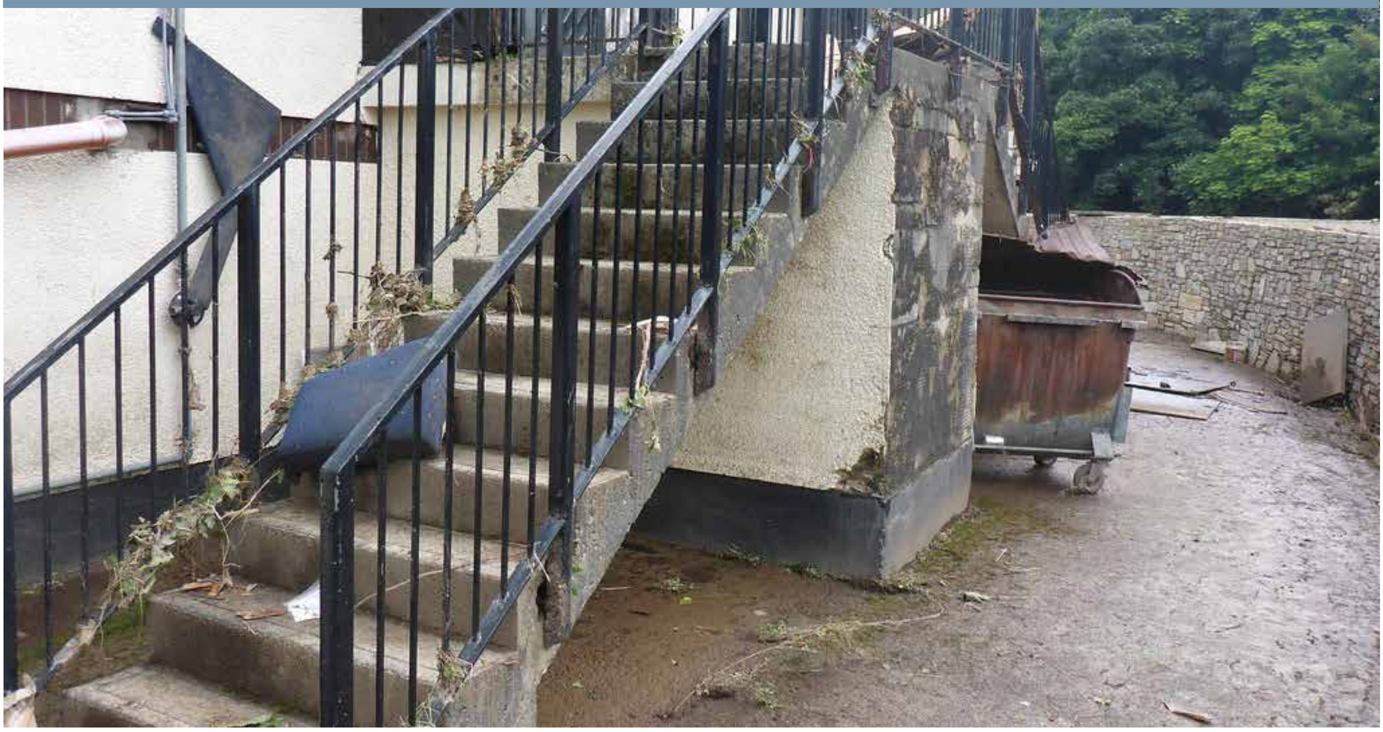
Figure 5.2-2: Collapse of the Glenrandal Bridge in Claudy (photo from NIFRA 2018) on the River Faughan, upstream of the Londonderry APSFR

Areas significantly affected within close proximity to the Londonderry APSFR were Drumahoe, Eglinton and Altnagelvin; Altnagelvin and most of Drumahoe are within the Londonderry APSFR boundary, whereas Eglinton is situated 6 km to the north-east of the APSFR boundary.

The severe weather event of August 2017 caused widespread flooding which affected approximately 400 homes, numerous businesses and significant areas of agricultural land in the North Western IRBD. There was also significant damage to infrastructure with 210 roads either closed or impacted and 89 bridges requiring remedial action, including the collapse of the Glenrandal Bridge in Claudy (see Figure 5.2-2). NI Water also had flood damage at key assets including the Faughan Water Pumping Station used to pump raw water to Carmoney Water Treatment Works.

The River Faughan exceeded bank level and flooded nearby infrastructure and property such as the Three Mile House and Institute FC Riverside Stadium at Drumahoe. The depth of flooding at Three Mile House, a commercial property which sits on the Londonderry side of the Faughan River, can be seen in Figure 5.2-3 below where debris from the flooding is left behind in the railings.

Figure 5.2-3: Flood wrack visible on railings of 'Three Mile House', within the Londonderry ASPFR with flood defence



5.2.3 CATCHMENT

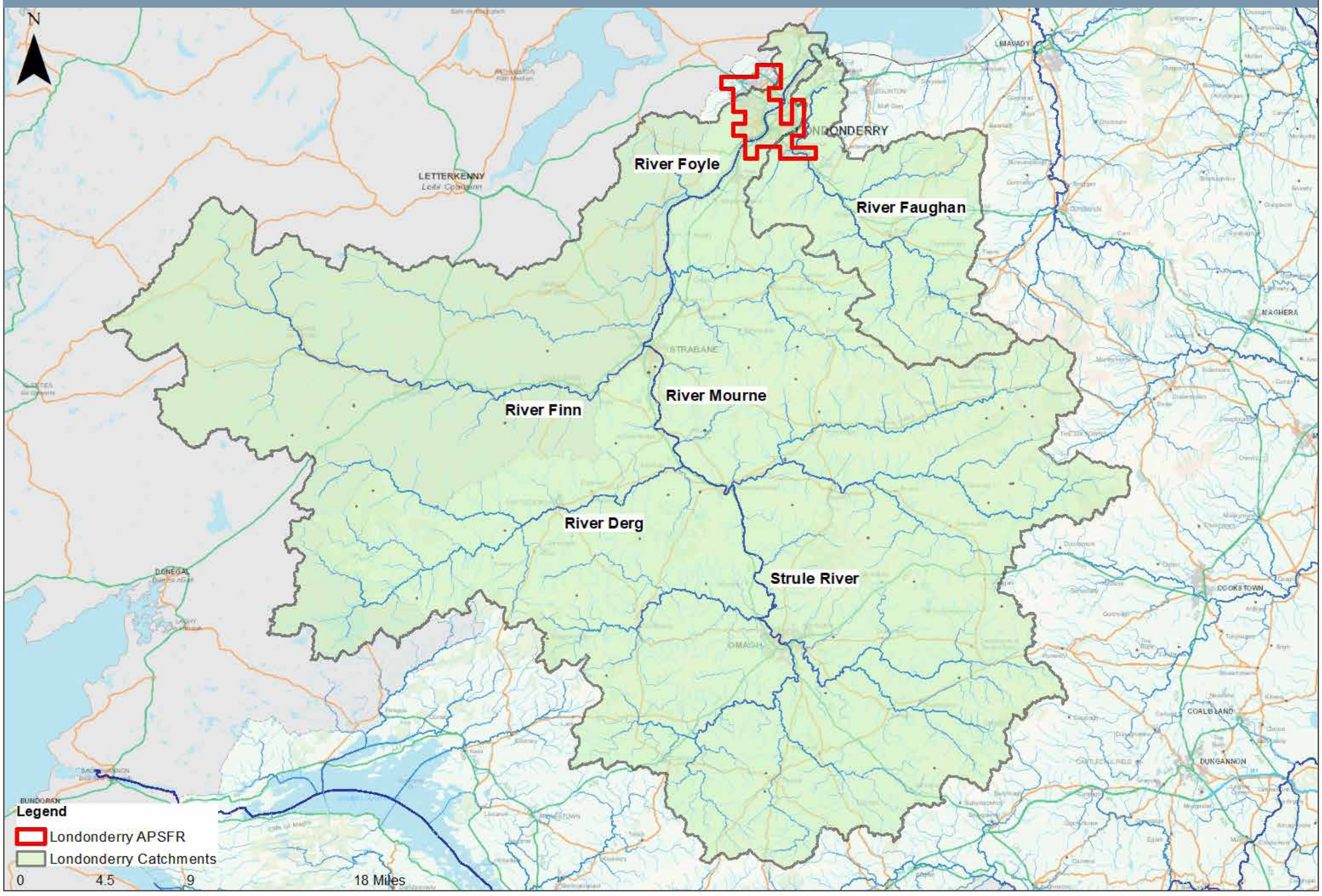
5.2.3.1 Catchment characteristics and tributaries

The River Foyle System is located in the north west of NI and drains a significant portion of NI west of Lough Neagh. There are a large number of steep tributaries flowing north-westward from the Sperrin Mountains which combine to form the River Mourne tributary of the Foyle. Although the River Mourne produces the highest gauged flows in NI, the River Foyle into which it flows does not constitute a major flood risk to Londonderry itself because the city is situated in the wider, tidal reaches of this river. The headwaters of another major tributary, the River Finn, are located to the south and west of Londonderry in hills of Donegal in the RoI. Figure 5.2-4 shows an overview of the wider catchment and tributaries for the River Foyle and River Faughan which enter the port at Londonderry.

Londonderry was developed around the river as a trading port. Downstream of the confluence of the Mourne and Finn rivers at Strabane to its tidal outfall at Londonderry the watercourse is known as the River Foyle. The Foyle is navigable for much of its length.

In addition to the main channel and tributaries, there are also a number of surface water bodies in the Foyle catchment. The majority of these features are small and spread across the large catchment and are likely to have little impact on the attenuation of flood flows. The most significant surface water feature is Lough Derg, in the River Derg tributary

Figure 5.2-4: Catchments in relation to the Londonderry APSFR



catchment. This lake is located across the border in the RoI.

Because a large part of the Foyle river catchment lies within the RoI, there is continuing cooperation with its OPW on matters of flood risk through 3 main cross-border groups set up for this purpose. Mutual cooperation arrangements with OPW continue for the Floods Directive second cycle as they have done for the first cycle and even before the introduction of the Directive. DfI held a position on the RoI's North Western IRBD, Catchment Flood Risk Assessment and Management (CFRAM) group and was a consultee on the FRMPs arising from that programme. Similarly, OPW is regularly updated on Flood Risk Management Planning developments in NI which are of cross-border interest.

Land use in the catchment is predominantly rural. There are a number of large settlements upstream of Strabane, including Omagh, Newtownstewart, Sion Mills and Castlederg, but these are small in comparison to the overall catchment area.

Within the bounds of the Londonderry APSFR there are commercial and quayside areas adjacent to the River Foyle on the western bank, with the rail link to Belfast skirting the eastern bank. Land rises fairly steeply away from the river in both easterly and westerly directions. Outside the city centre, urban areas are drained by small watercourses and local drainage systems which mainly flow back towards the Foyle. Drainage on the North Western and South Eastern fringes of the APSFR flow away from the city.

5.2.3.2 Urban drainage and wastewater network

NI Water is responsible for the clean drinking water supply, foul and storm water sewerage networks throughout NI. Within the bounds of the Londonderry APSFR, the sewerage network is split between combined systems (foul and storm) which tend to be in the older parts of the city and separate systems in new developments. There are approximately 230 km of combined sewers, 280 km of storm sewers and 240 km of foul sewers in the APSFR.

NI Water has two WwTW at Ardlough Road and Stradreagh Granhsa Park which are situated within the Londonderry APSFR. Additional sewage treatment infrastructure which also services the APSFR consists of 21 sewage pumping stations. The main WwTW situated on the bank of Lough Foyle at Culmore treats the wastewater from this catchment. The main water supply for this catchment extracts water from the River Faughan, impacted during the 2017 flood, before being treated at Carmoney Water Treatment plant and dispatched via the water network.

5.2.3.3 Environment

The APSFR encompasses the following WFD waterbodies, as shown in Table 5.2-1 below.

Table 5.2-1: Waterbody classification in and around Londonderry APSFR

Waterbody name	2015 Classification	2018 Classification	2021 Objective	Reason for failure
UKGBNI1NW393901002 Skeoge River	Poor Ecological Potential	Poor Ecological Potential	Moderate Ecological Potential	Invertebrates Fish (Hydro-morphology)
UKGBNI5NW250030 Upper Foyle	Moderate	Moderate	Moderate	Nutrients
UKGBNI1NW020204034 Burngibbagh	Good	Good	Good	N/A
UKGBNI1NW020208259 Faughan River (Carnmoney)	Poor	Moderate	Good	Fish (Hydro-morphology)

NB Hydromorphology can only downgrade an overall classification from High to Good.

More information about status and individual objectives can be viewed at the NIEA Information Request Viewer.

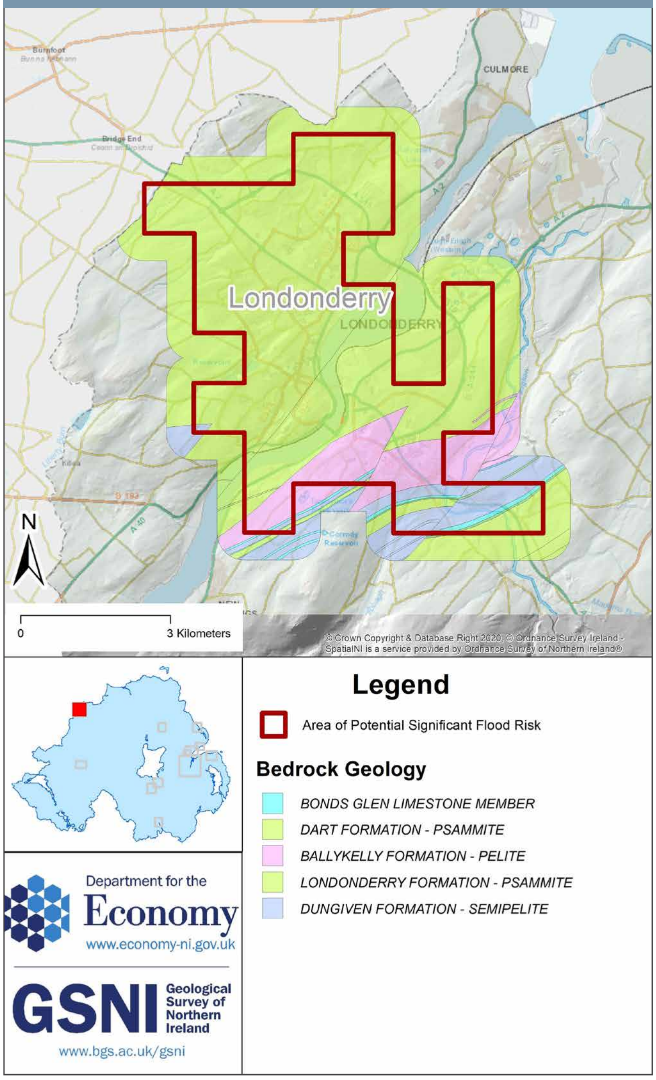
Some of the rivers and tributaries within the APSFR boundary, such as the Skeoge and Upper Foyle, suffer from acute and chronic pollution that is impacting upon their ecological status.

Flood alleviation works such as reducing run off within the catchment, improving the sewerage network by separating the foul and surface drainage and the establishment of blue / green infrastructure such as SuDS could all play a positive role in achieving WFD objectives within these waterbodies.

5.2.4 GEOLOGY

5.2.4.1 Bedrock Geology

Figure 5.2-5 : Bedrock geology of Londonderry



Bedrock under the Londonderry APSFR is composed of indurated schists belonging to:

- the Londonderry Formation (psammite);
- Ballykelly Formation (pelite);
- Dungiven Formation (semipelite) Bonds Glen Limestone Member (limestone) and;
- Dart Formation (psammite).

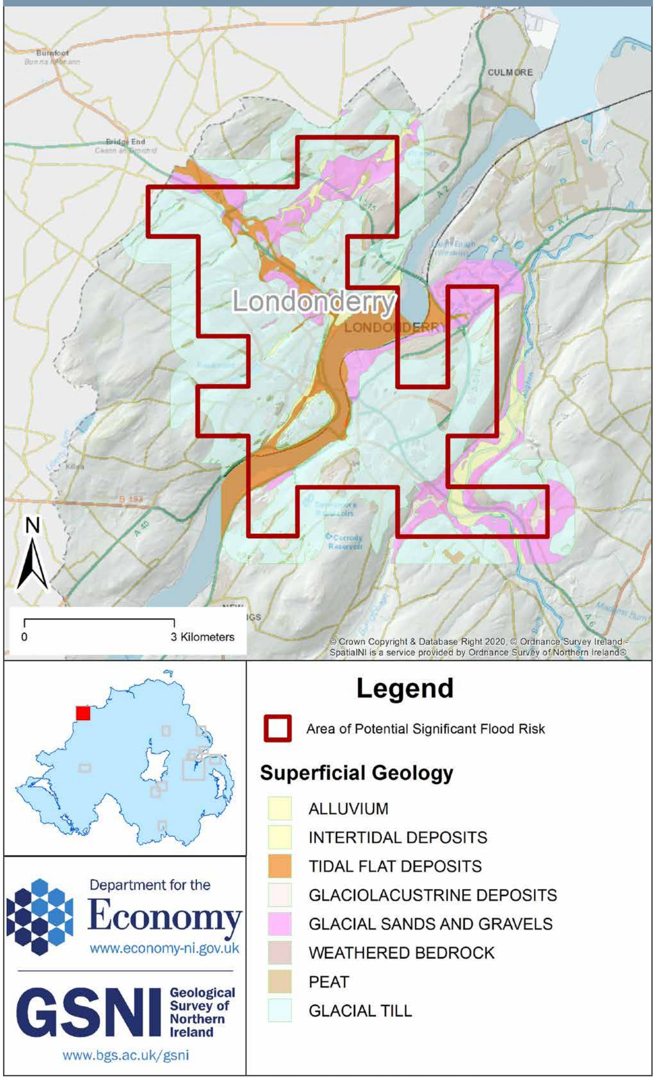
In the near surface these rocks hold limited groundwater in joints and fractures. However, surface water ingress into the bedrock is likely to be extremely limited and as such the bedrock offers virtually no alleviation of surface water flooding.

5.2.4.2 Superficial Geology

Glacial till is the dominant superficial deposit covering bedrock across the area, but it has very low permeability and as such will do little to alleviate surface flooding by allowing water to infiltrate into it or the underlying geology. Within this APSFR, in the Faughan river valley, adjacent to the south bank of the Foyle, Buncrana Road, Springtown, Galliagh and Ballyarnet areas of Derry, there are valley constrained deposits of glacial sand and gravel that have high porosity and permeability. Such deposits can readily absorb rain and surface water, and so where uncovered by impermeable man-made surfaces, will have a mitigating effect on surface flooding. However, once the storage within these deposits approaches capacity, it is possible that they could start to be a source of longer duration groundwater flooding especially in low lying valley floor areas and topographic hollows.

Areas of river alluvium are typically composed of sand, silt and cobbles and when not fully saturated can take in rain and surface water to help alleviate flooding. However, areas of alluvium tend to be quite thin and low lying, and are the first to flood in response to rising river water levels. Also present in the river valleys and estuaries are raised and active tidal flat deposits of clay that are impermeable and therefore will not alleviate surface flooding by allowing water to infiltrate into them or the underlying geology

Figure 5.2-6 : Superficial geology of Londonderry



5.2.5 SOURCES OF FLOODING

5.2.5.1 Risk to buildings and infrastructure by source

The NIFRA 2018 identified that Londonderry has the second highest level of flood risk amongst the twelve APSFR for NI. DfI has undertaken detailed predictive computer mapping and modelling of flooding from rivers and sea, and further strategic mapping for surface water flooding. The results of this mapping can be found on [Flood Maps (NI)](). An analysis of the potential consequences from flooding through computer modelling and mapping shows the predominant flood risk is from surface water flooding. Surface water flooding and flooding arising from smaller watercourse systems are therefore considered to be the predominant flood risks, however, during the August 2017 event, fluvial flooding from the River Faughan, flowing just to the east of Londonderry, and from other smaller systems in the city, contributed significantly to flood damages. While the August 2017 flood event was rare and extreme, exceeding design capability of flood defences by a considerable margin, surface-water flooding which can occur more frequently, is considered to have the potential to generate greater damages in this APSFR.

Despite the vast catchment of the River Foyle and the volume it receives from its tributaries, the River Foyle itself poses a limited fluvial risk to the city of Londonderry. Fluvial risk to infrastructure in Londonderry is posed from its smaller urban tributaries through the city and the River Faughan to the east. Surface water flooding causes more frequent flood damage and so annual average damages are much greater than those from fluvial and tidal sources. The surface water mapping also shows the floodplains of some smaller urban watercourses that are at highest risk.

Figure 5.2-7 shows the annual average damages (AAD) calculated by flood source. The graph shows that the highest AAD cost is from surface water sources by a considerable margin. Predicted AAD for surface water amounts to just under £8 million, second highest is tidal sources reaching approximately £450,000. The AAD from fluvial sources are lowest at approximately £170,000.

Figure 5.2-7: Annual Average Damages (£m) by flood source

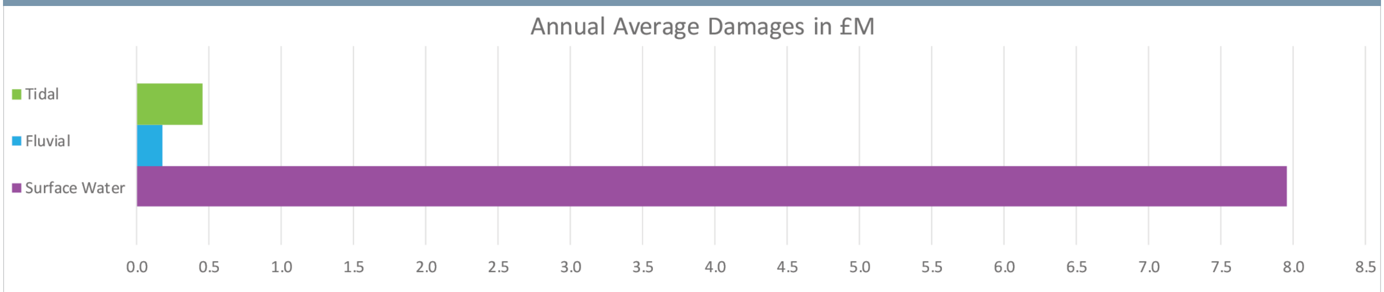
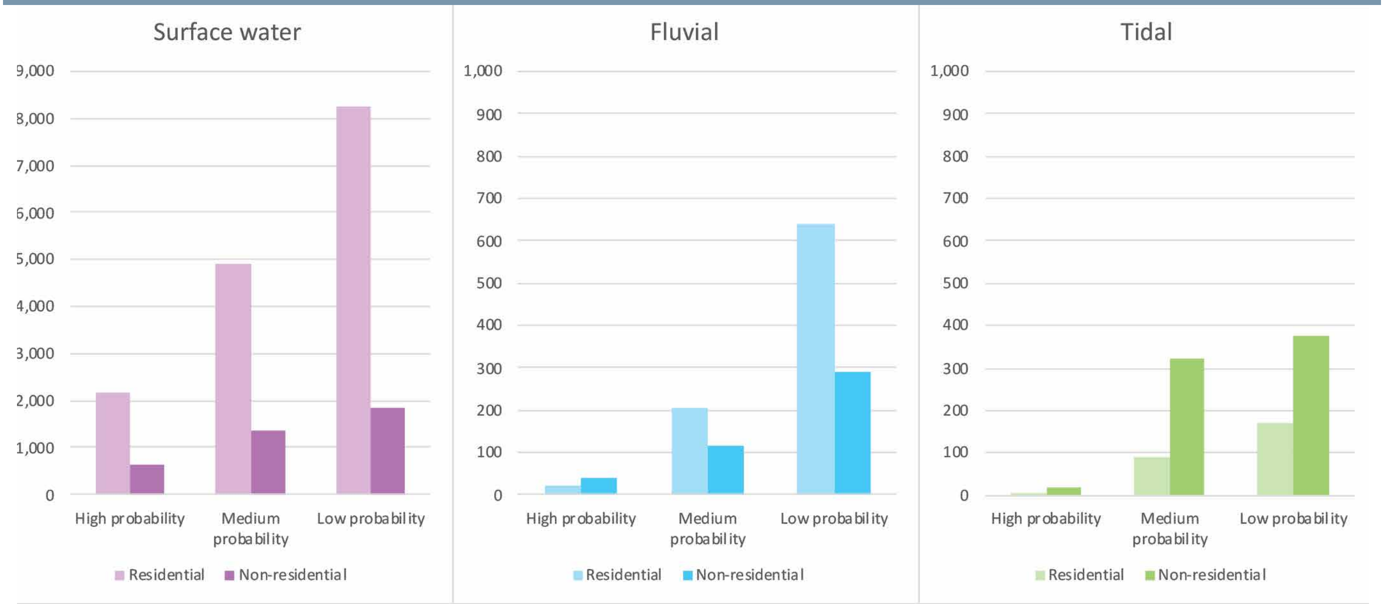


Figure 5.2-8 below shows a similar trend to Figure 5.2-7 in that surface water mapping indicates the highest number of buildings at risk from flooding compared to both tidal and fluvial flooding for high, medium and low probability events. Table 5.2-2 shows the return periods which have been assessed as high, medium and low probability events for surface water, fluvial and tidal flooding.

Table 5.2-2: Return periods for high, medium and low probability

Probability	Surface water	Fluvial	Tidal
High	3.33 % AEP (1 in 30 year)	10 % AEP (1 in 10 year)	10 % AEP (1 in 10 year)
Medium	0.5 % AEP (1 in 200 year)	1 % AEP (1 in 100 year)	0.5 % AEP (1 in 200 year)
Low	0.1 % AEP (1 in 1000 year)	0.1 % AEP (1 in 1000 year)	0.1 % AEP (1 in 1000 year)

Figure 5.2-8: Number of buildings located within the modelled flood extent



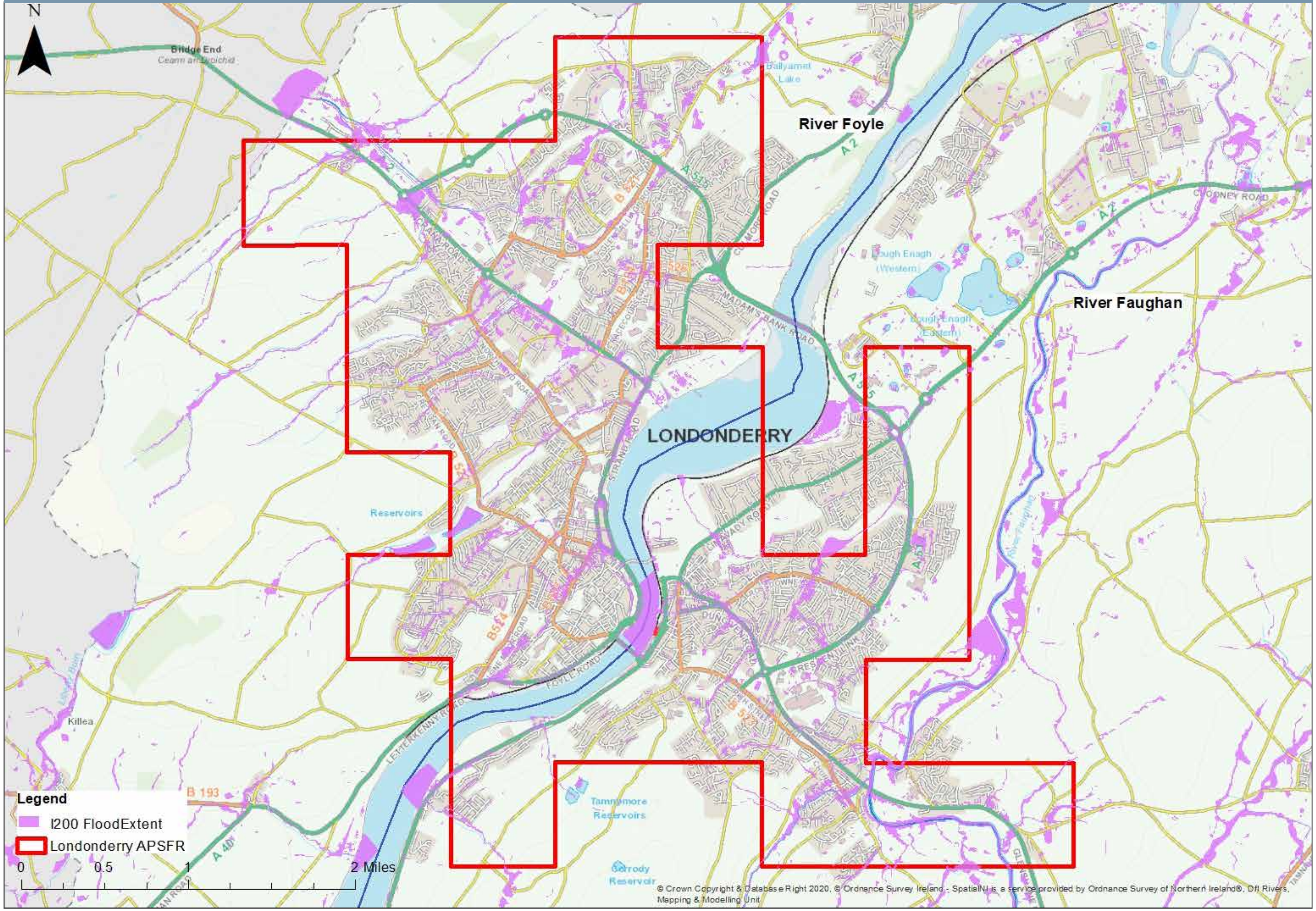
Note that the scale for surface water on Figure 5.2-8 (above), is different to account for significantly higher values than those for fluvial and tidal.

5.2.5.2 Surface Water (Pluvial)

The main areas of the city identified as being at surface water flood risk are the low-lying areas behind the quays on the west bank of the Foyle such as: Foyle Street, Strand Road and Rossville Street. These areas were impacted during the notable event of July 2015. There were also occurrences of surface water flooding across the city during August 2017 in the Springtown and Galliagh areas. Figure 5.2-9 shows the distribution of surface water flood risk across the APSFR at a 0.5% AEP (1 in 200 year) return period.

Infrastructure at risk from surface water flood events up to 0.1 % AEP (1 in 1000 year) in the Londonderry APSFR are care homes, police stations, schools, electricity substations, environmental heritage sites and built heritage sites. A detailed breakdown of this is included in Appendix D.

Figure 5.2-9: Overview of surface water hazard mapping for a 0.5% AEP (1 in 200 year) flood event



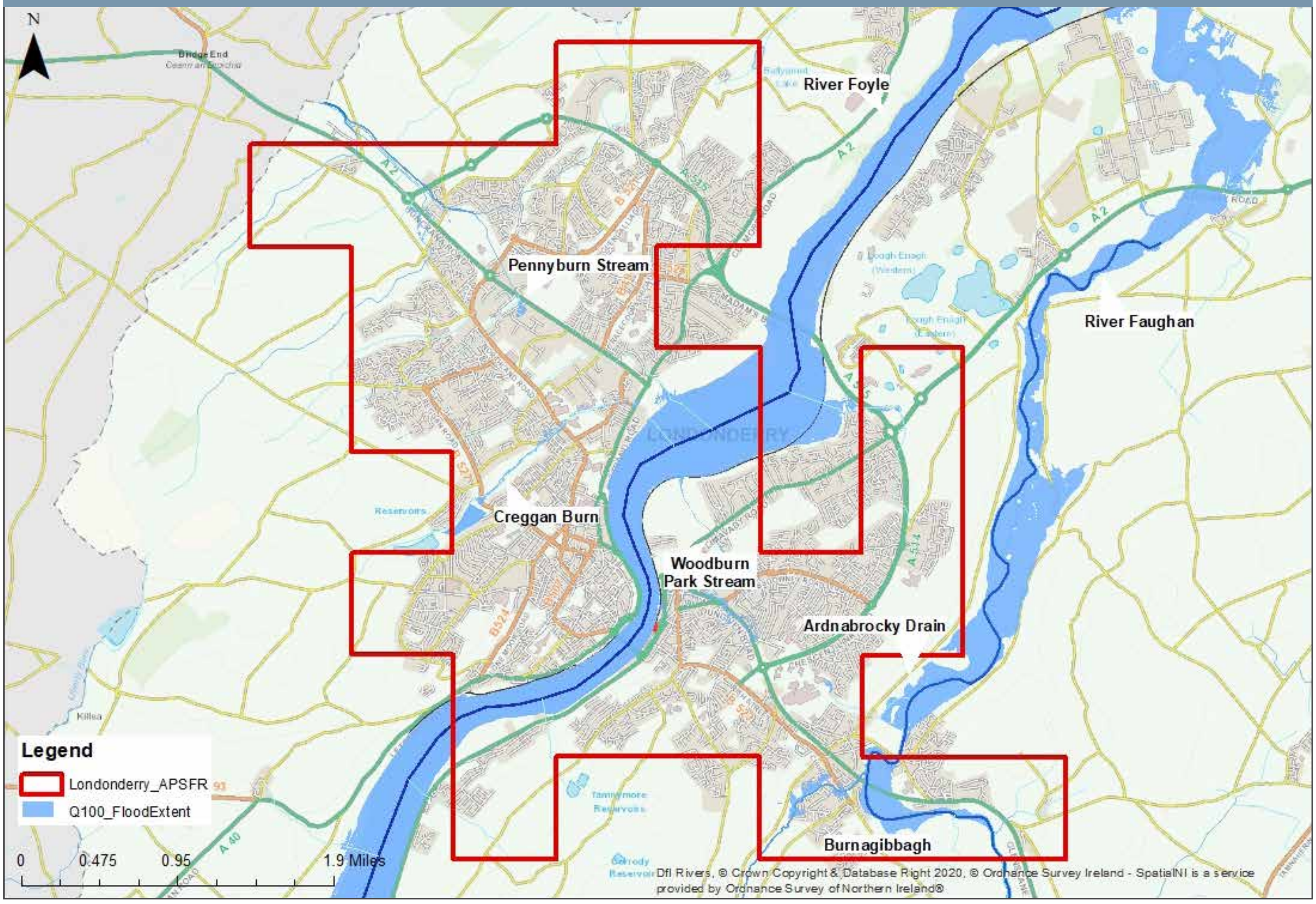
5.2.5.3 Fluvial

There are several urban watercourses running through the city, and the main areas at risk of fluvial flooding on the west bank of the Foyle lie near the Pennyburn Stream and Creggan Burn. The main areas at risk on the east bank are near the Woodburn Park Stream, Burnagibbagh and Ardnabrocky Drain. Figure 5.2-10 below shows the distribution of fluvial flood risk as an overview across the Londonderry APSFR.

The five Flood Alleviation Schemes as set out in the first cycle FRMP, are detailed in Section 5.2.7 of this APSFR are labelled in Figure 5.2-10 below.

Infrastructure at risk from fluvial flood events up to 0.1 % AEP (1 in 1000 year) in the Londonderry APSFR are electricity substations, environmental designated sites and built heritage sites. A detailed breakdown of this is included in Appendix D.

Figure 5.2-10: Overview of fluvial hazard mapping for a 1 % AEP (1 in 100 year) flood event



5.2.5.4 Tidal

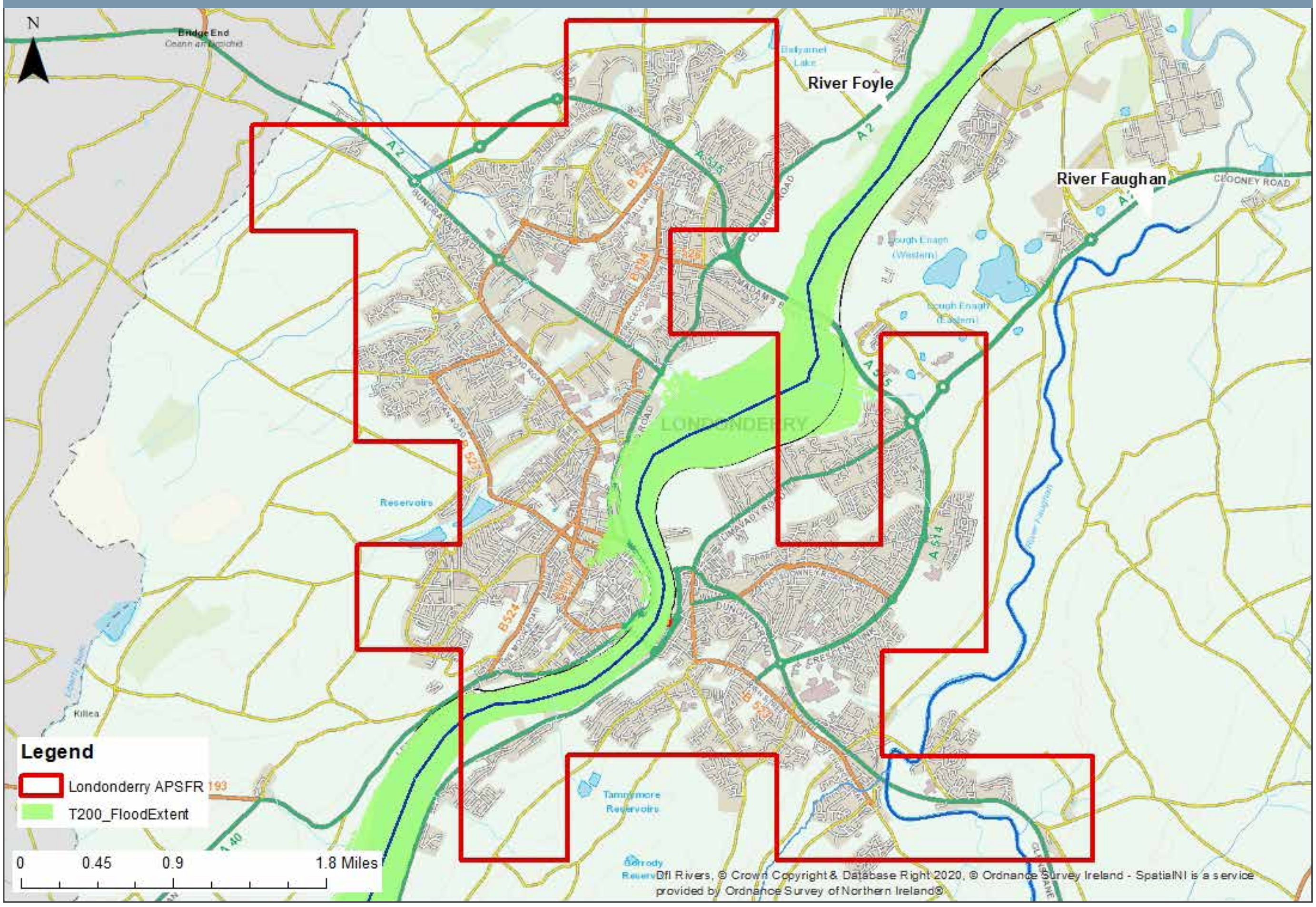
Lough Foyle is a complex tidal estuary with a narrow entrance and many irregular features, including numerous mud flats. Londonderry has no formal sea defences, however, banks/quays act as a form of tidal defence that provides limited protection to low-lying areas of the city. These could overtop in more severe flood events, although tidal flood risk is much lower overall than combined fluvial and surface water flood risk and the standard of protection they offer is unknown.

Further studies are being undertaken at Coolkeeragh Power Station on the coast, where flooding could lead to significant infrastructure failure. At Coolkeeragh, the railway embankment acts as a form of sea defence, although it is not recognised or managed as a formal flood defence.

An overview of the tidal flood extent for the Londonderry APSFR is shown in Figure 5.2-11 below.

Infrastructure at risk from tidal flood events up to 0.1 % AEP (1 in 1000 year) in the Londonderry APSFR are GP surgeries, a police station, electricity substations and listed buildings. A detailed breakdown of this is included in Appendix D.

Figure 5.2-11: Overview of tidal hazard mapping for a 0.5 % AEP (1 in 200 year) flood event



5.2.6 CURRENT FLOOD RISK MITIGATION

5.2.6.1 Planning

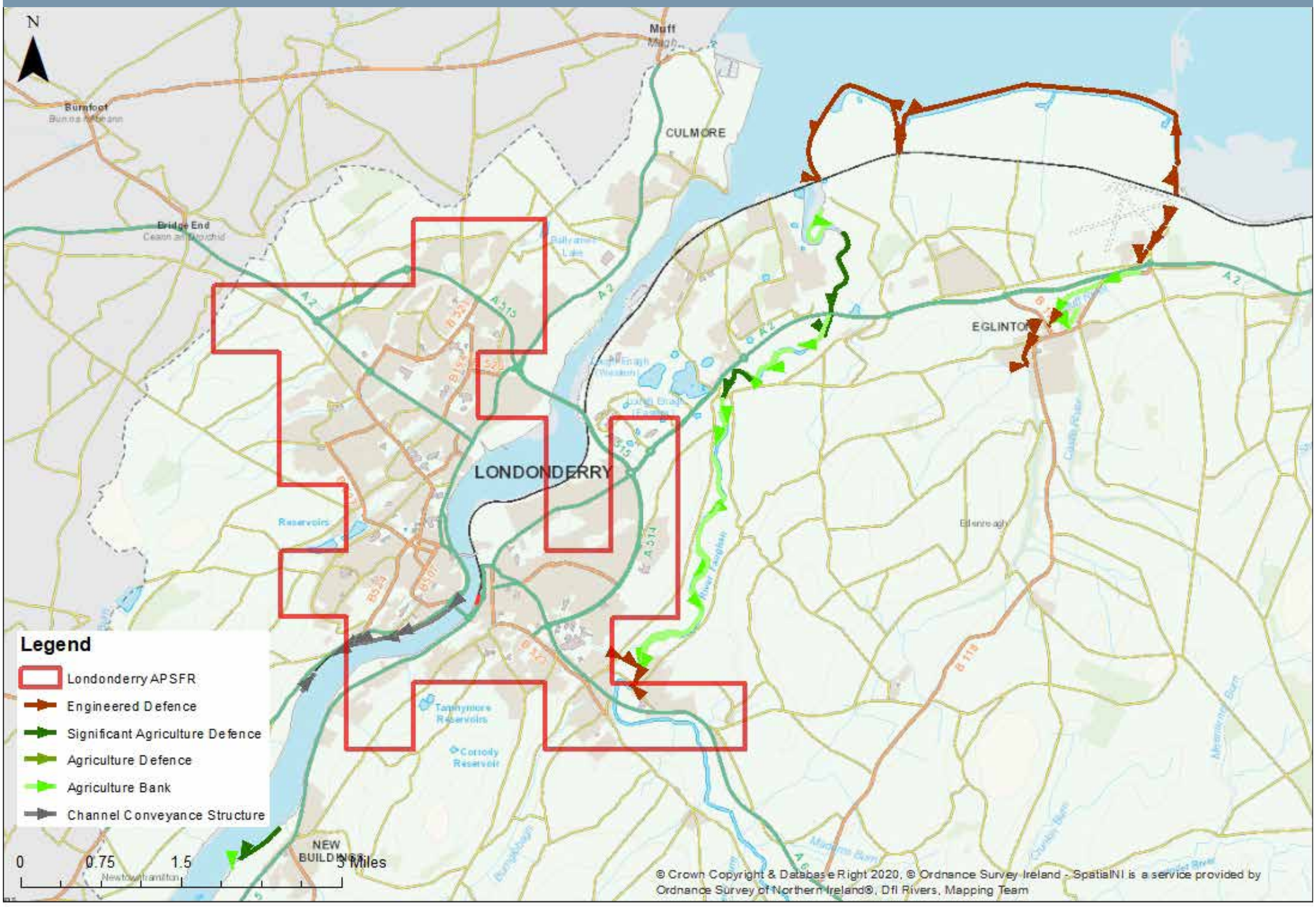
In addition to national planning policy and advice, DfI Rivers will advise against bringing forward sites or the zoning of any land in preparation for the new Derry City and Strabane District Council Local Development Plan, particularly for built development, that has been identified from the flood maps as being within the 1 % AEP (1 in 100 year) fluvial floodplain, 0.5 % AEP (1 in 200 year) tidal floodplain/ reservoir inundation area, or is susceptible to surface water flooding.

5.2.6.2 Flood defences

Figure 5.2-12 below shows the existing defences in the vicinity of the Londonderry APSFR which protect properties from fluvial and tidal flood risk. All existing defences listed below lie outside the boundary of the APSFR, apart from the raised parkland along Foyle Road to the south of Londonderry. Defences in the figure below are:

- the sea defences at Black Brae, Longfield, Ballykelly and Myroe on the south bank of Lough Foyle;
- various agricultural embankments throughout the river catchment;
- engineered river flood defences protecting the village of Eglington;

Figure 5.2-12: Flood defences in Londonderry APSFR.



- a sheetpiled river flood defence on the left bank of the River Faughan at Three Mile House (Drumahoe) shown in Figure 5.2-12 as engineered defence;
- raised linear parkland alongside the River Foyle at Foyle Road and;
- an embankment at Newbuildings which defends properties from inundation from the River Foyle.

Other schemes outside the first cycle of FRMP measures undertaken by DfI Rivers to address specific drainage and flood defence issues in Londonderry are, culvert works at Shantallow, the Springtown Tributary Extension, and Coshquin Burn Extension. There was also a major scheme to divert a proportion of the flow from the Skeoge River to the River Foyle, which enabled extensive regeneration to take place on the west bank of the River Foyle.

NI Water completed two capital schemes during PC15, the current investment period 2015-2021, which were;

- Sheelin Park Flood Alleviation (£65 k);
- Foyle Springs, Derry Flood Alleviation (£385 k).

5.2.6.3 NI Coastal Flood Response Plan

Due to the tidal flood risk in Londonderry, the APSFR is included in the Northern Ireland Coastal Flood Response Plan, published in January 2019.

The NI Coastal Flood Response Plan was developed by the Flooding and Severe Weather Working Group of the 3 NI Emergency Preparedness Groups (EPGs). Its aim is to provide a pre-planned response to warnings of coastal flooding and to outline the graduated incident and co-ordinated inter-agency response to a potential or actual tidal flooding event affecting NI. The Plan was completed and tested in early 2017 and it includes coastal areas in the vicinity of Londonderry. The Plan remains a living document to incorporate any changes to the area and to ensure it is up to date.

5.2.7 ACTIONS IN THE FIRST CYCLE FLOOD RISK MANAGEMENT PLAN

In the first cycle FRMP, there were seven specific measures for Londonderry APSFR. Some of these measures were reprioritised following the severe flooding in 2017.

Good progress has been made on the Londonderry APSFR measures, with the completion of the Coastal Emergency Response Plan and the six potential Capital Works Schemes are being progressed through feasibility studies (note that in the first cycle FRMP these six were originally scheduled for the second cycle FRMP period).

Table 5.2-3 shows a summary of the measures within Londonderry APSFR and their progress.

Table 5.2-3: Progress tracking for Flood Risk Management Plan measures 2015-2021

Category	Measure code from First Cycle FRMPs	Measure description	Progress
PROTECTION	UKNI_NW_APSFR_01_01	Ardnabrocky, Ardnabrocky Drain – Flood Alleviation Scheme (protecting approx. 10 residential and commercial properties)	Feasibility study complete.
	UKNI_NW_APSFR_01_02	Lower Tullyally, Burnagibbagh – Flood Alleviation Scheme (protecting approx. 90 residential and commercial properties)	Feasibility study complete.
	UKNI_NW_APSFR_01_03	Waterside, Woodburn Park Stream – Flood Alleviation Scheme (protecting approx. 120 residential and commercial properties)	Feasibility study complete.
	UKNI_NW_APSFR_01_04	Springtown, Pennyburn Stream – Flood Alleviation Scheme (protecting approx. 55 commercial properties)	Feasibility study complete.
	UKNI_NW_APSFR_01_05	Creggan, Creggan Burn – Flood Alleviation Scheme (protecting approx. 20 residential and commercial properties)	Feasibility study complete.
	UKNI_NW_APSFR_01_06	Foyle Coastal Study	Feasibility study complete.
PREPAREDNESS	UKNI_NW_APSFR_01_07	Foyle Coastal Emergency Response Plan	Coastal flood plans completed and tested.

5.2.7.1 Prevention

No particular Prevention measures specific to Londonderry were set out in the first cycle FRMP.

As outlined in Chapter 4, DfI Rivers advises on planning applications regarding the risk of flooding. The basis of this advice is to avoid inappropriate development in areas which are at risk of flooding and to ensure that any development does not increase flood risk elsewhere.

5.2.7.1.1 Planning policy

A new LDP for the Derry City and Strabane District Council (DCSDC) for the period up to 2032 is being prepared with the adoption of the Plan Strategy in 2021/2022 and Local Policies Plan in 2023/2024, during the second FRMP cycle. It will comprise:

- a Plan Strategy to define strategic objectives for future development of the District including strategic policies and a spatial strategy;
- a Local Policies Plan which will include site-specific proposals, designations and zoning to deliver the Strategy.

On adoption, the new LDP will replace the current Derry Area Plan 2011 and the Strabane Area Plan 2001 and operational planning policies that were produced by the previous Department of the Environment.

5.2.7.2 Protection

Following the re-prioritisation of measures as a consequence of the August 2017 flood event in the North Western IRBD, DfI Rivers commissioned feasibility studies for Londonderry APSFR Measures 1-6 (coded 'UKNI_NW_APSFR_01_01' to 'UKNI_NW_APSFR_01_06'). These feasibility studies identify viable solutions to fluvial and tidal flooding within the Londonderry APSFR. Detailed design of the schemes is scheduled to commence in 2020, with the construction phase start date programmed for 2022.

The schemes are as follows:

- Ardnabrocky Drain Flood Alleviation Scheme (FAS);
- Lower Tullyally, Burnagibbagh FAS;
- Waterside, Woodburn Park Stream FAS;
- Springtown, Pennyburn Stream FAS;
- Creggan Burn FAS;
- Foyle Coastal Study.

The fluvial hazards for the five watercourses proposed for FAS above are shown in Figure 5.2-10.

The HFPGS is available to those residents who have experienced property flooding. In the Londonderry APSFR, so far 13 properties have successfully applied for the scheme and all installation works have been completed. Just outside the APSFR boundary to the east of the city there are 11 further properties (10 in Eglinton) that have also availed of the scheme and works have been completed.

5.2.7.3 Preparedness

The Coastal Emergency Response Plan for Londonderry was completed and tested in early 2017. The Plan remains a living document to incorporate any changes to the area and to ensure it is up to date.

The local community in the Altnagelvin Area (Drumahoe) has expressed an interest in community engagement, therefore engagement led by RCRG is presently ongoing. This has been pursued in addition to the first cycle FRMP actions.

5.2.8 UPDATED PROGRAMME FOR SECOND CYCLE FLOOD RISK MANAGEMENT PLAN

5.2.8.1 Key Messages

Although there are no specific measures set out under Prevention for the Londonderry APSFR in the first cycle FRMP, the Derry City and Strabane District Council Area (DCSDC) LDP is scheduled to be finalised early in the second cycle FRMP. The LDP, alongside current advice on Planning from DfI Rivers, will support mitigation of flood risk in the council area in relation to both new development and redevelopment proposals from the LDPs adoption and through the second FRMP cycle. This will be taken forwards as a measure for the second cycle FRMP for DfI Rivers to work with DCSDC to update the flood risk policy within the new LDP.

Protection measures identified in the first cycle FRMP are awaiting detailed design in 2020. Five of these schemes will reduce the risk of fluvial flooding from smaller watercourses in the APSFR and the remaining scheme is focussed on coastal flood risk. In addition to this, DfI Roads will look at opportunities for alleviating surface water flood risk through road improvement schemes, by the use of sustainable drainage.

Under the Preparedness category, the Coastal Emergency Response Plan has successfully been completed within the first cycle FRMP. In addition to the measures set out, there has been an expression of interest from Altnagelvin Area (Drumahoe) community where engagement is ongoing through the RCRG; therefore this will be progressed through to the second cycle FRMP. The HFPGS will continue to support owners of domestic properties at risk to better prepare themselves.

5.2.8.2 Enhanced Drainage Area Plan

NI Water is currently taking forward modelling in the form of DAPs across NI for drainage areas with populations typically above 2000. The traditional approach is for all combined and foul sewers to be modelled. For the period April 2021 – March 2027 NI Water, will be conducting Enhanced DAPs in each of the APSFR. These Enhanced DAPs extend modelling to include the NI Water storm sewers, which may identify drainage improvement schemes.

Table 5.2-4 below sets out the measures and timescales for the Londonderry APSFR in the second cycle FRMP:-

Table 5.2-4: Proposed measures for Flood Risk Management Plan cycle 2021-2027

Category	Measure summary	Lead authority	Specific measure	Timescale
PREVENTION	Influence local planning policy for development and flood risk		By 2024, DfI Rivers will work with Derry City and Strabane District Council to update flood risk policy in the Local Development Plan.	2024
	Enhanced Drainage Area Plan	NI Water	By the 31st March 2027, NI Water will produce an Enhanced DAP for Londonderry that sets out actions to mitigate integrated flooding issues.	2027
PROTECTION	Implementation of Flood Alleviation Schemes	DfI Rivers	By 2024, the DfI will progress flood alleviations schemes for the Burnagibbagh, Woodburn Park Stream, Pennyburn Stream and Creggan Burn through detailed design and construction to alleviate fluvial flooding.	2024
	Implementation of Flood Alleviation Schemes	DfI Rivers	By 2024, DfI Rivers will undertake detailed design work for the Foyle Coastal flood alleviation scheme, after which the scheme will be constructed.	2024
	Identify new opportunities to alleviate flood risk, particularly surface water	DfI Roads	By 2027, DfI Roads will integrate sustainable drainage systems into improvements to the A2 road to alleviate surface water flooding	2027
PREPAREDNESS	Community engagement though the Regional Community Resilience Group (RCRG) in Altnagelvin/ Drumahoe and other areas requiring support	RCRG	By 2021 the RCRG will finalise establishment of the Altnagelvin/ Drumahoe community group to increase the resilience of the community to flooding.	2021
			The RCRG will progress engagement in further areas of Londonderry, as appropriate or as required, to increase community resilience to flooding.	2027

5.3

NEWRY

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5.3.1 SUMMARY

5.3.1.1 Flood risk area overview

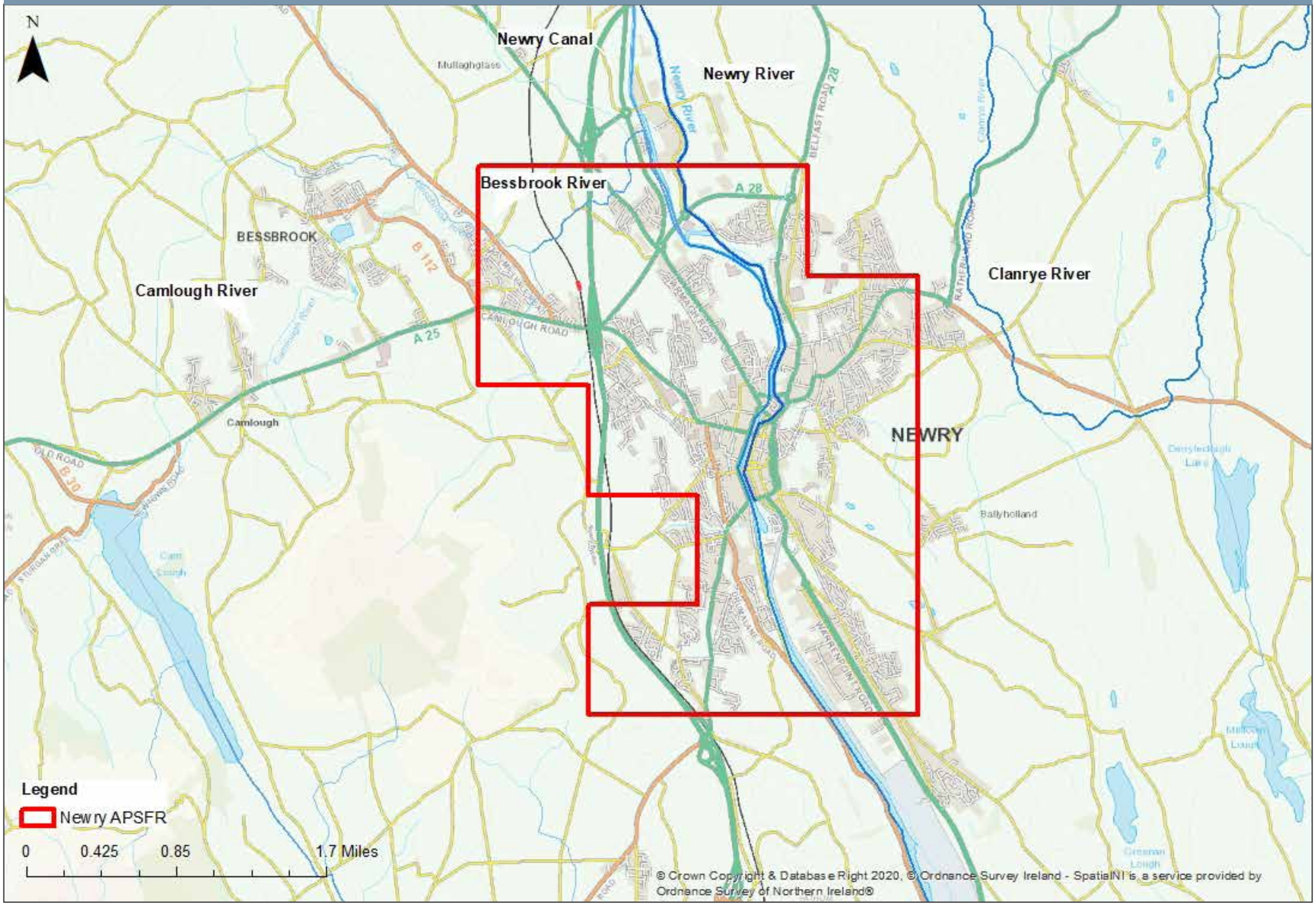
Newry is a city which straddles the boundary between counties Armagh and Down, and lies 34 miles (55 km) south from Belfast not far from the border with the RoI. It has a population of approximately 26,970 according to the 2011 Census. The city is bisected by the Newry River and Newry Canal as shown below in Figure 5.3-1, and the core boundary of the Newry APSFR is located within the Newry and Mourne Local Flood Management Area.

Newry is situated in the Neagh Bann IRBD and flood risk in the area is from fluvial, surface water and coastal sources. The most recent significant flooding was in 2014 although there was also flooding in early 2020.

5.3.1.2 Northern Ireland Flood Risk Assessment (NIFRA) 2018

The boundary for the Newry flood risk area, as identified in the PFRA 2011, was a linear area along the watercourses running through Newry. The APSFR boundary was updated and changed in the NIFRA 2018, and now includes the Dunbrae and Camlough Road area to the west, and also an area towards Ballyholland in the east.

Figure 5.3-1: Location and boundary of Newry APSFR and key watercourses



5.3.2 HISTORY

5.3.2.1 Summary of flooding history

Newry's flood history across numerous parts of the city, is well documented in records dating back to the mid-1800s with prominent flood events occurring in October 2011 and November 2014.

There is a flood bank between the Newry River and the Newry Canal on the outskirts of the city, to prevent flood water crossing into the Newry Canal which can cause a flood risk to Newry City Centre. In October 2011 the Newry River overtopped this bank although no flooding occurred in the City Centre and the event was recorded as a 'near miss'.

Other recent events occurred around the Greenan Road and Old Warrenpoint Road area in March 2013 where surface water flooding affected residential properties and roads in the area. In this event, high levels were recorded in the Commons Stream and a tributary culvert exceeded its capacity. Figure 5.3-2 below shows flooding from this 2013 event.

On November 13th and 14th 2014, extensive and prolonged rainfall caused flooding in Newry, with the rainfall station at Glenanne recording 101.4 mm of rain over a four-day period. This resulted in significant flooding at Bridge Street in the city centre due to a combination of surcharging of the storm drainage network, high flows in the Glen River culvert, to which stormwater is discharged, and the Newry River being affected by a high tide preventing flow through the syphons at the downstream end of the Glen River Culvert. Several homes and shops were evacuated in Bridge Street, due to part of the street being under 600 mm – 900 mm of water. During this event Newry Sports Centre was used as a rescue centre. Both commercial and residential properties were flooded along Bridge Street and it was described as 'impassable' by police at that time.

Figure 5.3-2: Surface water flooding at Greenan Road in March 2013

5.3.2.2 Flood events since 2015

Newry experienced flooding as a result of Storm Frank in December 2015 which affected Kilmorey Street, Derryleckagh Road and the major road routes between Kilkeel and Newry.

In January 2016, Newry, Mourne and Down District Council activated its emergency flood plan when some of the highest ever rainfalls recorded in the Newry area resulted in extremely high river levels, which led to flooding in both urban and rural areas. The emergency response involved coordination and liaison between flood response agencies, Council and Blue-Light organisations, along with the distribution of sandbags and making safe passage for pedestrians/traffic.

In August 2019, intense rainfall lead to sewage backing up in residents' homes at Killeavy Road and manholes in the area also overflowing with raw sewage.

Figure 5.3-3: Flooding from Newry River into Newry Canal, December 2015

5.3.3 CATCHMENT

5.3.3.1 Catchment characteristics and tributaries

Newry is within the Neagh Bann IRBD, and the APSFR consists of a complex network of open watercourses and culverts, including the Newry River and Newry Canal. The entire Newry River catchment, to its discharge point at Carlingford Lough, has a total catchment area of approximately 323 km2 and drains a large area of South East Down and South West Armagh. This catchment is shown in Figure 5.3-4 below.

The Newry River and Newry Canal are the main watercourses that flow through Newry City Centre to outfall at Carlingford Lough, where the Newry Canal joins the Newry River estuary through a side weir. The rivers Clanrye, Jerettspass and Bessbrook are other key watercourses within the Newry area. It should be noted that flows in the Bessbrook are affected by the attenuation provided by Cam Lough and its associated and recently reconstructed dam structure situated in the hills to the west of the City beside the village of Camlough.

The Newry River begins at the confluence of the Jerretspass and the Clanrye Rivers, approximately 5.5 km upstream of Newry City Centre. From this confluence point it continues through Newry City Centre where it becomes tidal downstream of Thompson's Weir. The detailed interactions of these watercourses are shown in Figure 5.3-4a below, and the location of Thompson's Weir is shown in Figure 5.3-4b.

Figure 5.3-4: Catchments in relation to the Newry APSFR

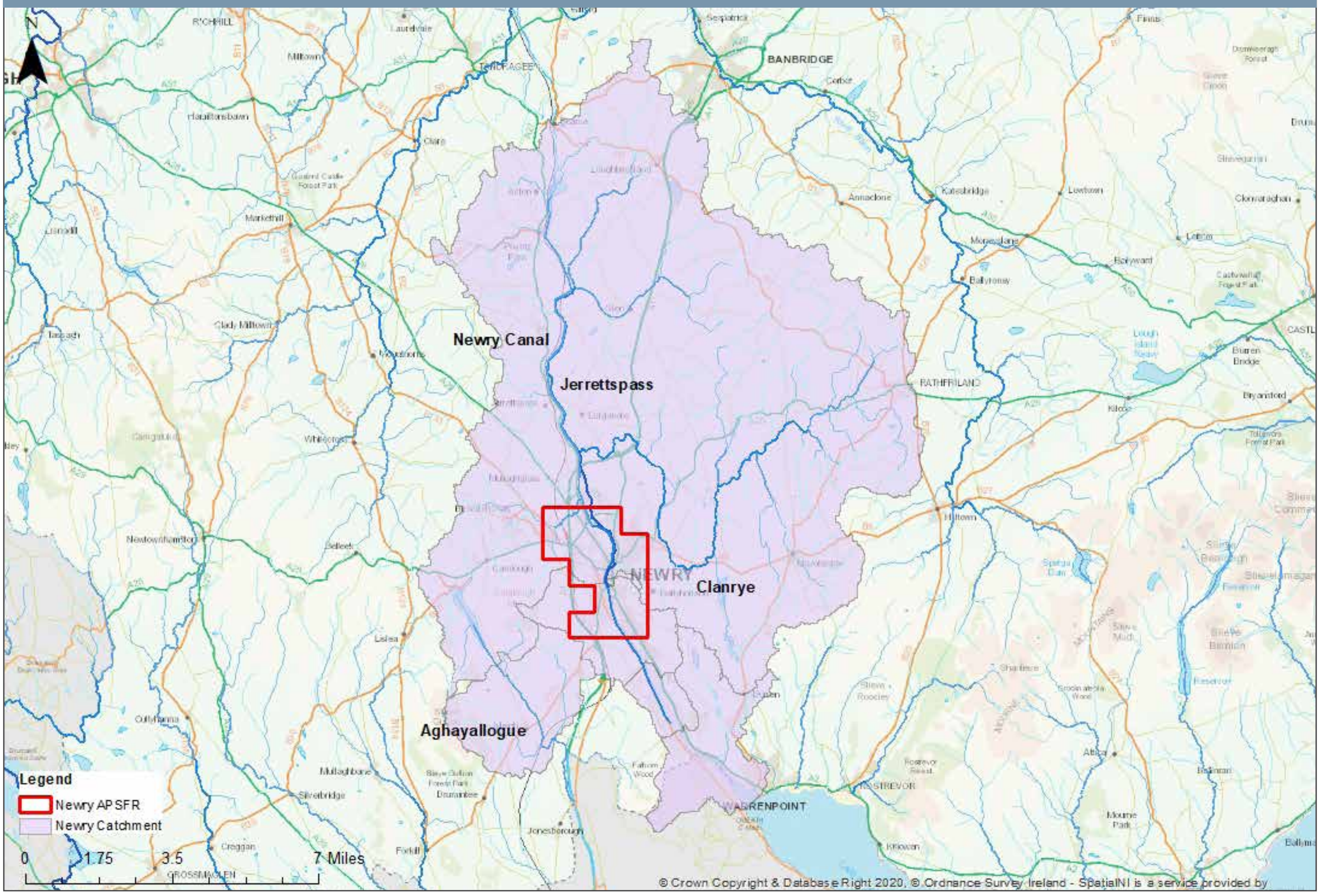


Figure 5.3-4a: Detailed interaction of watercourses in the Newry APSFR

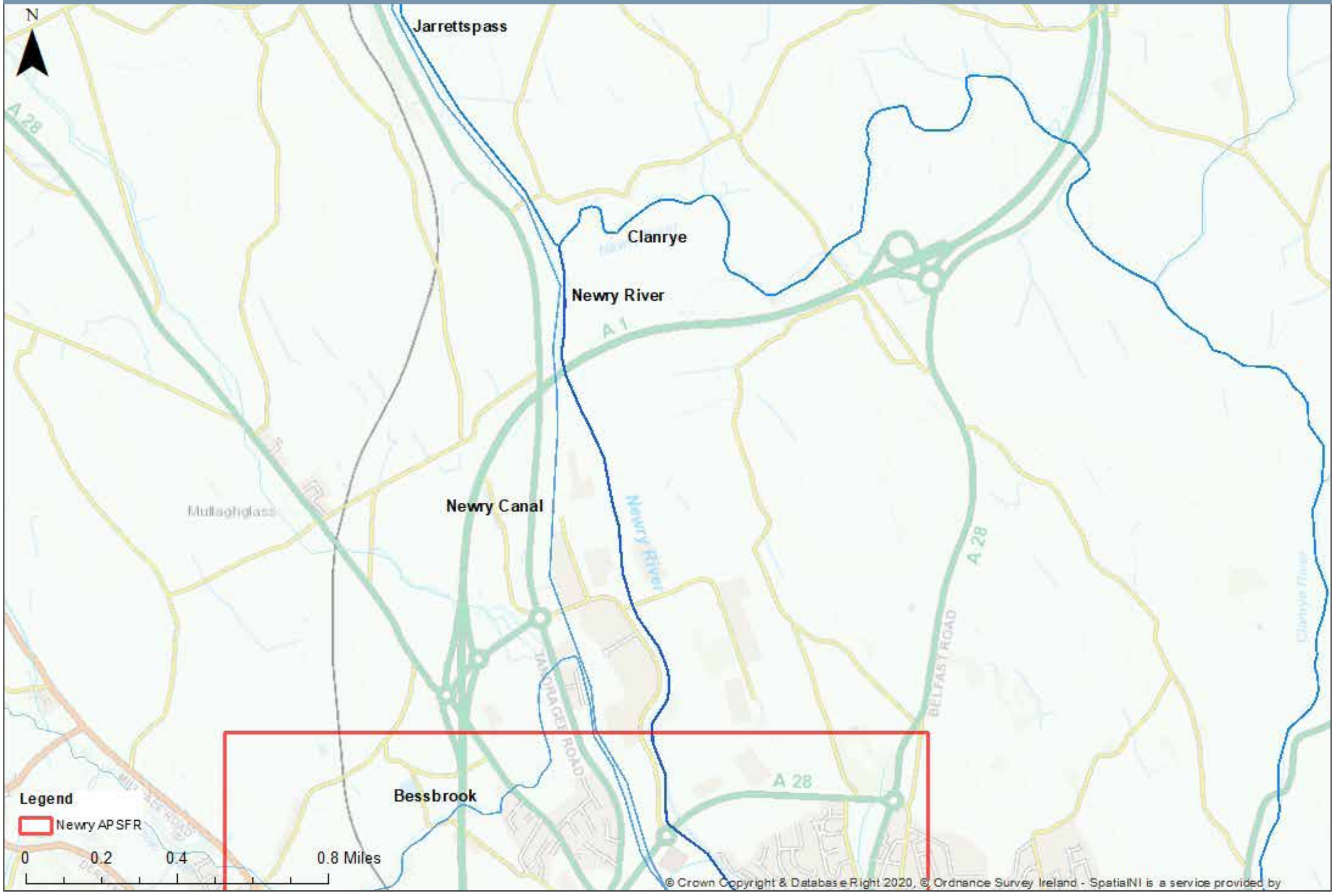
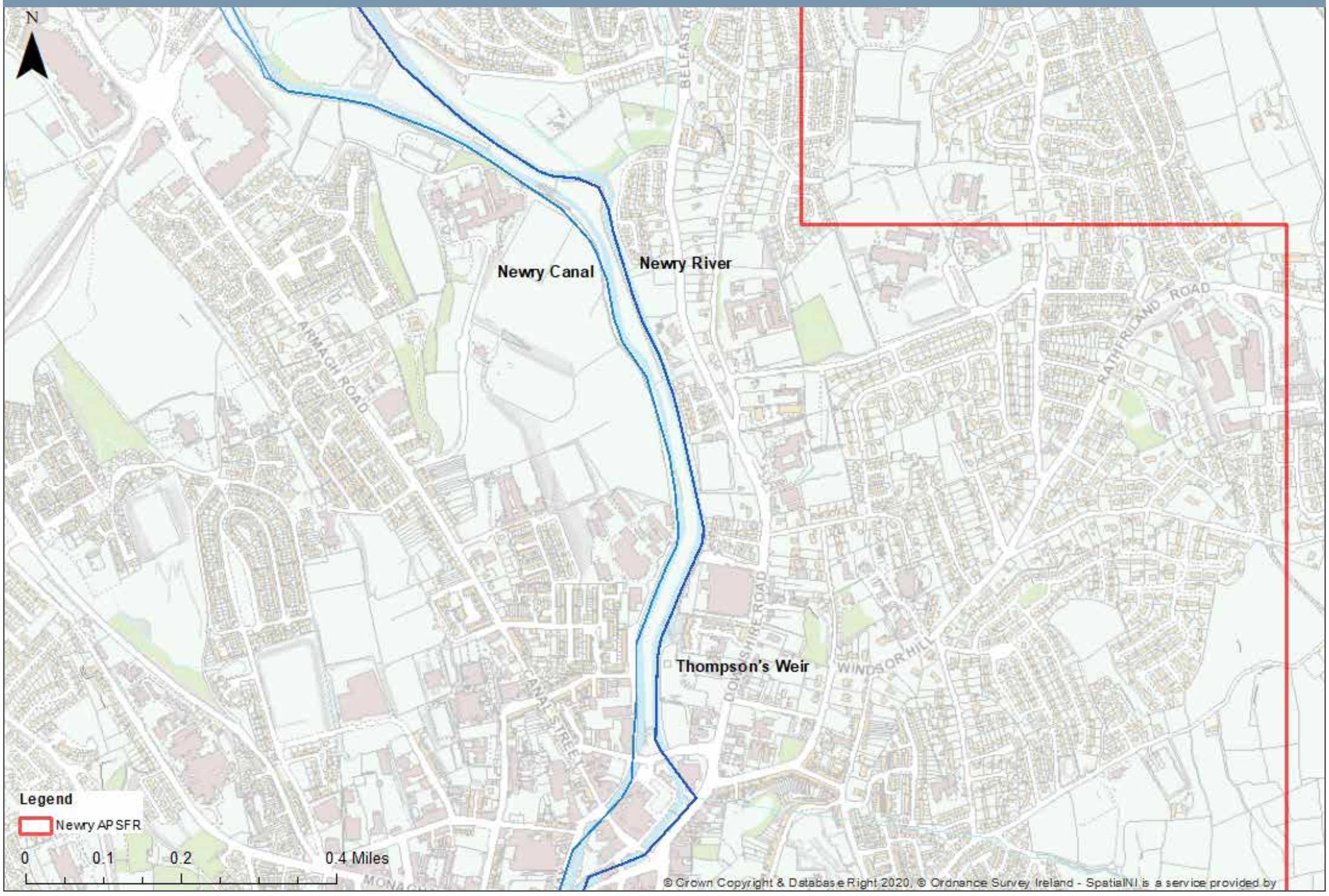


Figure 5.3-4b: Location of Thompson's Weir on the River Newry, adjacent to Glin Ree Court



Downstream of the City Centre the river channel significantly widens before entering Carlingford Lough. Other named tributaries of the Newry River include Damolly Drain, Downshire Stream, Sandy's Street Stream, Derrybeg River (plus tributaries), Glen River (plus tributaries), Knox Peebles Stream and the Commons Stream (plus tributaries), which are further detailed below in Section 5.3.5.3. The Bessbrook River can also be considered as a tributary; however, it discharges into the Newry Canal which in turn discharges into the Newry River.

The Derrybeg River and its tributaries drain much of the western part of Newry and it discharges to the Newry River via a syphon arrangement in the area of Cornmarket / O'Hagan Street. Large sections of the Derrybeg River are culverted through the low-lying areas of the City Centre. The Derrybeg River and Dromalane Stream join the Newry River from the west and they are culverted under the Newry Canal in syphons just south of Albert Basin.

The Newry Canal was opened in 1742 to allow a connection from Newry through to the Upper Bann at Portadown and on towards Lough Neagh. The canal was abandoned for commercial purposes in stages from 1949 to 1974. It is a designated watercourse and serves a drainage function in the rural area upstream of Newry. The maintained water level of the Canal is 3.5 m which is approximately 0.5 m below the adjacent ground levels. An agreement between DfI Rivers and Newry, Mourne and Down District Council allows for the canal water level to be lowered when warning of a potential flood event is received.

5.3.3.2 Urban drainage and wastewater network

NI Water is responsible for the clean drinking water supply, foul and storm water sewerage networks throughout NI.

The majority of the NI Water drainage network within the APSFR is separated; there is approximately 115 km of storm sewers and 130 km of foul sewers. The total length of combined sewer network is approximately 30 km.

Newry's WwTW serving the whole area of Newry is situated in the Greenbank Industrial Estate just upstream of where the Newry River widens into Carlingford Lough. There are 12 NI Water wastewater pumping stations within the Newry APSFR, and one sludge treatment works at the WwTW site.

5.3.3.3 Environment

The APSFR encompasses the following WFD waterbodies:

Table 5.3-1: Waterbody classification in and around Newry APSFR

Waterbody name	2015 Classification	2018 Classification	2021 Objective	Reason for failure
UKGBNI1NB060604048: Newry Canal	Moderate Ecological Potential	Moderate Ecological Potential	Good Ecological Potential	N/A
UKGBNI1NB060608240: Bessbrook (Newry) River	Moderate Ecological Potential	Moderate Ecological Potential	Good Ecological Potential	Invertebrates Macrophytes BOD Soluble Reactive Rhosphorus
UKGBNI1NB060608227: Newry River	Moderate	Moderate	Good	Phytobenthos Fish Soluble Reactive Phosphorus
UKGBNI1NB060608247: Flurry River (Meigh)	Moderate	Poor	Good	Dissolved Oxygen (DO)
UKGBNI5NB030010: Newry Estuary	MEP	N/A	MEP	Angiosperms, Invertebrates Dissolved Inorganic Nitrogen (DIN) Fish Specific pollutants

More information about status and individual objectives can be viewed at the NIEA Information Request Viewer.

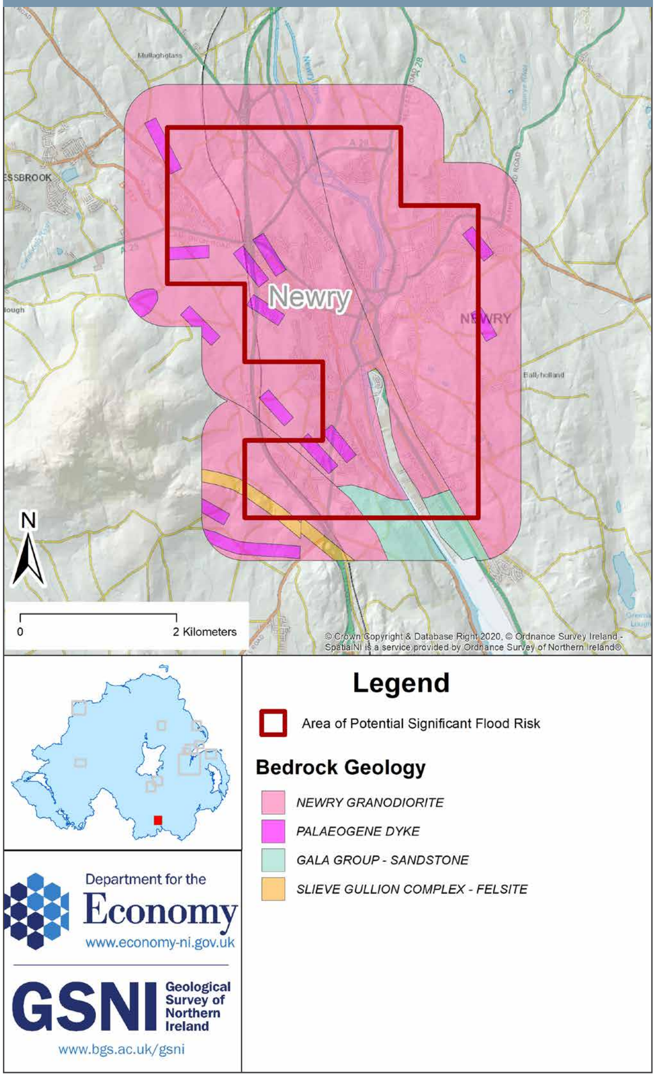
The Newry River and the tributaries within the APSFR boundary suffer from acute and chronic pollution that is impacting upon their ecological status.

Flood alleviation works such as reducing run off within the catchment, improving the sewerage network by separating the foul and surface drainage and the establishment of blue / green infrastructure such as SuDS could all play a positive role in achieving WFD objectives within these waterbodies.

5.3.4 GEOLOGY

5.3.4.1 Bedrock Geology

Figure 5.3-5 : Bedrock geology of Newry



Bedrock under the Newry APSFR includes:

- granites of the Newry Igneous and Slieve Gullion complexes and;
- greywacke sandstone of the Gala Group.

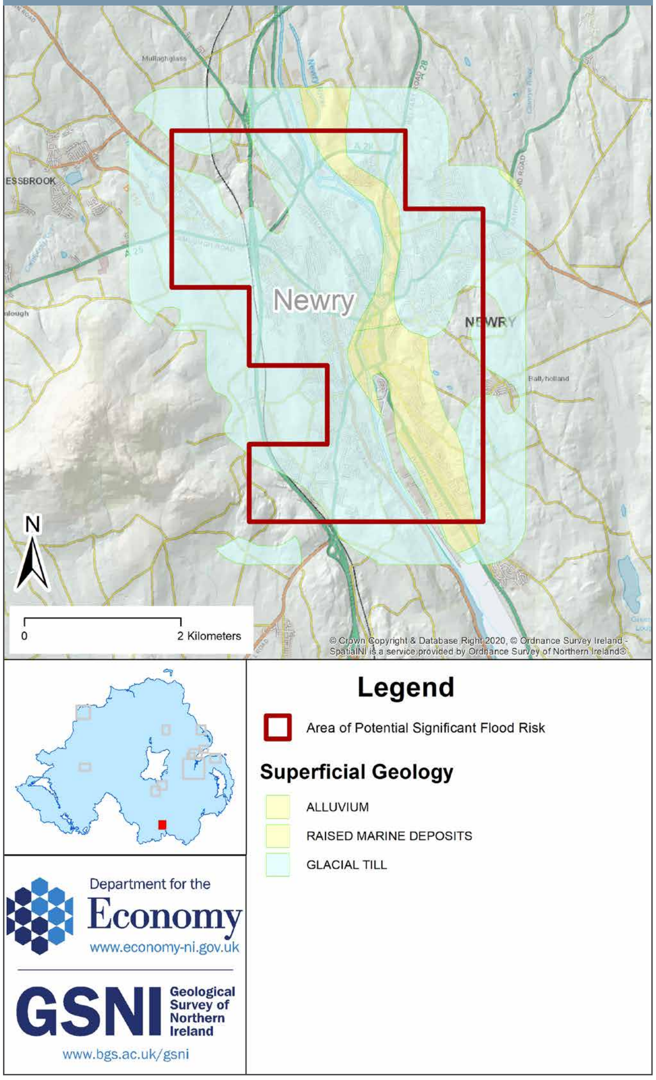
These rocks are completely indurated and typically contain very limited groundwater in fractures and joints in the shallow subsurface. Surface water ingress into these rocks is likely to be extremely slow and so they offer very little alleviation of surface water flooding.

5.3.4.2 Superficial Geology

Glacial till is the dominant superficial deposit covering bedrock across the area, but it has very low permeability, and so will not alleviate surface flooding as it will not allow water to infiltrate into it or the underlying geology.

In the northeast of the APSFR, river alluvium either side of the Newry River, is typically composed of sand, silt and cobbles. When not fully saturated, alluvium can take in rainwater and help alleviate flooding. However, river alluvium tends to be quite thin and low lying, and these are the first areas to flood in response to rising river water levels. Also present in the southeast are raised and active estuarine deposits of clay that are impermeable and these will not alleviate surface flooding by allowing water to infiltrate into them or the underlying geology.

Figure 5.3-6 : Superficial geology of Newry



5.3.5 SOURCES OF FLOODING

5.3.5.1 Risk to buildings and infrastructure by source

In the NIFRA 2018, Newry was ranked 3rd of the 45 FRAs in terms of potential adverse consequences of flooding. DfI has undertaken detailed predictive computer mapping and modelling of flooding from rivers and sea, and further strategic mapping for surface water flooding. The results of this mapping can be found on Flood Maps (NI). An analysis of the potential consequences from flooding shows the predominant flood risk is from fluvial flooding.

Figure 5.3-7 shows the predicted annual average damages (AAD) by flood source. The graph shows that the highest AAD cost is from fluvial sources. Predicted fluvial AAD were just over £4.2 million with surface water sources reaching just over £1.6 million. The total damages from tidal sources were lowest at approximately £185,000.

Figure 5.3-7: Annual Average Damages (£m) by flood source

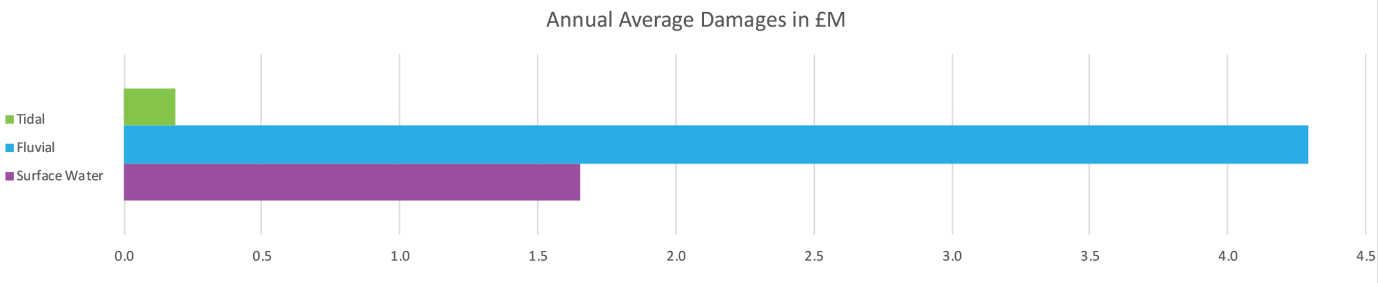
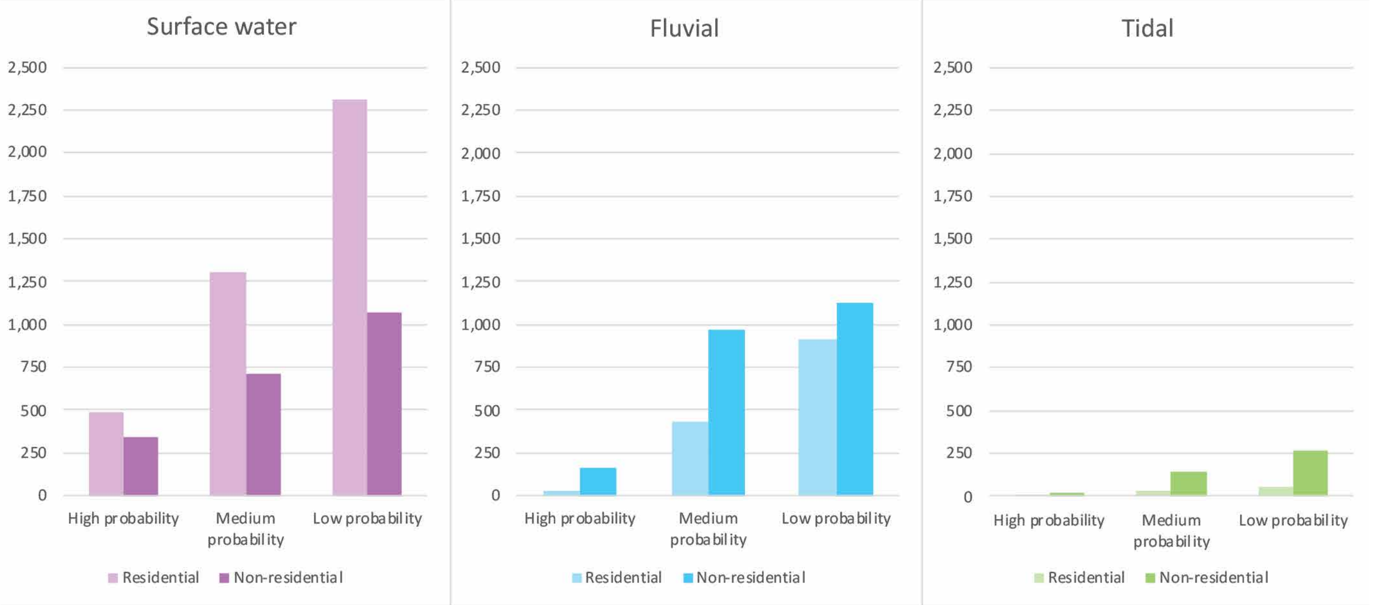


Figure 5.3-8 below shows that at each probability, predicted surface water flooding affects the highest number of buildings (residential and non-residential) compared to both tidal and fluvial flooding for the high, medium and low probability events. For fluvial and tidal flooding, there are a higher number of non-residential properties shown to be at risk of flooding compared to residential properties. Table 5.3-2 shows the return periods which have been assessed as high, medium and low probability events for surface water, fluvial and tidal flooding.

Table 5.3-2: Return periods for high, medium and low probability

Probability	Surface water	Fluvial	Tidal
High	3.33 % AEP (1 in 30 year)	10 % AEP (1 in 10 year)	10 % AEP (1 in 10 year)
Medium	0.5 % AEP (1 in 200 year)	1 % AEP (1 in 100 year)	0.5 % AEP (1 in 200 year)
Low	0.1 % AEP (1 in 1000 year)	0.1 % AEP (1 in 1000 year)	0.1 % AEP (1 in 1000 year)

Figure 5.3-8: Number of buildings located within the modelled flood extent



5.3.5.2 Surface water (Pluvial)

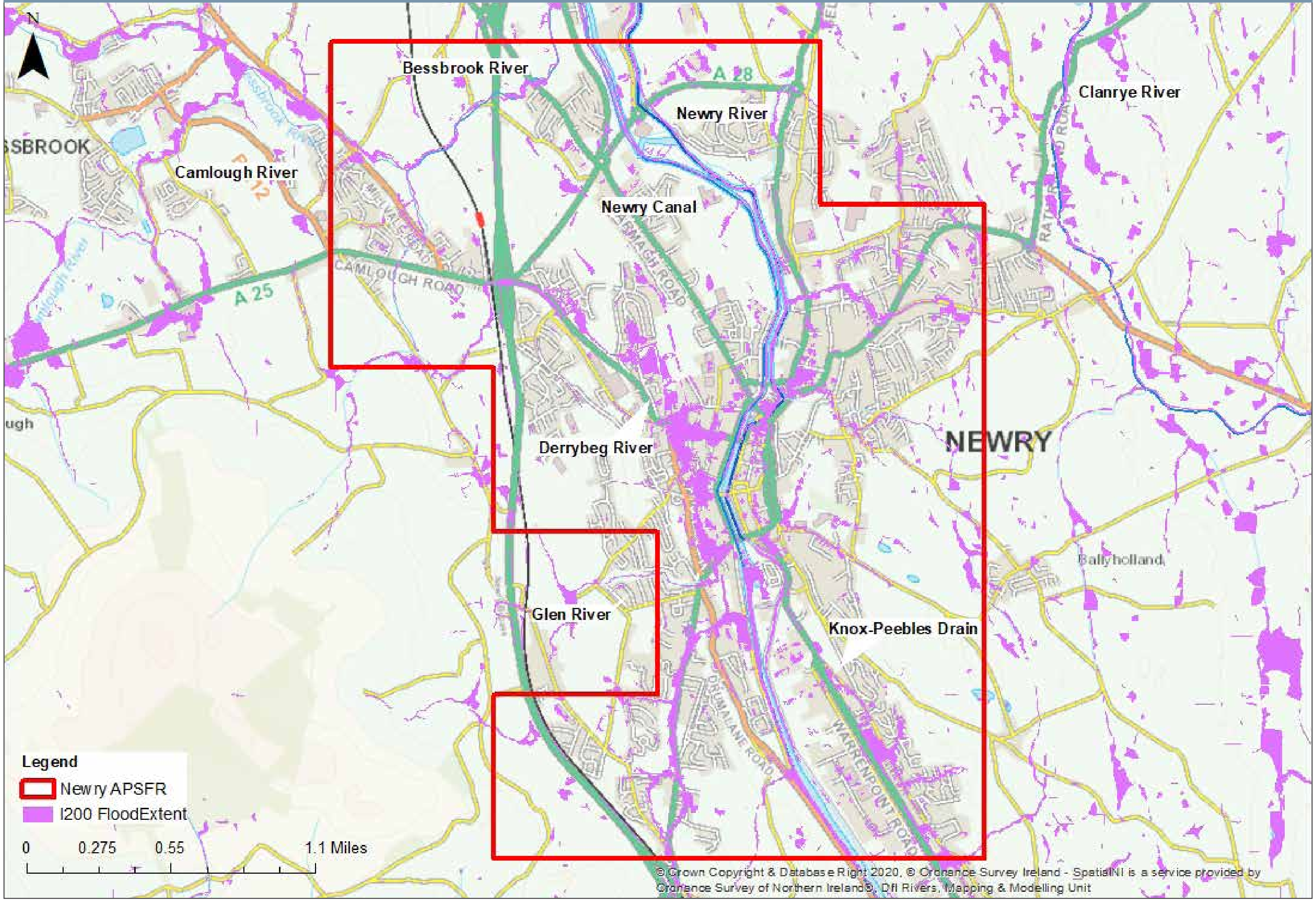
Figure 5.3-9 below shows an overview of the surface water risk distribution across the Newry APSFR according to the modelled 0.5 % AEP (1 in 200 year) flood event.

Key areas of surface water risk in Newry according to the modelled extent are shown towards the centre of Newry to the west of the canal, along the A25 Monaghan Street and a significant flow path and pooling in the commercial/retail area from Monaghan Street to Bridge Street.

Other residential areas shown to be at surface water risk are into the city centre along Dublin Road up to the Quays Leisure Centre, and to the east of Warrenpoint Road. These areas of surface water flood risk follow the floodplains of the Dromalane Stream and Knox-Peebles Drain, urban watercourses which drain down Dublin Road and Warrenpoint Road respectively, towards the Newry River. It should be noted, however, that the surface water mapping picks up the floodplains of some of the smaller urban watercourses.

Infrastructure at risk from surface water flood events up to 0.1 % AEP (1 in 1000 year) in the Newry APSFR are IPPC sites, GP surgeries, a fire station, a police station, schools, NI Water sewage pumping stations, electricity substations, environmental designated sites and built heritage sites. A detailed breakdown of this is included in Appendix D.

Figure 5.3-9: Overview of surface water hazard mapping for a 0.5 % AEP (1 in 200 year) flood event

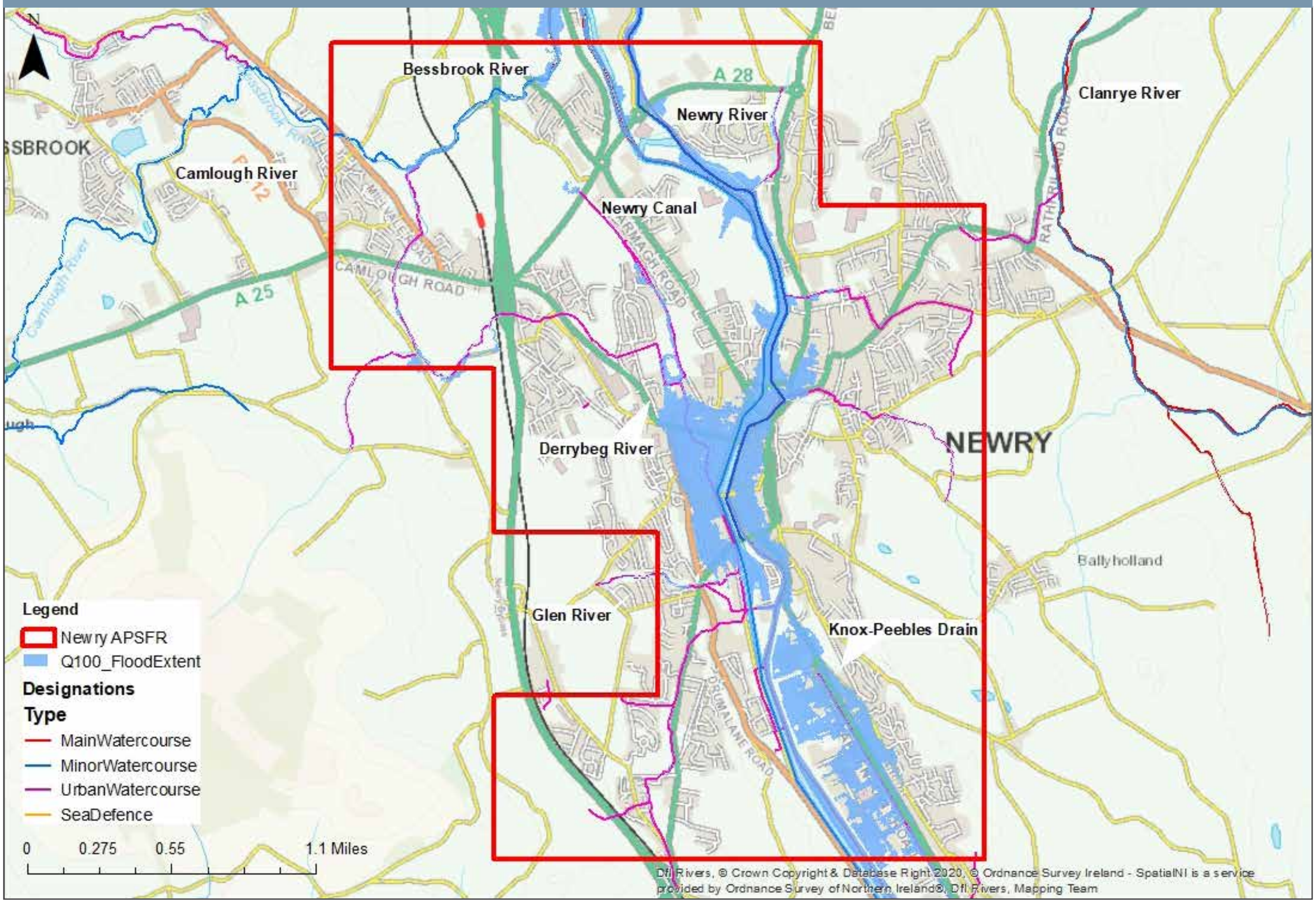


5.3.5.3 Fluvial

Fluvial flood risk for a 1 % AEP (1 in 100 year) flood event is shown below in Figure 5.3-10. Flooding mechanisms in the City Centre are complicated due to interactions between the Newry River and Newry Canal as well as water backing up into tributaries and the contributing drainage system. The banks and quay walls of the canal are significantly lower than the flood walls which have been constructed along the banks of the Newry River through the City Centre, therefore the fluvial modelling shows that a small increase in flow in the canal leads to major overtopping of its banks causing severe flooding.

Infrastructure at risk from fluvial flood events up to 0.1 % AEP (1 in 1000 year) in the Newry APSFR are IPPC sites, GP surgeries, a fire station, schools, NI Water sewage pumping stations, electricity substations, environmental designated sites and built heritage sites. A detailed breakdown of this is included in Appendix D.

Figure 5.3-10: Overview of fluvial hazard mapping for a 1 % AEP (1 in 100 year) flood event



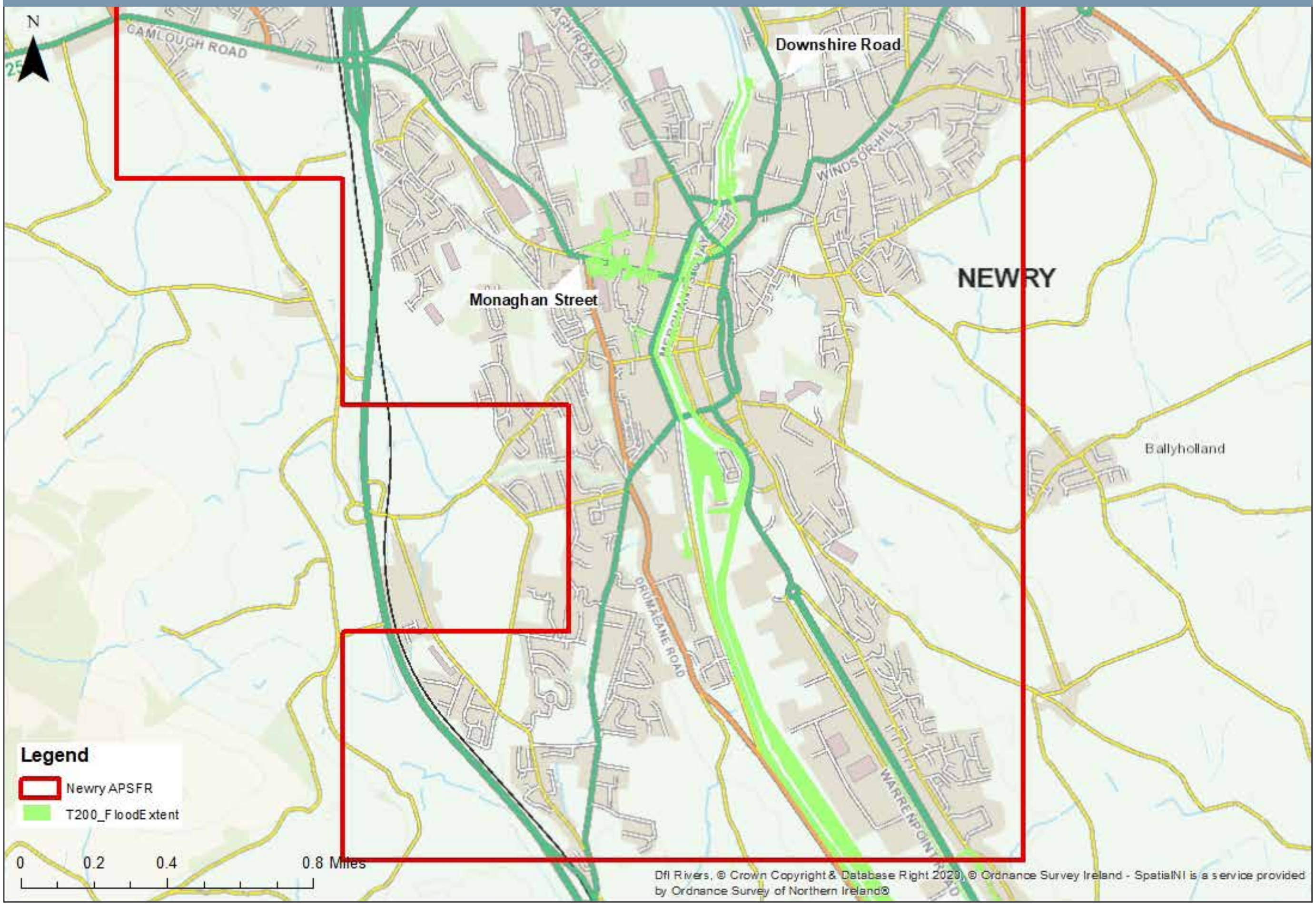
5.3.5.4 Tidal

The lower reaches of the Newry River, including the reach through the City Centre, are tidal. When an extreme tidal event is experienced on the river this causes river flows to back up. This subsequently causes overtopping of the river and additional flow into the canal, also leading to flooding. An extreme tide event also 'tide locks' several culverts which discharge to the river, including the Derrybeg River, Glen River, Sandy's Street Stream and Knox Peebles Stream. This causes culverts and associated manholes to surcharge.

Infrastructure at risk from tidal flood events up to 0.1 % AEP (1 in 1000 year) in the Newry APSFR are a NI Water sewage pumping station, electricity substations, environmental designated sites and listed buildings. A detailed breakdown of this is included in Appendix D.

An overview of the tidal flood risk at a 0.5 % AEP (1 in 200 year) event is shown in Figure 5.3-11, which identifies the tidal flood risk reaching as far north inland as Downshire Road and the low-lying area of Monaghan Street.

Figure 5.3-11: Overview of tidal hazard mapping for a 0.5 % AEP (1 in 200 year) flood event



5.3.6 CURRENT FLOOD RISK MITIGATION

5.3.6.1 Planning

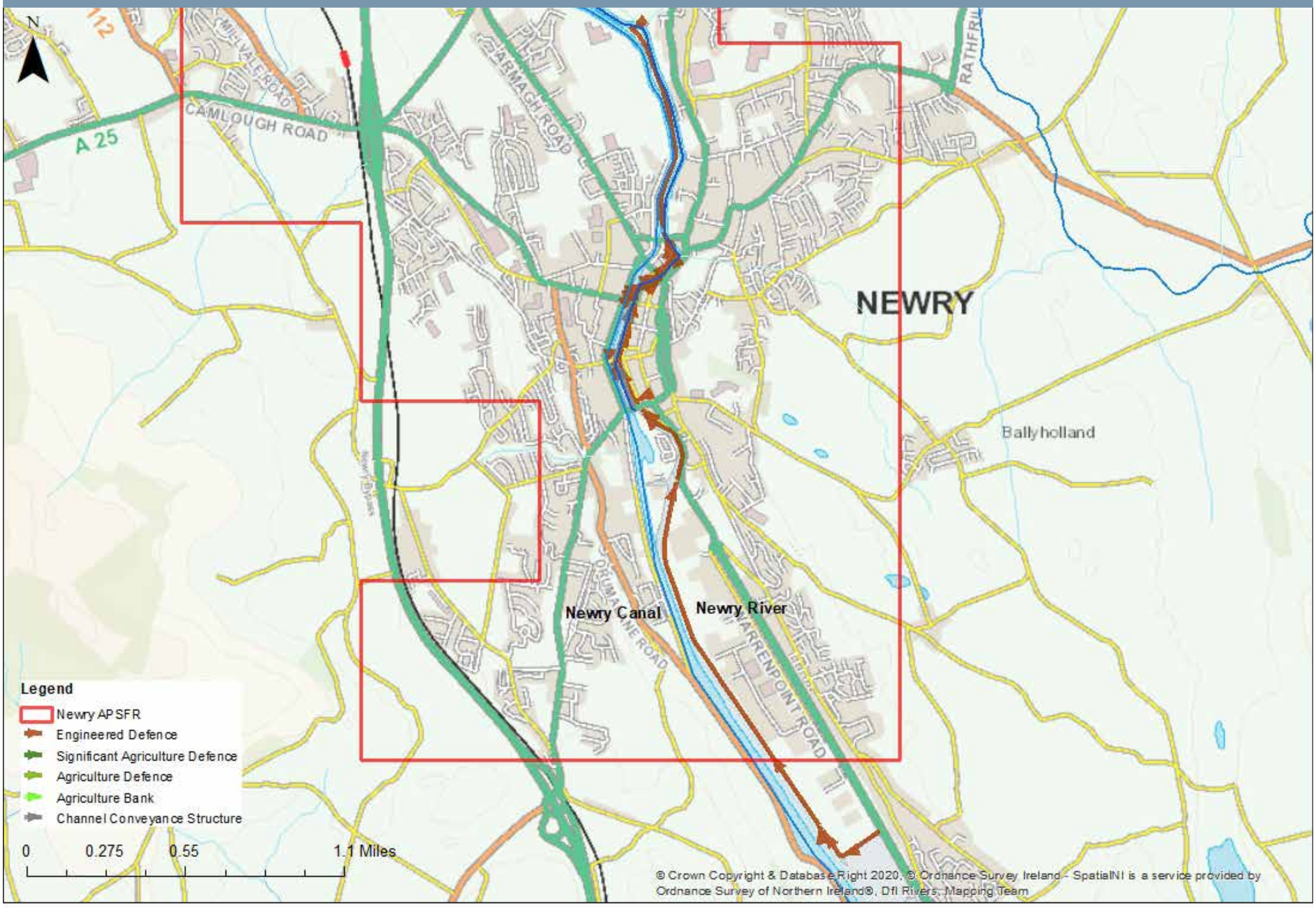
In addition to national planning policy and advice, DfI Rivers will advise against bringing forward sites or the zoning of any land in preparation for the new Newry, Mourne and Down District Council Local Development Plan, particularly for built development, that has been identified from the flood maps as being within the 1 % AEP (1 in 100 year) fluvial floodplain, 0.5 % AEP (1 in 200 year) tidal floodplain/ reservoir inundation area, or is susceptible to surface water flooding.

5.3.6.2 Flood defences

A major flood protection scheme was undertaken in Newry in stages during the 1990s which involved the construction of significant lengths of flood wall along the Newry River through the City Centre along with raising of the 'Middle Bank' between Lock No. 3 and Clanrye Bridge. This is shown in Figure 5.3-12 below.

Although the defences along the Newry River were designed to provide a 0.5 % AEP (1 in 200 year) SoP for tidal flood risk, due to channel capacity issues these same defences provide a lower SoP against fluvial flooding, as evident through recent flooding in Newry. This highlights the requirement for a further study to look at the feasibility of increasing the SoP against fluvial flooding.

Figure 5.3-12: Flood defences in Newry APSFR.



5.3.6.3 NI Coastal Flood Response Plan

Due to the tidal flood risk in Newry, the APSFR is included in the Northern Ireland Coastal Flood Response Plan, published in January 2019.

The NI Coastal Flood Response Plan was developed by the Flooding and Severe Weather Working Group of the 3 NI Emergency Preparedness Groups (EPGs). Its aim is to provide a pre-planned response to warnings of coastal flooding and to outline the graduated incident and co-ordinated inter-agency response to a potential or actual tidal flooding event affecting NI. The Plan was completed and tested in early 2017 and it includes coastal areas in the vicinity of Newry. The Plan remains a living document to incorporate any changes to the area and to ensure it is up to date.

5.3.7 ACTIONS IN THE FIRST CYCLE FLOOD RISK MANAGEMENT PLAN

In the first cycle FRMP, there were four measures set out specifically for the Newry APSFR.

Good progress has been made on the Newry APSFR measures, with the completion of the Coastal Emergency Response Plan and the Capital Works Schemes for Newry River FAS and the Coastal FAS being progressed through detailed design under a combined Newry FAS. The Preparedness measure to establish the Bridge Street/Cleary Crescent local community resilience group has been completed.

Table 5.3-3 shows a summary of measures within the Newry APSFR and their progress.

Table 5.3-3: Progress tracking for Flood Risk Management Plan measures 2015-2021

Category	Measure code from First Cycle FRMPs	Measure description	Progress
PROTECTION	UKNI_NB_APSFR_01_01	Newry River Flood Alleviation Scheme	Detailed Design ongoing
	UKNI_NB_APSFR_01_03	Coastal Flood Alleviation Scheme	Incorporated into Newry River Flood Alleviation Scheme.
PREPAREDNESS	UKNI_NB_APSFR_01_02	Bridge Street/Cleary Crescent - Establishment of local community resilience group	Complete
	UKNI_NB_APSFR_01_04	Coastal Emergency Response Plan	Complete

5.3.7.1 Prevention

No particular Prevention measures specific to Newry were set out in the first cycle FRMP.

As outlined in Chapter 4, DfI Rivers advises on planning applications regarding the risk of flooding. The basis of this advice is to avoid inappropriate development in areas which are at risk of flooding and to ensure that any development does not increase flood risk elsewhere.

5.3.7.1.1 Planning policy

A new LDP for the Newry, Mourne and Down District Council area, for the period up to 2030 is being prepared with the adoption of the Plan Strategy in 2022/2023 and Local Policies Plan in 2025/2026, during the second FRMP cycle. It will comprise:

- a Plan Strategy to define strategic objectives for future development of the District including strategic policies and a spatial strategy;
- a Local Policies Plan which will include site-specific proposals, designations and zoning to deliver the Strategy.

On adoption, the new LDP will replace the current Plans for the District and operational planning policies that were produced by the previous Department of the Environment.

5.3.7.2 Protection

Two flood alleviation schemes were proposed through the measures set out in the first cycle FRMP for Newry; one for the Newry River inland and the other for Greenbank at the coast.

The coastal FAS was progressed and a detailed study was undertaken of the Greenbank area. However, no viable scheme was identified and therefore consideration will be given to alternative methods of alleviating coastal flood risk through the second cycle FRMP.

The Newry River FAS is currently at detailed design stage for further flood defences along the main Newry River, in conjunction with possible upstream storage. This is to offer a higher standard of protection from fluvial flooding in Newry. Construction start date of the scheme is currently undetermined.

5.3.7.3 Preparedness

Two measures were set out through the first cycle FRMP to increase preparedness in the Newry area. A local community resilience group at Bridge Street/Cleary Crescent has been established, with resources provided to the community and contacts established and maintained with key residents.

A detailed Coastal Emergency Response Plan has been developed and tested to complete the remaining measure set out for Newry.

5.3.8 UPDATED PROGRAMME FOR SECOND CYCLE FLOOD RISK MANAGEMENT PLAN

5.3.8.1 Key Messages

Measures set out for the Newry APSFR in the first cycle FRMPs focused on Protection and Preparedness related to fluvial flooding. The Preparedness measures have been successfully progressed and completed within the first FRMP cycle.

The flood alleviation scheme on the Newry River has been progressed and its detailed design and construction will continue during the second cycle FRMP. As no viable scheme was identified for the coastal flood alleviation scheme, consideration will be given to alternative methods of alleviating coastal flood risk through the second cycle FRMP.

Although there are no specific measures set out under Prevention for the Newry APSFR in the first cycle FRMP, the Newry, Mourne and Down District Council LDP is scheduled to be finalised early in the second cycle FRMP. The LDP, alongside current advice on Planning from DfI Rivers, will support mitigation of flood risk in the council area in relation to both new development and redevelopment proposals from the LDPs adoption and through the second FRMP cycle. This will be taken forwards as a measure for the second cycle FRMP for DfI Rivers to work with the council to update the flood risk policy within the new LDP.

5.3.8.2 Enhanced Drainage Area Plan

NI Water is currently taking forward modelling in the form of DAPs across NI for drainage areas with populations typically above 2000. The traditional approach is for all combined and foul sewers to be modelled. For the period April 2021 – March 2027 NI Water will be conducting Enhanced DAPs in each of the APSFR. These Enhanced DAPs extend modelling to include the NI Water storm sewers, which may identify drainage improvement schemes.

Table 5.3-4 below sets out the measures and timescales for the Newry APSFR in the second cycle FRMP.

Table 5.3-4: Proposed measures for Flood Risk Management Plan cycle 2021-2027

Category	Measure summary	Lead authority	Specific measure	Timescale
PREVENTION	Enhanced Drainage Area Plan	NI Water	By 31st March 2027, NI Water will produce an Enhanced DAP for Newry that sets out actions to mitigate integrated flooding issues	2027
	Influence local planning policy for development and flood risk	DfI Rivers	By 2025, DfI Rivers will work with Newry, Mourne and Down District Council to update flood risk policy in the Local Development Plan	2025
PROTECTION	Flood alleviation works	DfI Rivers	By 2022, DfI Rivers will undertake detailed design work for the Newry River flood alleviation scheme, after which the scheme will be constructed.	2022

5.4

LURGAN

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5.4.1 SUMMARY

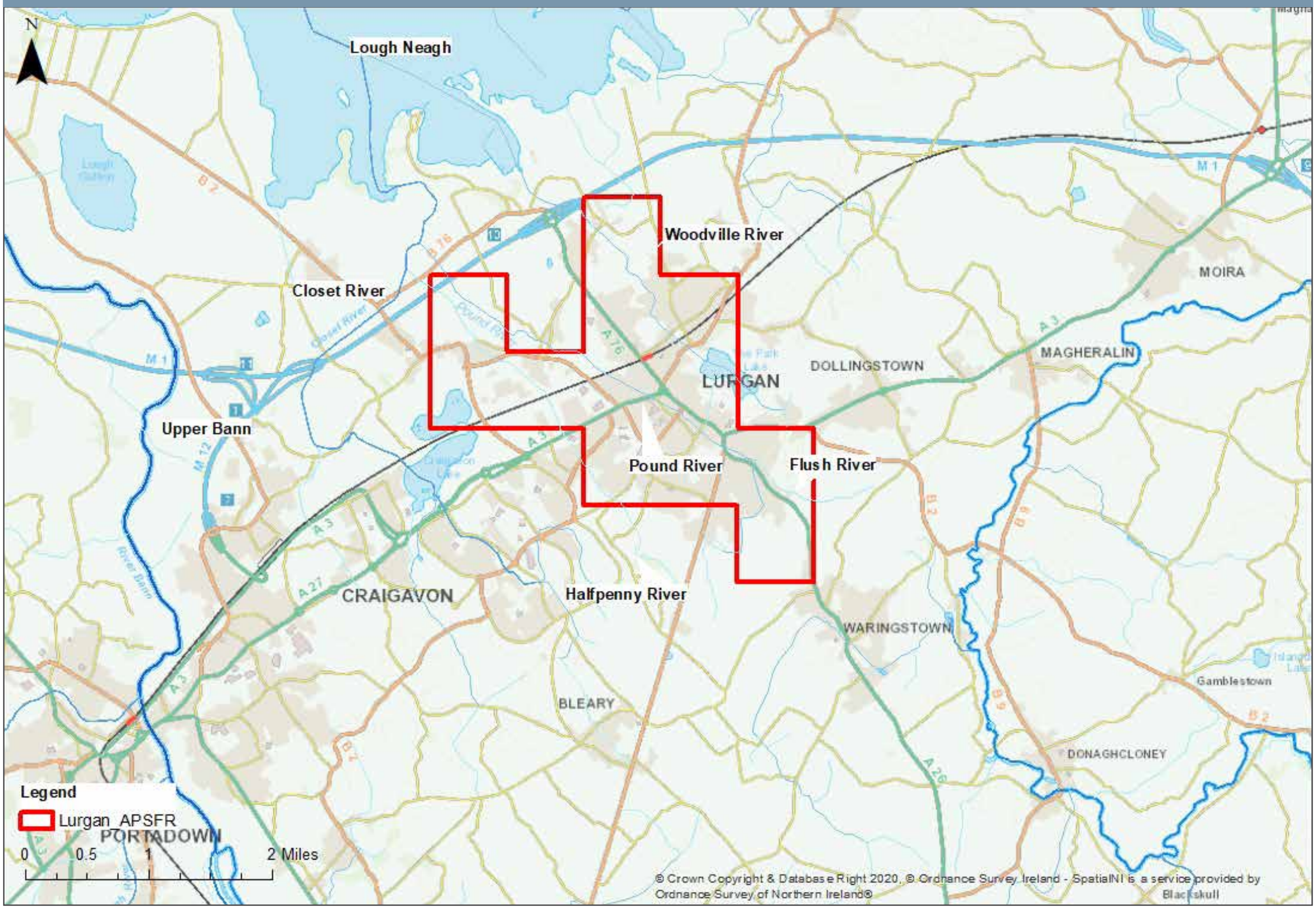
5.4.1.1 Flood risk area overview

Lurgan is situated about 18 miles (29km) south west of Belfast and is linked to the city by both the M1 motorway and the Belfast – Dublin railway line. The town is within the Armagh City, Banbridge and Craigavon local council area, and has a population of around 25,000 according to the 2011 census. The Lurgan APSFR is located within the Neagh Bann IRBD, and the Lough Neagh Local Flood Management Area. Flooding in the APSFR is primarily caused by small watercourses in the area exceeding channel capacity and a number of culverts which are unable to convey flood flows.

Drainage issues and surface water flooding also exacerbate the flood risk within Lurgan.

The Craigavon Balancing Lakes which fringe on the west of the Lurgan APSFR, were created during the early 1970s when an area of low-lying, poorly drained land was excavated to create the two lakes. The South Lake was designed to act as a balancing lake, releasing collected rainwater into Lough Neagh.

Figure 5.4-1: Location and boundary of Lurgan APSFR and key watercourses



An exceptional flood event occurred in November 1901 which is now known as the 'Great Floods' due to multiple areas of Lurgan including factories, commercial and residential properties being inundated with floodwater and raw sewage. More recently, flooding occurred in July 2018 at the Soye Crescent housing development off the North Circular Road when over 80 mm of rain fell in a few hours, which overwhelmed the storm drainage systems.

5.4.1.2 Northern Ireland Flood Risk Assessment (NIFRA) 2018

The NIFRA 2018 indicated that Lurgan is at risk of flooding from fluvial and surface water sources which could adversely impact on people and property in the area.

The APSFR boundary determined by NIFRA has increased slightly since the area was initially identified in the PFRA 2011. The APSFR boundary, as shown in Figure 5.4-1 above, now extends further north to the lower reaches of the Pound River and further south along the A26.

5.4.2 HISTORY

5.4.2.1 Summary of flooding history

On the 12th November 1901 an intense storm occurred in the Lurgan area bringing extreme rainfall and hurricane force winds. This flood event is now known as the 'Great Floods'. The Flush River overtopped it banks inundating the Flush factory works and raw sewage flowed down High Street and Market Street. The Lurgan Weaving Company and houses on Factory Lane flooded and the low-lying Dougher cemetery suffered extensive damage, as it was under water for weeks. Commercial buildings along the High Street were flooded and the residential areas of Union Street, Moore's Lane, Roger's Court, Edward Street and Waring Street were also flooded as the Pound River flooded out of bank. Homes around Lough Neagh to the north of Lurgan were abandoned, livestock was lost, and the Park Lake overflowed leaving surrounding areas under water.

More recently, flooding in Lurgan is known to have occurred in August 2008, October 2011 and November 2014; when both residential and commercial properties as well as local infrastructure were inundated.

Widespread flooding took place throughout NI and the RoI in August 2008. On the 16th August 2008 the gauged daily rainfall totals across the province were recorded at between 80 % and 100 % of the monthly average. In Lurgan, most of the flooding occurred upstream of the Flush River Diversion and Shane Park culvert; where the watercourse channel is narrow and heavily vegetated. An example of this flooding is shown in Figure 5.4-2, below. Several properties were affected on the Clanrolla Tributary; the cause of which was later identified as an undersized culvert. The Halfpenny River also exceeded its channel capacity and flooded areas of Knockramer Meadows.

In October 2011 heavy rainfall caused flooding throughout NI, with localised flooding reported in Lurgan. According to local reports, the flooding in November 2014 affected areas of Mourne Road and Cottage Road.

5.4.2.2 Flood events since 2015

In March 2018, minor flooding occurred in the town's Edward Street. Exceptionally heavy rainfall was also recorded in the area on 21st July 2018 when the Soye Crescent housing development off North Circular Road experienced serious flooding.

In some areas, residents were unable to leave their homes due to the high levels of floodwater. NI Water storm drains were overwhelmed which led to raw sewage and other debris in the floodwater. Flooding at the Halfpenny River led to damage to homes in the Knockramer area during the same event.

Figure 5.4-2: Flooding at Shane Park, Lurgan, August 2008

5.4.3 CATCHMENT

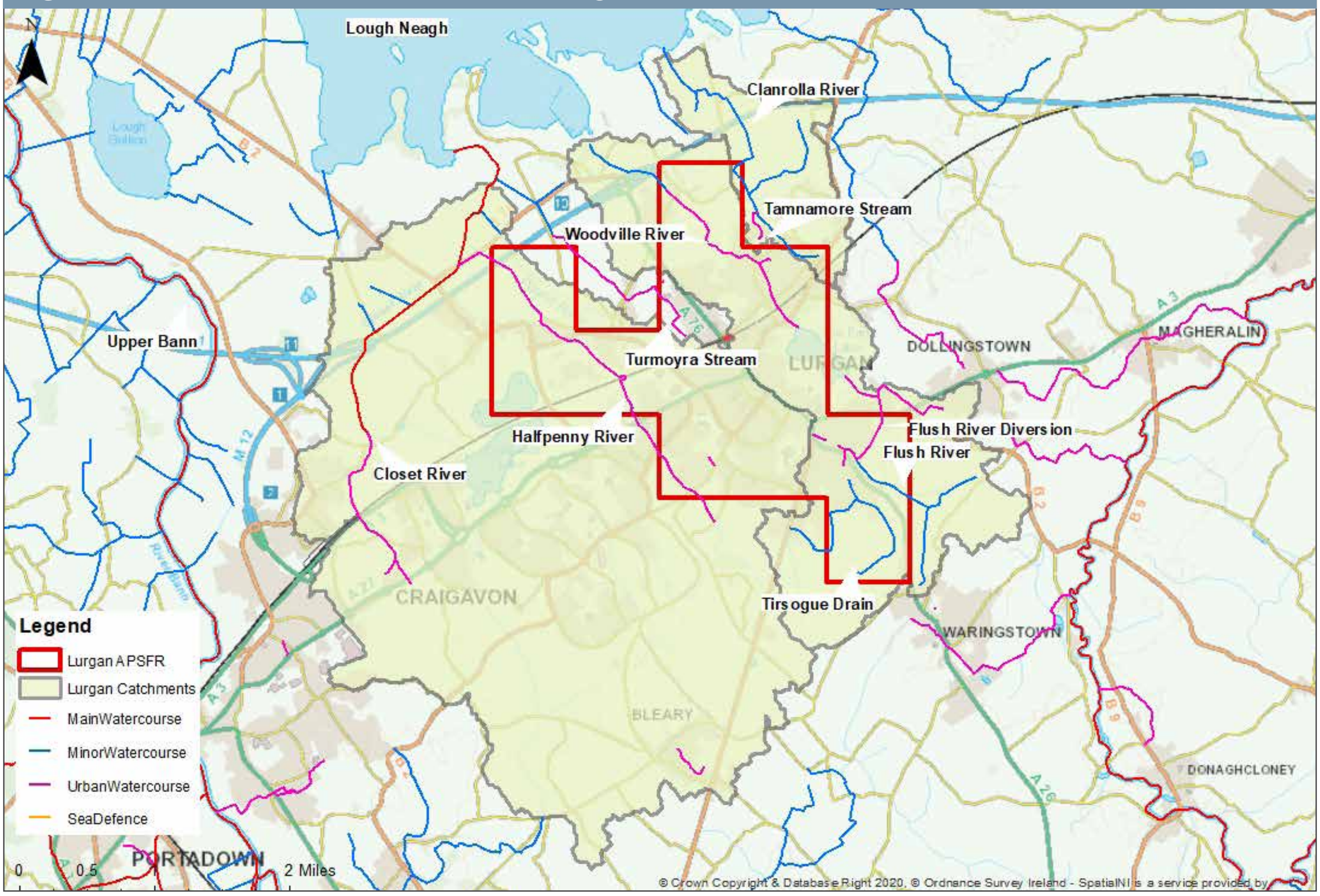
5.4.3.1 Catchment characteristics and tributaries

Lurgan is situated in the Neagh Bann IRBD and its catchment sits in a relatively flat area by the south eastern shore of Lough Neagh.

There are three main catchments draining the Lurgan APSFR as shown in Figure 5.4-3 below;

- The extreme east of the ASPFR boundary is served by the Clanrolla River and Tamnamore Stream. The Tamnamore Stream is a small urban watercourse taking flows from the Fox's Hill estate area and is a tributary of the Clanrolla River which outfalls to Lough Neagh;
- The eastern-central part of Lurgan including the High Street, and areas affected by flooding in 2008 around the Shane Park area are served by a network of tributaries and diversions of the Flush River. The main tributary of the Flush River is the Tirsogue Drain which flows from rural areas to the south of Lurgan and joins the Flush River Diversion to the rear of properties along Irwin Drive. The Flush River flows north and enters the Park Lake which becomes the Woodville River to its outfall at Lough Neagh;
- The west of Lurgan is served by the Halfpenny River and Turmoyra Stream, both of which join the River Closet further downstream of the APSFR boundary before discharging to Lough Neagh. The River Closet takes flows

Figure 5.4-3: Catchments in relation to the Lurgan APSFR



from the Craigavon area to the west of Lurgan and links the Southern Lake (one of the two local 'balancing lakes') to Lough Neagh.

The Tirsogue Drain and Flush River catchments are classified as being largely rural watercourses, whereas the Halfpenny River is moderately urbanised as it flows through Craigavon. Due to development of Craigavon since the 1950s, rural areas which would have usually attenuated flows have become urbanised which may have contributed to increased flood risk in the Lurgan area.

5.4.3.2 Urban drainage and wastewater network

NI Water is responsible for the clean drinking water supply, foul and storm water sewerage networks throughout NI.

The majority of the NI Water drainage network within the APSFR is separated with approximately 105 km of storm sewers and 130 km of foul sewers. The total length of combined sewer network is approximately 20 km.

The Lurgan area is served by a WwTW at Ballynacorr and there are also five NI Water wastewater pumping stations in the ASPFR.

5.4.3.3 Environment

The APSFR encompasses the following WFD waterbodies:

Table 5.4-1: Waterbody classifications in and around the Lurgan APSFR

Waterbody name	2015 Classification	2018 Classification	2021 Objective	Reason for failure
UKGBNI1NB030308243: Lough Neagh Peripheral	Bad Ecological Potential	Poor Ecological Potential	Moderate Ecological Potential	N/A
UKGBNI1NB030308239: Pound River	Moderate	Moderate	Good	Biological Oxygen Demand Dissolved oxygen Soluble Reactive Phosphorus
UKGBNI1NB030308209: Closet River	Moderate	Moderate	Good	Benthic Invertebrates Biological Oxygen Demand Soluble Reactive Phosphorus

More information about status and individual objectives can be viewed at the

NIEA Information Request Viewer.

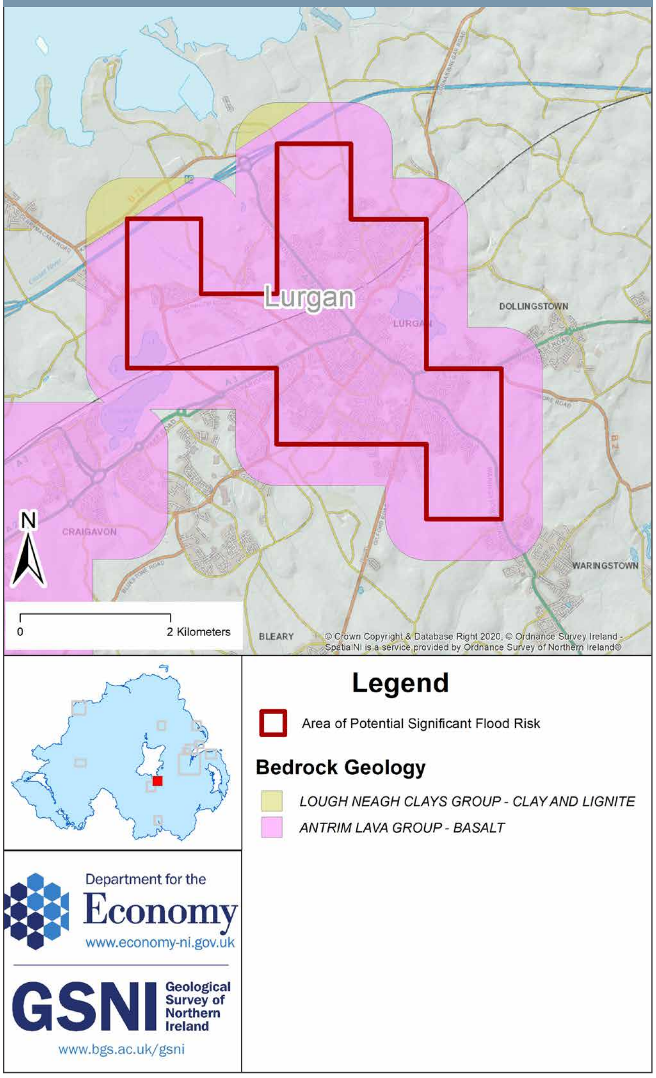
Lough Neagh and its peripheral waterbodies suffers from acute and chronic pollution that is impacting upon their ecological status. Mitigation measures should be put in place to ensure the proposed works do not compromise the future WFD objectives for the waterbody and in other downstream water bodies. Potential threats include site pollutants, increase in sedimentation, pollution from drainage and surface water runoff from storage / work areas and surrounding access roads.

Flood alleviation works such as reducing run off within the catchment, improving the sewerage network by separating the foul and surface drainage and the establishment of blue / green infrastructure such as SuDS could all play a positive role in achieving WFD objectives within these waterbodies.

5.4.4 GEOLOGY

5.4.4.1 Bedrock Geology

Figure 5.4-4 : Bedrock geology of Lurgan

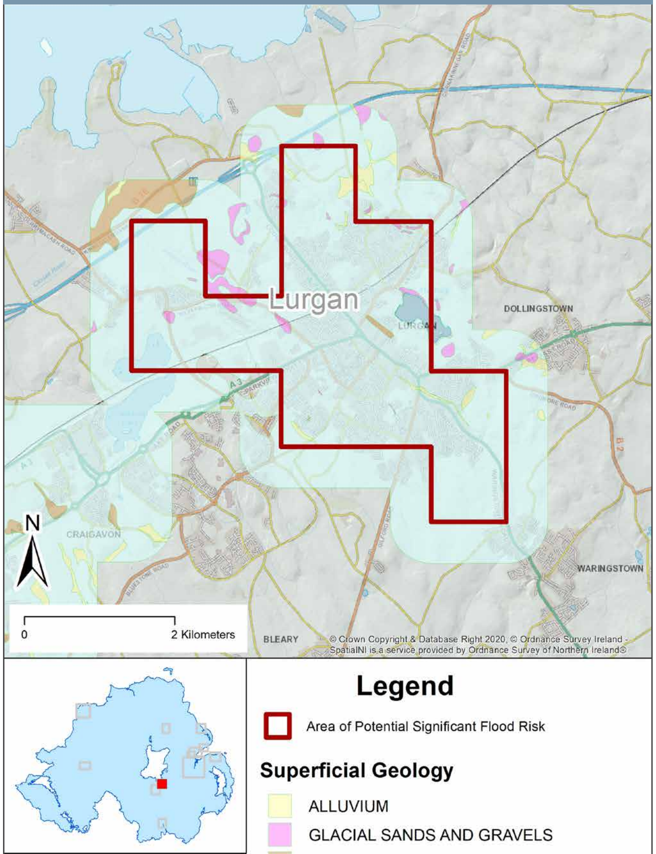


Bedrock under the Lurgan APSFR is composed of basalt belonging to the Antrim Lava Group. Basalts can contain significant volumes of groundwater in joints, fractures and small cavities. However, surface water ingress into the bedrock is likely to be extremely limited and so it offers very little alleviation of surface water flooding. In this area the bedrock is kept separate from surface water by a layer of glacial till.

5.4.4.2 Superficial Geology

Till derived from basalt tends to be silt dominated and has very low permeability, and therefore does little to alleviate surface water flooding as it will not allow water to infiltrate into it or the underlying geology.

Figure 5.4-5 : Superficial geology of Lurgan



Department for the Economy
www.economy-ni.gov.uk
GSNI Geological Survey of Northern Ireland
www.bgs.ac.uk/gsni

5.4.5 SOURCES OF FLOODING

5.4.5.1 Risk to buildings and infrastructure by source

According to the NIFRA 2018, the town of Lurgan in terms of potential adverse consequences of flooding is ranked 4th of the 45 Flood Risk Areas. DfI has undertaken detailed predictive computer mapping and modelling of flooding from rivers and sea, and further strategic mapping for surface water flooding. The results of this mapping can be found on Flood Maps (NI). An analysis of the potential consequences from flooding shows the predominant flood risk is from surface water sources. It should be noted, however, that the surface water mapping picks up the floodplains of some of the smaller urban watercourses.

Figure 5.4-6 shows the predicted annual average damages (AAD) by flood source. The graph shows that the highest AAD is from surface water flooding by a considerable margin. Predicted surface water AAD were over £3 million whereas the fluvial flooding damages reached approximately £96,500.

Figure 5.4-6: Annual Average Damages (£m) by flood source

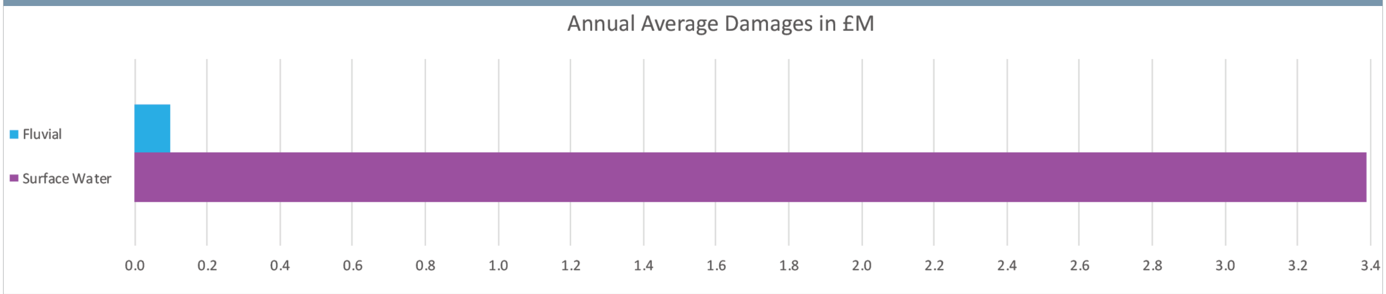
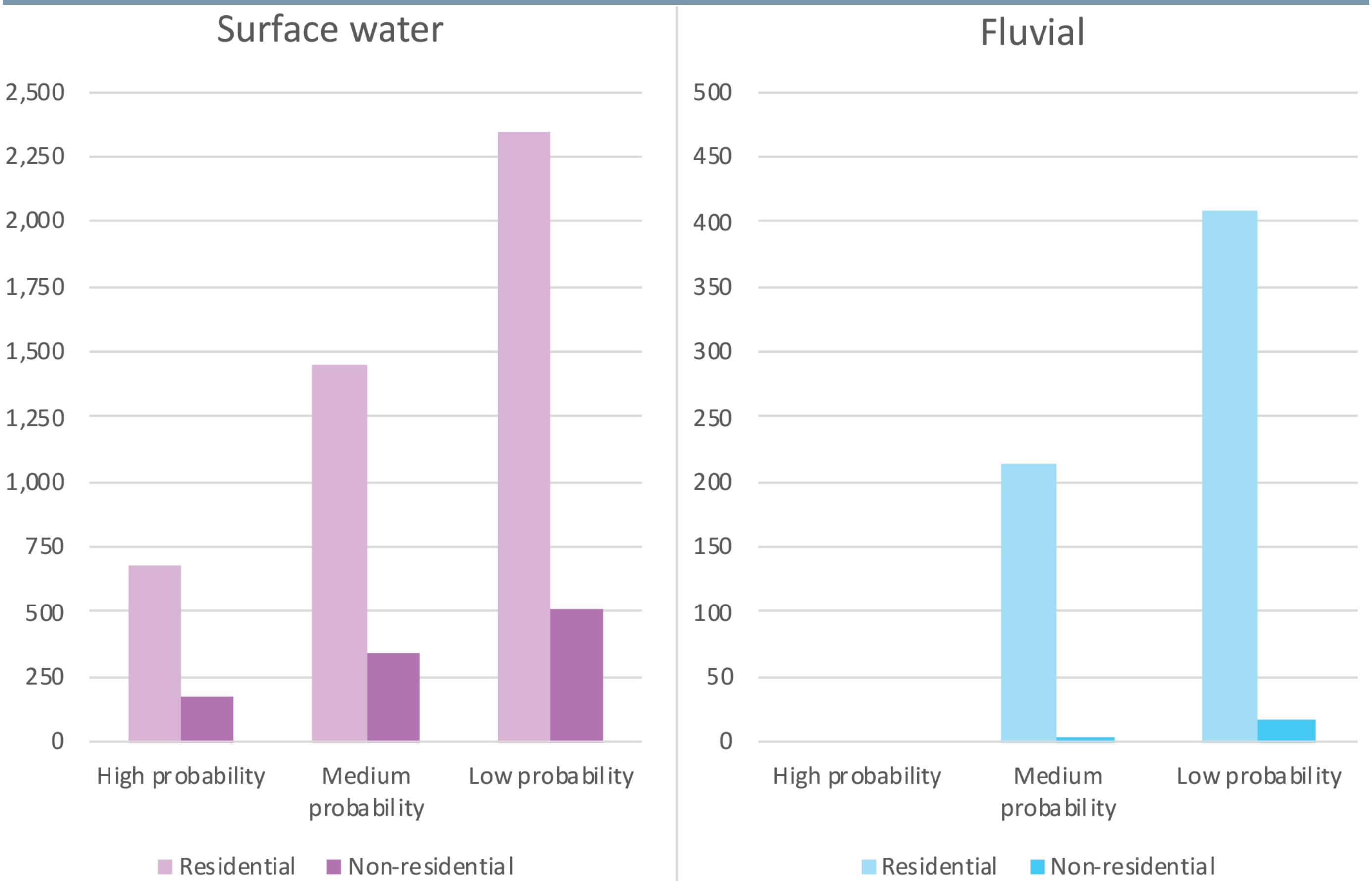


Figure 5.4-7 below shows a similar trend to Figure 5.4-6 in that surface water mapping predicts the highest number of buildings flooded compared to fluvial flooding for the high, medium and low probability events. Table 5.4-2 shows the return periods which have been assessed as high, medium and low probability events for surface water and fluvial flooding.

Table 5.4-2: Return periods for high, medium and low probability

Probability	Surface water	Fluvial
High	3.33 % AEP (1 in 30 year)	10 % AEP (1 in 10 year)
Medium	0.5 % AEP (1 in 200 year)	1 % AEP (1 in 100 year)
Low	0.1 % AEP (1 in 1000 year)	0.1 % AEP (1 in 1000 year)

Figure 5.4-7: Number of buildings located within the modelled flood extent



Note that the scale for surface water on Figure 5.4-7 above, is different to account for significantly higher values than those for fluvial.

5.4.5.2 Surface water (Pluvial)

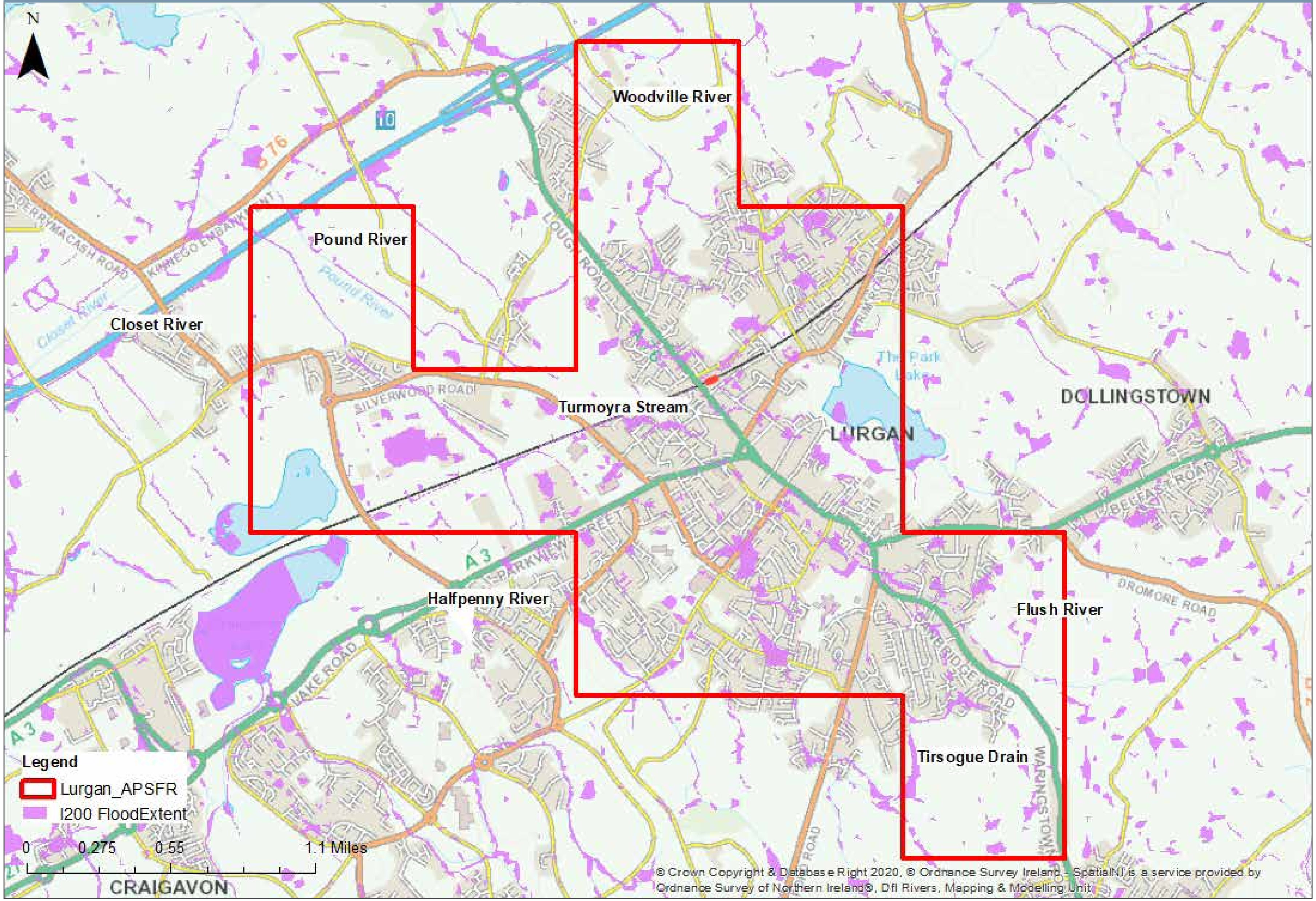
Surface water flooding across the Lurgan APSFR occurs where the existing drainage systems are overwhelmed and flows exceed capacity, the main reason for this being the urbanisation of Lurgan around small watercourses which are unable to take the increased runoff. Figure 5.4-8 below shows an overview of the surface water flood risk across Lurgan at a 0.5 % AEP (1 in 200 year) flood event.

There is significant pooling of surface water around residential areas to the north of Park Lake. The modelling shows flow paths from the residential areas in a north westerly direction towards the water treatment works, and pooling of water in other areas including commercial buildings immediately north of the railway, and residential areas around Soye Crescent adjacent to Tannaghmore Primary School.

Surface water flooding is also shown along High Street and areas of significant risk to the south of the High Street and Queen Street, affecting commercial properties, and significant risk further to the west along Union Street and Mourne Road areas. There is also a surface water flow path identified at Shane Park near the Tirsogue Drain, which was affected in the August 2008 flood event.

Infrastructure at risk from surface water flood events up to 0.1 % AEP (1 in 1000 year) in the Lurgan APSFR are an IPPC site, a police station, electricity substations, environmental designated sites and built heritage sites. A detailed breakdown of this is included in Appendix D.

Figure 5.4-8: Overview of surface water hazard mapping for a 0.5% AEP (1 in 200 year) flood event



5.4.5.3 Fluvial

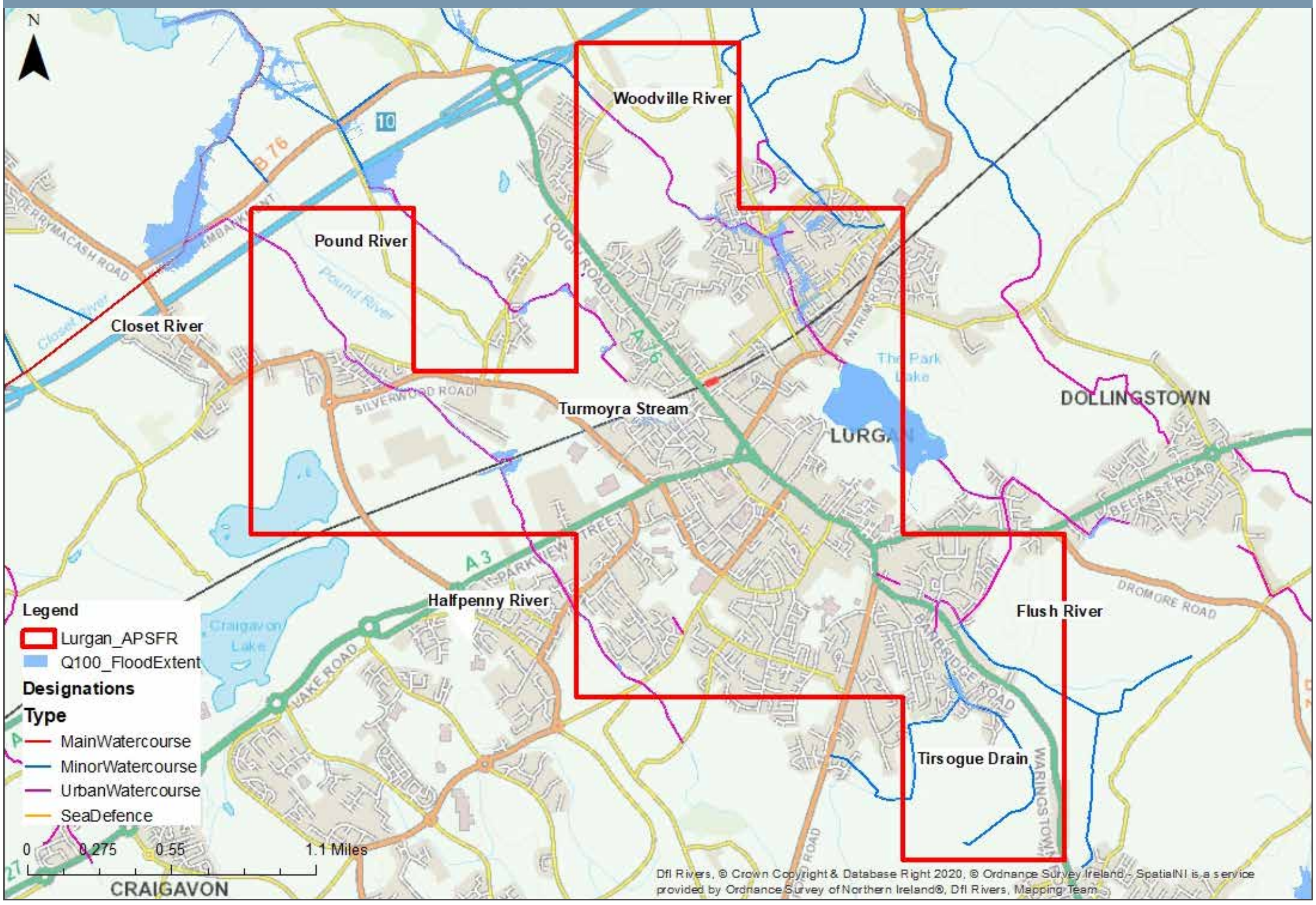
Fluvial risk across the Lurgan APSFR as shown through the fluvial modelling for the 1 % AEP (1 in 100 year) flood event is not extensive in comparison to historical flood records from the 'Great Floods' and the flood event in August 2008 around the Flush River and Tirsogue Drain. Figure 5.4-9 below shows an overview of the fluvial risk, and there are two key areas; one downstream of Park Lake to the north of the APSFR and the other around the confluence of the Tirsogue River and Flush River.

The fluvial modelling for the area downstream of Park Lake shows extensive out-of-bank flooding from the Woodville River north of the railway line in predominantly residential areas. Further residential areas to the east including Westwood and Sperrin Drive are also shown to be at risk of fluvial flooding from the Clanrolla River.

The Tirsogue Drain runs along Knocknashane Park in a north easterly direction and flows in an open channel along the rear of properties in Shane Park and Glenshane Drive. The modelled fluvial 1 % AEP (1 in 100 year) flood event shows out of bank flooding along this section of watercourse affecting residential properties, before the watercourse enters the Flush River Diversion.

Infrastructure at risk from fluvial flood events up to 0.1 % AEP (1 in 1000 year) in the Lurgan APSFR are a NI Water sewage pumping station, electricity substations, environmental designated sites and a historic park and gardens. A detailed breakdown of this is included in Appendix D.

Figure 5.4-9: Overview of fluvial hazard mapping for a 1 % AEP (1 in 100 year) flood event



5.4.6 CURRENT FLOOD RISK MITIGATION

5.4.6.1 Planning

In addition to national planning policy and advice, DfI Rivers will advise against bringing forward sites or the zoning of any land in preparation for the new Armagh City, Banbridge and Craigavon Borough Council Local Development Plan, particularly for built development, that has been identified from the flood maps as being within the 1 % AEP (1 in 100 year) fluvial floodplain, 0.5 % AEP (1 in 200 year) reservoir inundation area, or is susceptible to surface water flooding.

5.4.6.2 Flood defences

There are no formal flood defences in Lurgan, although DfI Rivers has completed flood alleviation schemes, including some that were completed as measures in first cycle FRMPs.

Historically, a culvert repair scheme was completed on the Clanrolla Tributary in February 2003 (cost then approximately £85k). The scheme involved the replacement of 340 m of defective culverts with a 525 mm diameter pipeline and localised repairs upstream on a 450 mm diameter pipeline. The majority of these works were carried out within housing developments adjacent to the North Circular Road in Lurgan.

5.4.7 ACTIONS IN THE FIRST CYCLE FLOOD RISK MANAGEMENT PLAN

In the 2015 first cycle FRMP, there were five measures set out specifically for the Lurgan APSFR.

Good progress has been made on the Lurgan APSFR measures, with significant progress on the Capital Works Schemes. The Halfpenny River FAS and Tirsogue Drain FAS have both been completed and the Clanrolla River FAS (now known as Lurgan FAS) is progressing through detailed design.

The Preparedness measure to establish the Westwood/Sperrin Drive local community resilience group has been completed and progress on the Knockramer Meadows/ Silverwood Leaves local community resilience group is ongoing.

Table 5.4-3 shows a summary of measures within the Lurgan APSFR and their progress.

Table 5.4-3: Progress tracking for Flood Risk Management Plan measures 2015-2021

Category	Measure code from First Cycle FRMPs	Measure description	Progress
PROTECTION	UKNI_NB_APSFR_09_01	Clanrolla River Flood Alleviation Scheme	Economic appraisal approved and design ongoing.
	UKNI_NB_APSFR_09_03	Halfpenny River Flood Alleviation Scheme	Complete.
	UKNI_NB_APSFR_09_05	Tirsogue Drain Flood Alleviation Scheme	Complete.
PREPAREDNESS	UKNI_NB_APSFR_09_02	Westwood/Sperrin Drive - Establishment of local community resilience group	Complete.
	UKNI_NB_APSFR_09_04	Knockramer Meadows/ Silverwood Leaves - Establishment of local community resilience group	Ongoing.

5.4.7.1 Prevention

No particular Prevention measures specific to Lurgan were set out in the first cycle FRMP.

As outlined in Chapter 4, DfI Rivers advises on planning applications regarding the risk of flooding. The basis of this advice is to avoid inappropriate development in areas which are at risk of flooding and to ensure that any development does not increase flood risk elsewhere.

5.4.7.1.1 Planning policy

A new LDP for the Armagh City, Banbridge and Craigavon Borough Council for the period up to 2030 is being prepared with the adoption of the Plan Strategy in 2020/2021 and Local Policies Plan in 2022/2023, during the second FRMP cycle.

It will comprise:

- a Plan Strategy to define strategic objectives for future development of the Borough, including strategic policies and a spatial strategy;
- a Local Policies Plan which will include site-specific proposals, designations and zoning to deliver the Strategy.

On adoption, the new LDP will replace the current Plans for the Borough and operational planning policies that were produced by the previous Department of the Environment.

5.4.7.2 Protection

Three protection measures were set out through the first cycle FRMPs; two culvert replacements at Halfpenny River and Tirsogue Drain and a flood alleviation scheme for the Clanrolla River. The two culvert replacements have been successfully completed, and the FAS for the Clanrolla River has been progressed through feasibility study and economic approval. This scheme which will be continued to the second cycle FRMP is now known as the Lurgan Flood Alleviation Scheme.

5.4.7.3 Preparedness

Two measures were set out for Lurgan to establish local community resilience groups in the areas of Westwood/ Sperrin Drive and Knockramer Meadows/ Silverwood Leaves. DfI Rivers has sited sandbag containers for the community to use in a flood event, with continued engagement through 2020.

In addition to the measures set out for community engagement, the RCRG also commenced engagement in the Deans Walk / Shankill and Deeny Drive areas of Lurgan.

5.4.8 UPDATED PROGRAMME FOR SECOND CYCLE FLOOD RISK MANAGEMENT PLAN

5.4.8.1 Key Messages

Although no specific measures around the Prevention of flooding were proposed for the Lurgan APSFR in the first cycle FRMPs, the Armagh City, Banbridge and Craigavon LDP is scheduled to be finalised early in the second cycle FRMP. The LDP, alongside current advice on Planning from DfI Rivers, will support mitigation of flood risk in the council area in relation to both new development and redevelopment proposals from the LDPs adoption and through the second FRMP cycle. This will be taken forwards as a measure for the second cycle FRMP for DfI Rivers to work with the council to update the flood risk policy within the new LDP.

Community engagement in the Westwood/Sperrin Drive area of Lurgan by RCRG has been completed as planned through the first cycle FRMP, and further engagement is due to progress in the Knockramer Meadows/ Silverwood Leaves to form a community resilience group in the second cycle.

5.4.8.2 Enhanced Drainage Area Plan

NI Water is currently taking forward modelling in the form of DAPs across NI for drainage areas with populations typically above 2000. The traditional approach is for all combined and foul sewers to be modelled. For the period April 2021 – March 2027 NI Water, will be conducting Enhanced DAPs in each of the APSFR. These Enhanced DAPs extend modelling to include the NI Water storm sewers, which may identify drainage improvement schemes.

Table 5.4-4 below sets out the measures and timescales for the Lurgan APSFR in the second cycle FRMP.

Table 5.4-4: Proposed measures for Flood Risk Management Plan cycle 2021-2027

Category	Measure summary	Lead authority	Specific measure	Timescale
PREVENTION	Enhanced Drainage Area Plan	NI Water	By 31st March 2027, NI Water will produce an Enhanced DAP for Lurgan that sets out actions to mitigate integrated flooding issues	2027
	Influence local planning policy for development and flood risk	DfI Rivers	By 2022, DfI Rivers will work with Armagh, Banbridge and Craigavon Borough Council to update flood risk policy in the Local Development Plan	2022
PROTECTION	Flood alleviation works	DfI Rivers	By 2022, DfI Rivers will undertake detailed design work for the Lurgan FAS after which the scheme will be constructed.	2022
PREPAREDNESS	Community engagement though RCRG in the Westwood/Sperrin Drive area	RCRG	By 2021 the RCRG will establish the Westwood / Sperrin Drive community group to increase community resilience to flooding.	2021
	Community engagement though Regional Community Resilience Group in the Knockramer Meadows / Silverwood Leaves area	RCRG	By 2021 the RCRG will establish the Knockramer Meadows / Silverwood Leaves community group to increase community resilience to flooding.	2021

5.5

GLENGORMLEY AND MALLUSK

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5.5.1 SUMMARY

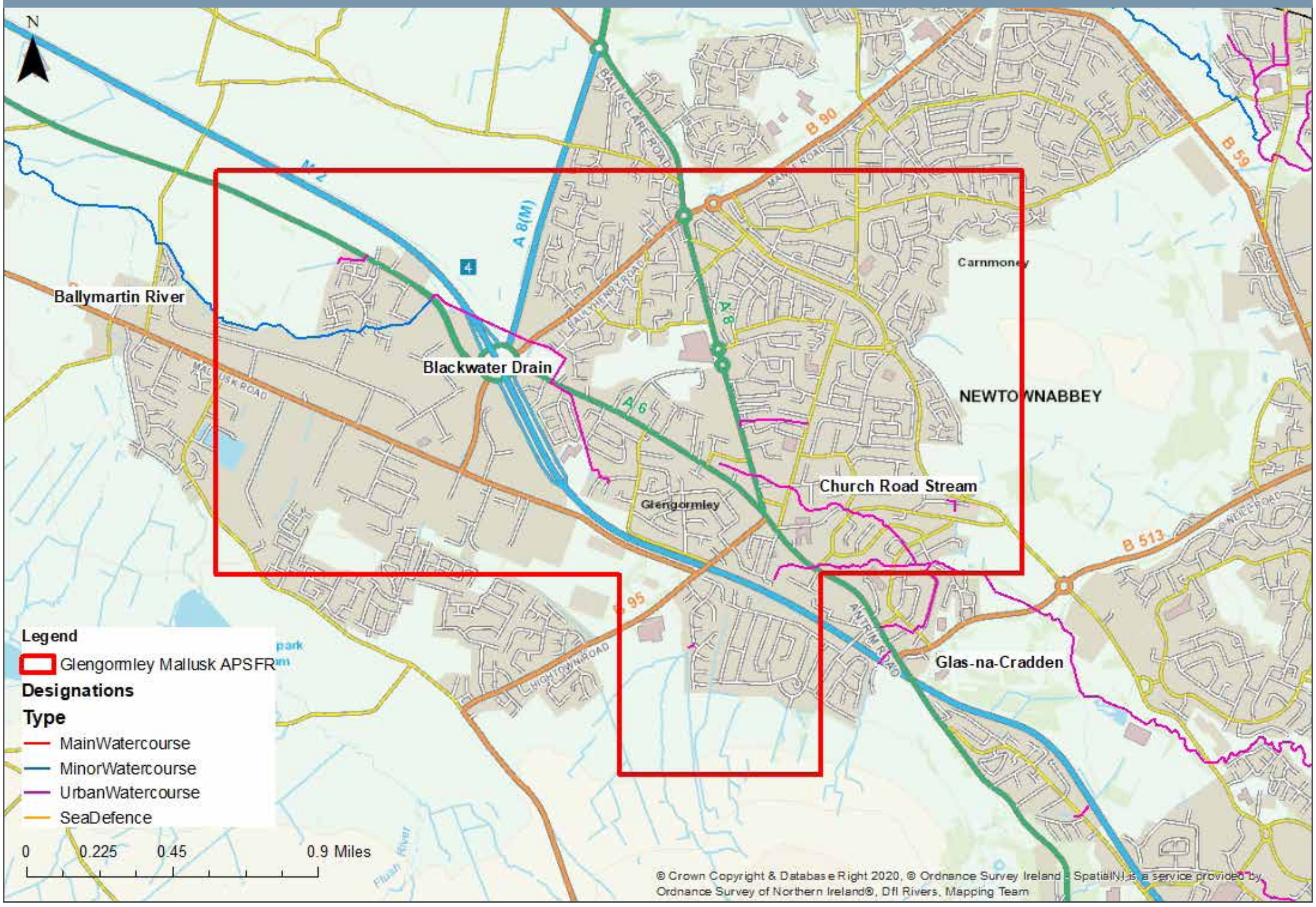
5.5.1.1 Flood risk area overview

The Glengormley and Mallusk area has a population of approximately 21,000 according to the 2011 census, and there is a risk of fluvial and surface water flooding to people and property within this APSFR. The Glengormley and Mallusk APSFR is in the Neagh Bann IRBD, and in both the Belfast Lough and Tidal Lagan and the Sixmilewater Local Flood Risk Management Areas. Figure 5.5-1 below shows the APSFR boundary and the key watercourses. The M2 motorway runs through the APSFR dividing the residential area of Glengormley, which is situated to the northeast of the motorway, from the mainly commercial and industrial areas of Mallusk on the southwest side of the motorway. The north and western parts of the APSFR drain in a westerly direction via the Blackwater Drain / Ballymartin River towards the Sixmilewater whereas the smaller south easterly part of the APSFR drains eastwards, through the Glas-na-Cradden watercourse and urban tributaries, towards Belfast Lough.

5.5.1.2 Northern Ireland Flood Risk Assessment (NIFRA) 2018

The boundary of the Glengormley and Mallusk APSFR was refined in the NIFRA 2018. The NIFRA 2018 identified a slightly larger area than the PFRA 2011, and the APSFR now expands further eastwards towards Carnmoney. The APSFR also borders the Newtownabbey APSFR along its northern boundary.

Figure 5.5-1: Location and boundary of Glengormley and Mallusk APSFR and key watercourses



5.5.2 HISTORY

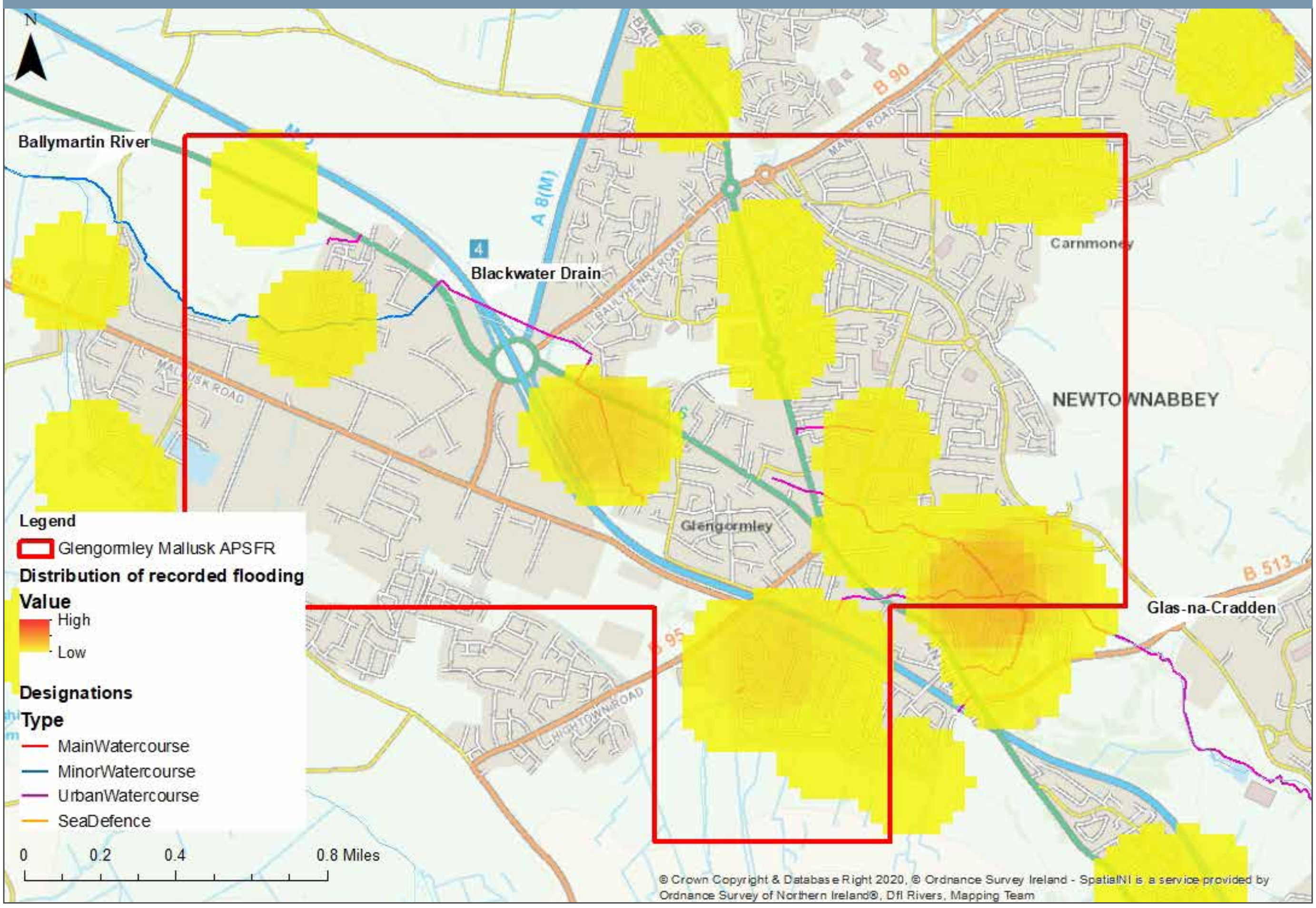
5.5.2.1 Summary of flooding history

Flooding across the Glengormley and Mallusk area has not been significant or widespread, when compared to other APSFR in NI. The flood event of 16th and 17th August 2008 caused flooding to pockets of properties and a small number of further reports of individual property flooding have occurred between 2011 and 2018. Severe flooding occurred at a plastics factory during the August 2008 event (the factory had also reported flooding on other occasions). This was caused by a combination of blockages to flow in a poorly maintained tributary drain running through the site, overland flow through the factory grounds and flood flows in the Ballymartin River flowing, adjacent to the north-western boundary of the factory.

Figure 5.5-2 below shows the distribution of reported flooding to properties in the APSFR.

Flood flows from the current and future development in the area are likely to impact the capacity of the existing watercourses and culvert network. Out of bank flooding has been reported at the confluence of the Ballymartin River and the Blackwater Drain, although detailed records are not available. Some localised flooding has also been reported on the left bank of the Ballymartin River upstream of Park Road Bridge.

Figure 5.5-2: Heatmap showing recorded flooding in the Glengormley and Mallusk APSFR



Key areas which have flooded in the past within Glengormley and Mallusk are:

- Roughfort Road;
- Lower Rogan Manor;
- Localised flooding at Park Road Manor;
- Commercial property close to the Blackwater Drain at Sentry Lane;
- Swanston Road.

Flooding in October 2013 affected 10 residential properties in the Swanston Road area of Glengormley, due to surface water exceeding the capacity of the local drainage system.

5.5.2.2 Flood events since 2015

Since 2015, there were reports of three properties flooding in 2017 and 2018. Two of these were in the new eastern extension of the APSFR, towards Carnmoney.

5.5.3 CATCHMENT

5.5.3.1 Catchment characteristics and tributaries

The Glengormley and Mallusk APSFR sits mainly in a valley at a watershed of drainage systems, the bulk of which flow westwards, and a lesser proportion flow eastward. The headwaters of the Ballymartin River, a designated watercourse, and the Blackwater Drain rise in the area. The APSFR is bounded by the steep Belfast Hills to the south which contribute run-off flows into the APSFR.

The Blackwater Drain extends for 1.3 km and flows as open channel north and westwards from its upstream limit at Mossgrove Primary School/Swanston Crescent to where it becomes the Ballymartin River, just upstream of Antrim Road, near the M2 motorway junction 4 roundabout. The Ballymartin River then flows in a north-westerly direction before discharging into the Sixmilewater at Ballymartin River Bridge, to the north of Templepatrick.

The Ballymartin River is an open channel watercourse which extends approximately 9.4 km. The overall Ballymartin River/ Blackwater Drain catchment, upstream of the Millbank Road Bridge is approximately 28.5 km^2. The catchment is much less urbanised to the west, once it leaves the urbanised Mallusk area.

A significant tributary of the Ballymartin River is the Flush River, which is an undesignated watercourse that flows approximately 2 km northwards from its source southwest of Mallusk at Ballyutoag/ Boghill Road through Hydepark Dam and Boghill Dams, before entering the Ballymartin River at the Sealstown Road/ Mallusk Road junction.

There are numerous other undesignated open channels and culverted watercourses which discharge to both the Blackwater

Drain and Ballymartin River and which contribute to the overall complexity of surface drainage systems in the APSFR.

The eastern extent of the APSFR, in Glengormley, forms the upper reaches of the Glas-na-Cradden catchment. The Glas-na-Cradden, which has a relatively small catchment of 8.6 km², flows in an easterly direction away from the APSFR, in a steep valley through Newtownabbey before discharging to Whitehouse Lagoon and ultimately Belfast Lough, adjacent to the M5 motorway.

A very small north-easterly fringe of the APSFR, drains residential areas at Carnmoney, via NI Water and DfI Roads culverted drainage systems, out of the APSFR to the Three Mile Water in Newtownabbey APSFR and on into Belfast Lough.

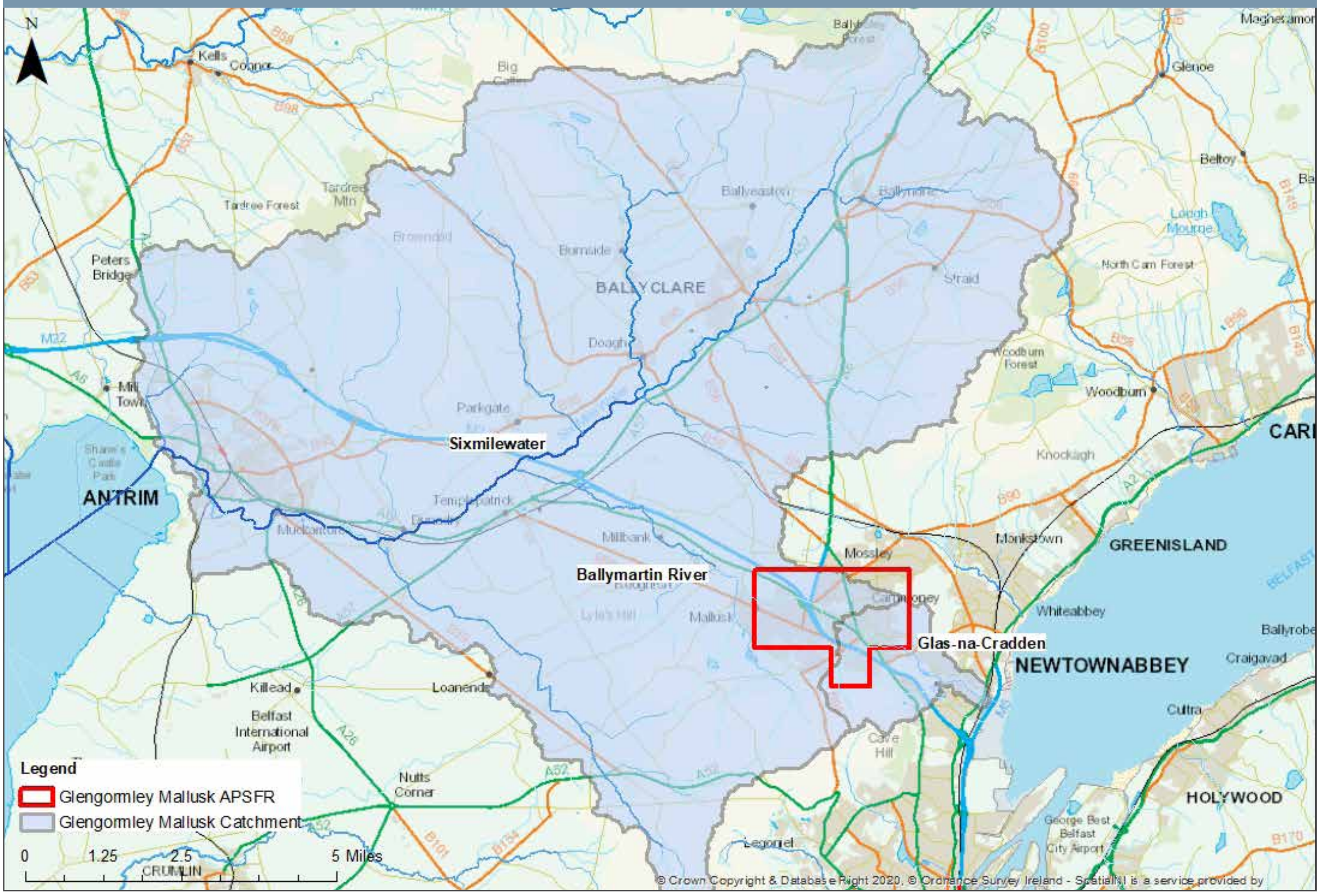
Figure 5.5-3 below shows the two catchments taking flows to the west and east of Glengormley and Mallusk.

5.5.3.2 Urban drainage and wastewater network

NI Water is responsible for the clean drinking water supply, foul and storm water sewerage networks throughout NI. Within the Glengormley and Mallusk APSFR, the sewerage network is predominantly separated, with only 15 km of combined sewers. There is approximately 69 km of storm sewer network and 100 km of foul sewer network in the area.

There are no WwTW within the Glengormley and Mallusk APSFR and the area is served by a WwTW towards the coast at Newtownabbey. There are four pumping stations in service within the APSFR.

Figure 5.5-3: Catchments in relation to the Glengormley and Mallusk APSFR



5.5.3.3 Environment

The APSFR encompasses the following WFD waterbodies.

Table 5.5-1: Waterbody classifications in and around the Glengormley and Mallusk APSFR

Waterbody name	2015 Classification	2018 Classification	2021 Objective	Reason for failure
UKGBNI1NB030305206: Ballymartin Water	Moderate	Moderate	Good	Invertebrates Diatoms Soluble Reactive Phosphorus

More information about status and individual objectives can be viewed at the NIEA Information Request Viewer.

Ballymartin Water is a tributary of the Sixmilewater, part of the Lough Neagh catchment. A key pressure on the Ballymartin are drainage misconnections and misuse of the storm water systems at Mallusk Industrial Estate.

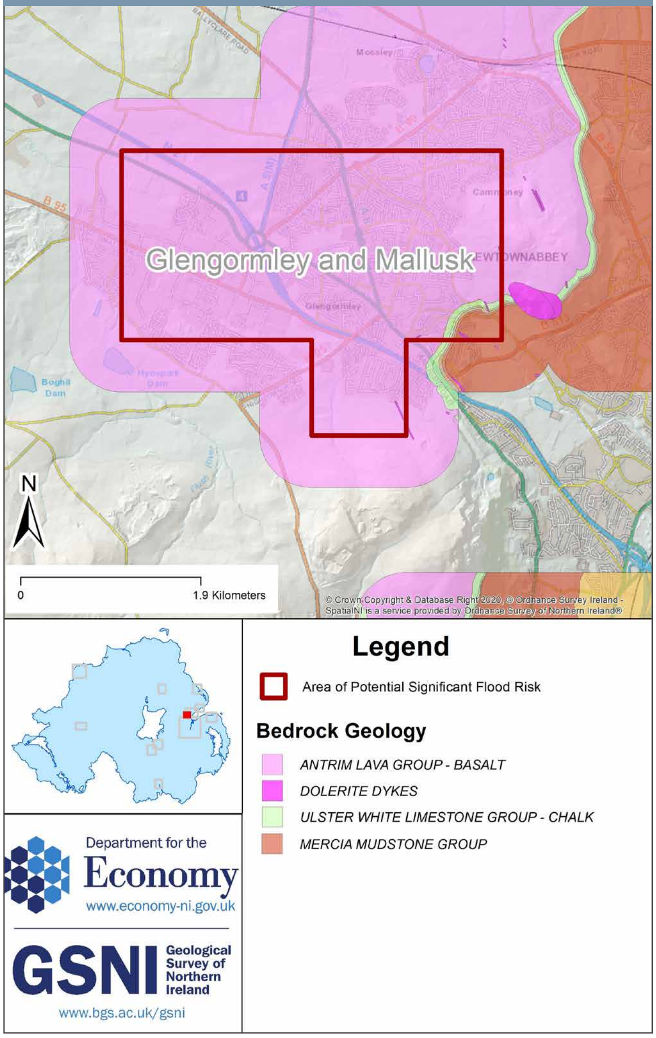
Belfast Lough and its peripheral waterbodies suffer from acute and chronic pollution that is impacting upon their ecological status.

Flood alleviation works such as reducing run off within the catchment, improving the sewerage network by separating the foul and surface drainage and the establishment of blue / green infrastructure such as SuDS could all play a positive role in achieving WFD objectives within these waterbodies.

5.5.4 GEOLOGY

5.5.4.1 Bedrock Geology

Figure 5.5-4 : Bedrock geology of Glengormley and Mallusk



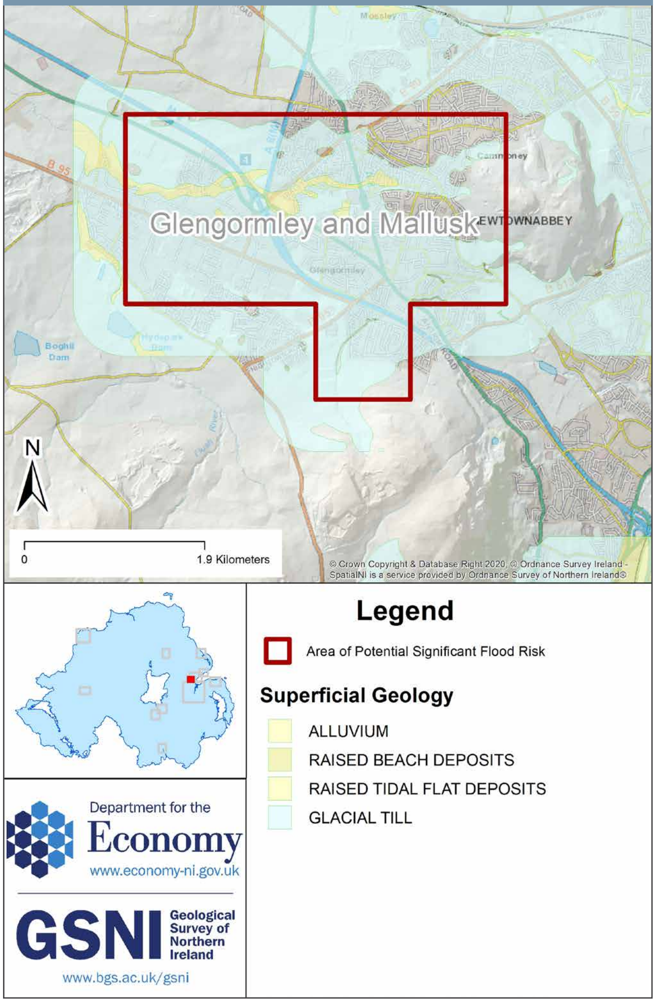
Bedrock under the Glengormley and Mallusk APSFR is composed of basalt belonging to the Antrim Lava Group. Basalts can contain significant volumes of groundwater in joints, fractures and small cavities, but surface water ingress into these rocks will be extremely slow and therefore they offer very little alleviation of surface water flooding. In the southeast of the APSFR chalk of the Ulster White Limestone Formation is present and overlies impermeable Mercia Mudstone Group. Chalk can contain cave systems into which surface water can flow and then reappear via springs downslope.

5.5.4.2 Superficial Geology

Glacial till is the dominant superficial deposit covering bedrock across the area, but it has very low permeability, and so will do virtually nothing to alleviate surface water flooding by allowing water to infiltrate into it or the underlying geology.

Areas of river alluvium are typically composed of sand, silt and cobbles and when not fully saturated can take in rain and surface water to help alleviate flooding. However, areas of alluvium tend to be quite thin and low lying and are the first to flood in response to rising river water levels.

Figure 5.5-5 : Bedrock geology of Glengormley and Mallusk



5.5.5 SOURCES OF FLOODING

5.5.5.1 Risk to buildings and infrastructure by source

In the NIFRA 2018, Glengormley and Mallusk was ranked 5th of the 45 FRAs in terms of potential adverse consequences of flooding. DfI has undertaken detailed predictive computer mapping and modelling of flooding from rivers and sea, and further strategic mapping for surface water flooding. The results of this mapping can be found on Flood Maps (NI). An analysis of the potential consequences from flooding shows the predominant flood risk is from surface water flooding.

Although exposed to fluvial flood risk from the Ballymartin River and its network of urban watercourses, the area identified at risk within the Glengormley and Mallusk APSFR is significantly more susceptible to surface water flood risk, resulting in more extensive damages. The surface water mapping does, however, include some of the floodplains from smaller watercourses.

Figure 5.5-6 shows that the predicted surface water annual average damages (AAD) were around £2.8 million, whereas the fluvial flooding damages reached approximately £130,000.

Figure 5.5-6: Annual Average Damages (£m) by flood source

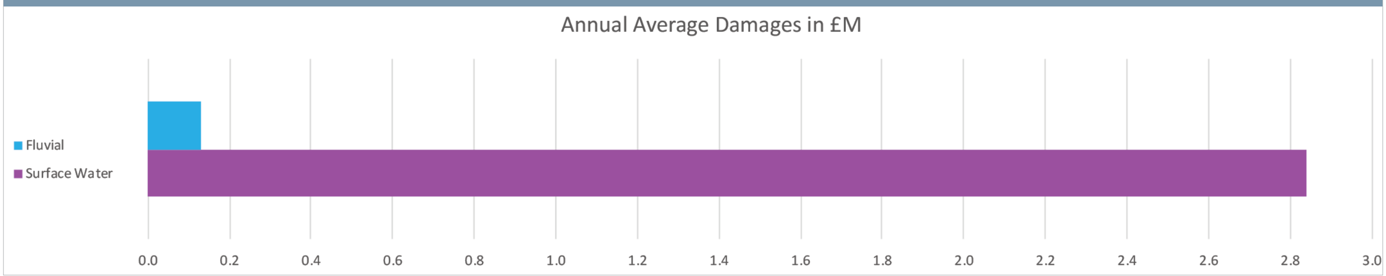
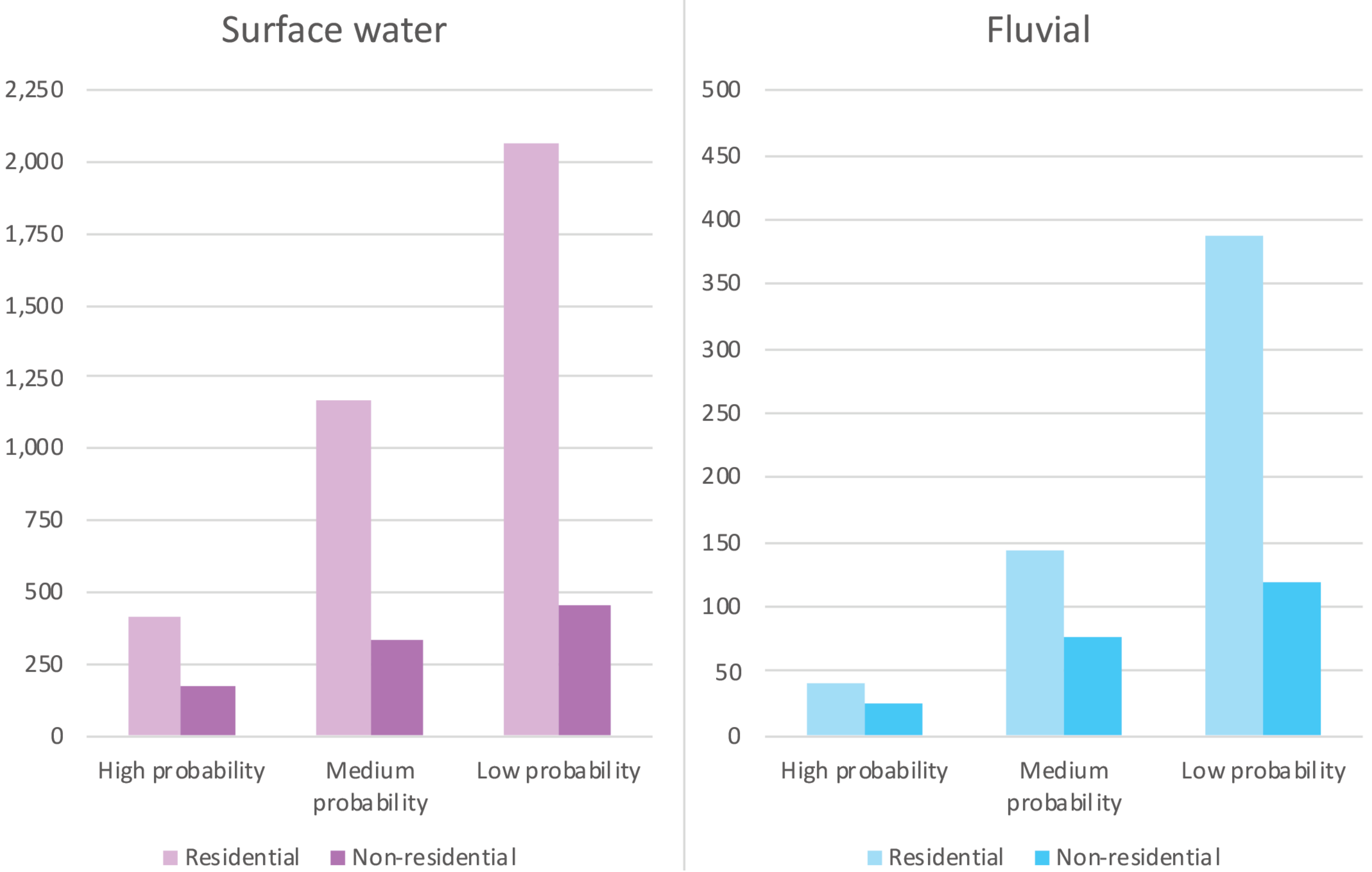


Figure 5.5-7 below shows a similar trend in that the surface water mapping predicts the higher number of residential and non-residential buildings flooded compared to fluvial sources for the high, medium and low probability events. Table 5.5-2 shows the return periods and probabilities which have been assessed as high, medium and low probability events for surface water and fluvial flooding.

Table 5.5-2: Return periods for high, medium and low probability

Probability	Surface water	Fluvial
High	3.33 % AEP (1 in 30 year)	10 % AEP (1 in 10 year)
Medium	0.5 % AEP (1 in 200 year)	1 % AEP (1 in 100 year)
Low	0.1 % AEP (1 in 1000 year)	0.1 % AEP (1 in 1000 year)

Figure 5.5-7: Number of buildings located within the modelled flood extent



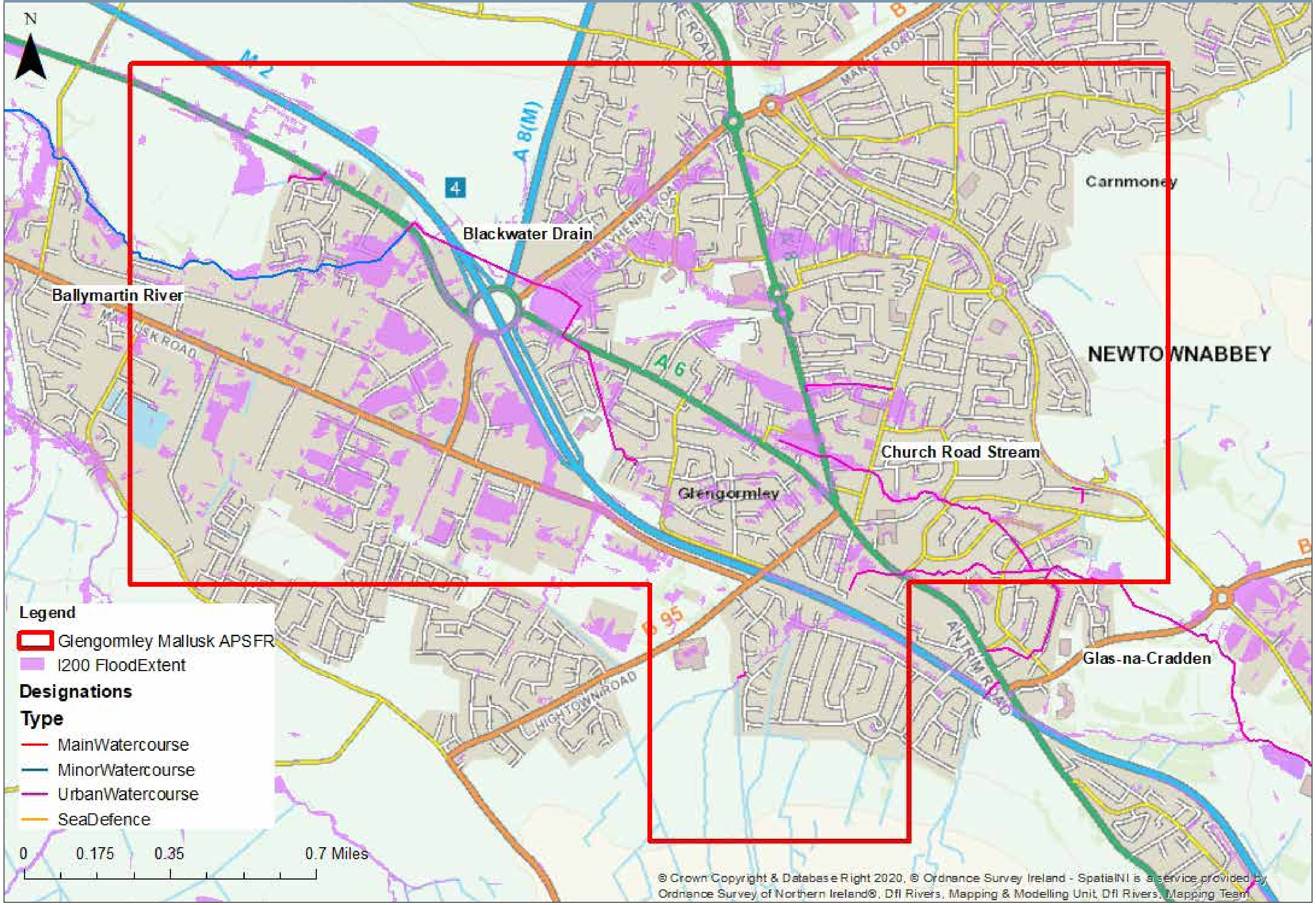
Note that the scale for surface water on Figure 5.5-7 above, is different to account for significantly higher values than those for fluvial.

5.5.5.2 Surface water (Pluvial)

The surface water flood map shows that conveyance routes and areas where surface water ponds are dispersed throughout the APSFR. To the west of the M2 motorway, it is predominantly industrial and commercial property which could be affected, particularly near the Antrim Road roundabout. To the east of the M2 motorway a significant residential area is shown within the hazard mapping. An overview of this mapping for the Glengormley and Mallusk APSFR is shown in Figure 5.5-8 below.

Infrastructure at risk from surface water flood events up to 0.1 % AEP (1 in 1000 year) in the Glengormley and Mallusk APSFR are IPPC sites, a care home, a GP surgery, a school, a sewage pumping station, electricity substations, environmental designated sites and built heritage sites. A detailed breakdown of this is included in Appendix D.

Figure 5.5-8: Overview of surface water hazard mapping for a 0.5 % AEP (1 in 200 year) flood event.

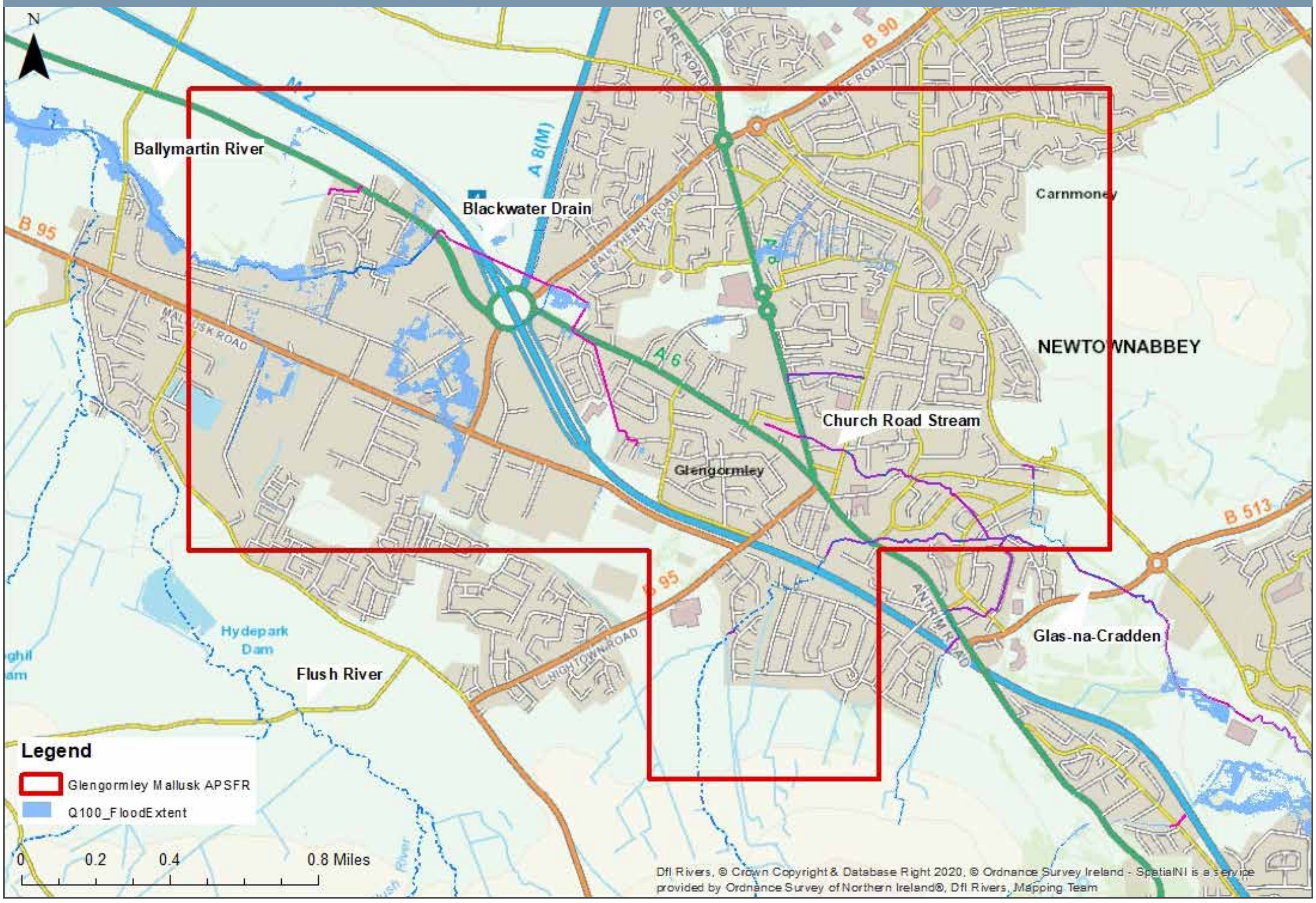


5.5.5.3 Fluvial

The main area at risk of fluvial flooding lies to the west of the motorway, where commercial and industrial buildings could be affected. There is also some fluvial risk to residential properties just off Ballyclare Road in the vicinity of Richmond Road and Richmond Crescent. Figure 5.5-9 below shows an overview of the areas at risk of fluvial flooding within the Glengormley and Mallusk APSFR.

Infrastructure at risk from fluvial flood events up to 0.1 % AEP (1 in 1000 year) in the Glengormley and Mallusk APSFR are IPPC sites, a sewage pumping station, electricity substations, a site of conservation importance and built heritage sites. A detailed breakdown of this is included in Appendix D.

Figure 5.5-9: Overview of fluvial hazard mapping for a 1 % AEP (1 in 100 year) flood event



5.5.6 CURRENT FLOOD RISK MITIGATION

5.5.6.1 Planning

In addition to national planning policy and advice, DfI Rivers will advise against bringing forward sites or the zoning of any land in preparation for the new Antrim and Newtownabbey Borough Council LDP, particularly for built development, that has been identified from the flood maps as being within the 1 % AEP (1 in 100 year) fluvial floodplain, 0.5 % AEP (1 in 200 year) reservoir inundation area, or is susceptible to surface water flooding.

5.5.6.2 Flood defences

There are no existing formal designated river flood defences in the vicinity of the Glengormley and Mallusk APSFR. However, DfI Roads and Rivers have worked together to upgrade Park Road and increase the capacity of the culvert on the Ballymartin River. The larger culvert both increases capacity and facilitates possible future lowering / regrading of the watercourse should a Flood Alleviation Scheme (FAS) be developed later. These culvert works were completed early in 2011 and are shown in the photographs below.

A feasibility study of the Ballymartin River and Blackwater Drain catchment concluded in 2014. The principal study aim was to determine whether viable options existed to alleviate fluvial flooding at various locations in the Ballymartin River and Blackwater Drain catchments, within the Mallusk area. The study was also undertaken because of the extensive development that was going on in the APSFR and the lack of information about drainage systems in the area. The study identified a number of locations in the Glengormley and Mallusk area at risk from fluvial flooding from designated and un-designated watercourses. It produced a number of recommendations for the alleviation of fluvial flood risk within the study area. Additional modelling and a report on the flooding at a factory site were also completed.

Figure 5.5-10: Photographs taken during Park Road culvert construction and of completed works

5.5.7 ACTIONS IN THE FIRST CYCLE FLOOD RISK MANAGEMENT PLAN

In the first cycle FRMP, there was one measure set out specifically for the Glengormley and Mallusk APSFR, which was a FAS for the Ballymartin River and its tributaries.

Table 5.5-3 shows a summary of measures within the Glengormley and Mallusk APSFR and their progress.

Table 5.5-3: Progress tracking for Flood Risk Management Plan objectives 2015-2021

Category	Measure code from First Cycle FRMPs	Measure description	Progress
PROTECTION	UK_NI_APSFR_08_01	Ballymartin River and tributaries – Flood Alleviation Scheme	Outline feasibility submitted in March 2014. Full feasibility study and economic appraisal commenced 2020.

5.5.7.1 Prevention

No particular Prevention measures specific to Glengormley and Mallusk were set out in the first cycle FRMP.

As outlined in Chapter 4, DfI Rivers advises on planning applications regarding the risk of flooding. The basis of this advice is to avoid inappropriate development in areas which are at risk of flooding and to ensure that any development does not increase flood risk elsewhere.

5.5.7.1.1 Planning policy

Development planning proposals for Glengormley and Mallusk is currently set out in the BMAP, under the Newtownabbey District. The BMAP proposals identify the key considerations that will be taken into account in determining planning applications within the Plan Area.

A new LDP for the Antrim and Newtownabbey Borough Council area, for the period up to 2030, is being prepared and due to be adopted by 2024, during the second FRMP cycle. It will comprise:

- a Plan Strategy to define strategic objectives for future development of the Borough, including strategic policies and a spatial strategy;
- a Local Policies Plan which will include site-specific proposals, designations and zoning to deliver the Strategy.

On adoption, the new LDP will replace the current development plan for the Borough and operational planning policies that were produced by the previous Department of the Environment.

5.5.7.2 Protection

There have been a small number of improvements made to watercourse and drainage systems in the APSFR in the recent past, but no major works have yet been proposed or undertaken.

The FAS in the programme from the first cycle FRMP is due to be carried over to the next cycle. The feasibility study for the scheme and economic appraisal is on the DfI Rivers Prioritised Capital Works Programme, for development and commenced in 2020.

5.5.7.3 Preparedness

There has been no specific flood risk management under the preparedness category for Glengormley and Mallusk. Regional measures for preparedness are outlined in Chapter 4 of this report.

A pilot project of community engagement to deliver flood warning and information, held in 2014, identified basic assessment formulae to assess and score areas that could potentially be a focus for flood warning and informing actions. Based on this scoring the Sandyknowes Park area and the surface water flood extent to the immediate west of the Sandyknowes Roundabout, could be considered suitable for inclusion in a programme of community engagement in future to deliver flood warning and informing initiatives.

5.5.8 UPDATED PROGRAMME FOR SECOND CYCLE FLOOD RISK MANAGEMENT PLAN

5.5.8.1 Key Messages

Although there are no specific measures set out under Prevention for the Glengormley and Mallusk APSFR in the first cycle FRMP, the Antrim and Newtownabbey Borough Council LDP is scheduled to be finalised early in the second cycle FRMP. The LDP, alongside current advice on Planning from DfI Rivers, will support mitigation of flood risk in the council area in relation to both new development and redevelopment proposals from the LDPs adoption and through the second FRMP cycle. This will be taken forwards as a measure for the second cycle FRMP for DfI Rivers to work with the council to update the flood risk policy within the new LDP.

The singular measure for Glengormley and Mallusk APSFR as set out through the first FRMP cycle is a Protection measure which is progressing through a feasibility study and will continue through the second cycle.

Further engagement will be carried out by the RCRG to establish a community group at Sandyknowles Park.

5.5.8.2 Living With Water Programme (LWWP)

The LWWP area covers the Greater Belfast Area and will promote an integrated approach to drainage and wastewater management across the catchment through the production of a Strategic Drainage Infrastructure Plan (SDIP). The aims of the SDIP are to help protect people and properties at risk from flooding, enhance the natural environment and help grow the local economy. The SDIP will include schemes and concepts to manage water in an integrated way across the catchment. These will include;

- Policy and Legislative changes;
- Improved WwTW;
- Sewerage network alterations;
- Upper Catchment management work including Natural Flood Management;
- Online and offline attenuation of watercourses using blue/green infrastructure, SuDS;
- Integrated concepts to improve public green space whilst incorporating blue/green infrastructure.

These are set out in the draft plan, Living With Water in Belfast, which was published for consultation in November 2020.

5.5.8.3 Enhanced Drainage Area Plan

NI Water is currently taking forward modelling in the form of DAPs across NI for drainage areas with populations typically above 2000. The traditional approach is for all combined and foul sewers to be modelled. For the period April 2021 – March 2027 NI Water, through the LWWP will be conducting Enhanced DAPs in each of the APSFR that fall within the scope of the Belfast SDIP. These Enhanced DAPs extend modelling to include the NI Water storm sewers. Through the LWWP, NI Water is also taking forward Integrated Drainage and Catchment Modelling within the Glengormley and Mallusk APSFR that will look at the interaction between watercourses and NI Water's sewerage and storm networks.

Table 5.5-4 below sets out the measures and timescales for the Glengormley and Mallusk APSFR in the second cycle FRMP.

Table 5.5-4: Proposed measures for Flood Risk Management Plan cycle 2021-2027

Category	Measure summary	Lead authority	Specific measure	Timescale
PREVENTION	Enhanced Drainage Area Plan	NI Water	By 31st March 2027, NI Water will produce an Enhanced DAP for Glengormley and Mallusk that sets out actions to mitigate integrated flooding issues.	2027
	Influence local planning policy for development and flood risk	DfI Rivers	By 2024, DfI Rivers will work with the Antrim and Newtownabbey Borough Council to update flood risk policy in the Local Development Plan	2024
	Living with Water Programme	DfI	By 2021, DfI will develop 'Living With Water in Belfast', an integrated Plan for Drainage and Wastewater Management in Greater Belfast. This Strategic Drainage Infrastructure Plan will set out an integrated approach to drainage and wastewater management.	2021
PROTECTION	Flood alleviation works (will form part of LWWP)	DfI Rivers	By 2022, DfI Rivers will undertake further feasibility work with regards to a flood alleviation scheme for the Ballymartin River and tributaries. Should this identify a viable scheme this will be followed by detailed design and construction.	2022
PREPAREDNESS	Community engagement though RCRG in areas requiring support	RCRG	The RCRG will establish the Sandyknowes Park community group and progress other engagement in the area as appropriate, to increase community resilience to flooding.	2027

5.6

LARNE

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5.6.1 SUMMARY

5.6.1.1 Flood risk area overview

Larne is an eastern coastal town in the North Eastern RBD, with a population according to the 2011 Census of 18,755. It is at risk of flooding from surface water, rivers and the sea due to its position on the coast and proximity to local rivers such as the Inver and Larne, as shown below in Figure 5.6-1. It is within the Larne Local Flood Management Area which borders the Local Flood Management areas of Glens, Maine and Braid, and Sixmilewater.

5.6.1.2 Northern Ireland Flood Risk Assessment (NIFRA) 2018

The NIFRA identified that people and properties in Larne are at risk from surface water, fluvial and tidal flooding sources. The Larne APSFR boundary is shown below in Figure 5.6-1. Larne is the only new APSFR identified for the second cycle FRMP.

Figure 5.6-1: Location and boundary of Larne APSFR and key watercourses

5.6.2 HISTORY

5.6.2.1 Summary of flooding history

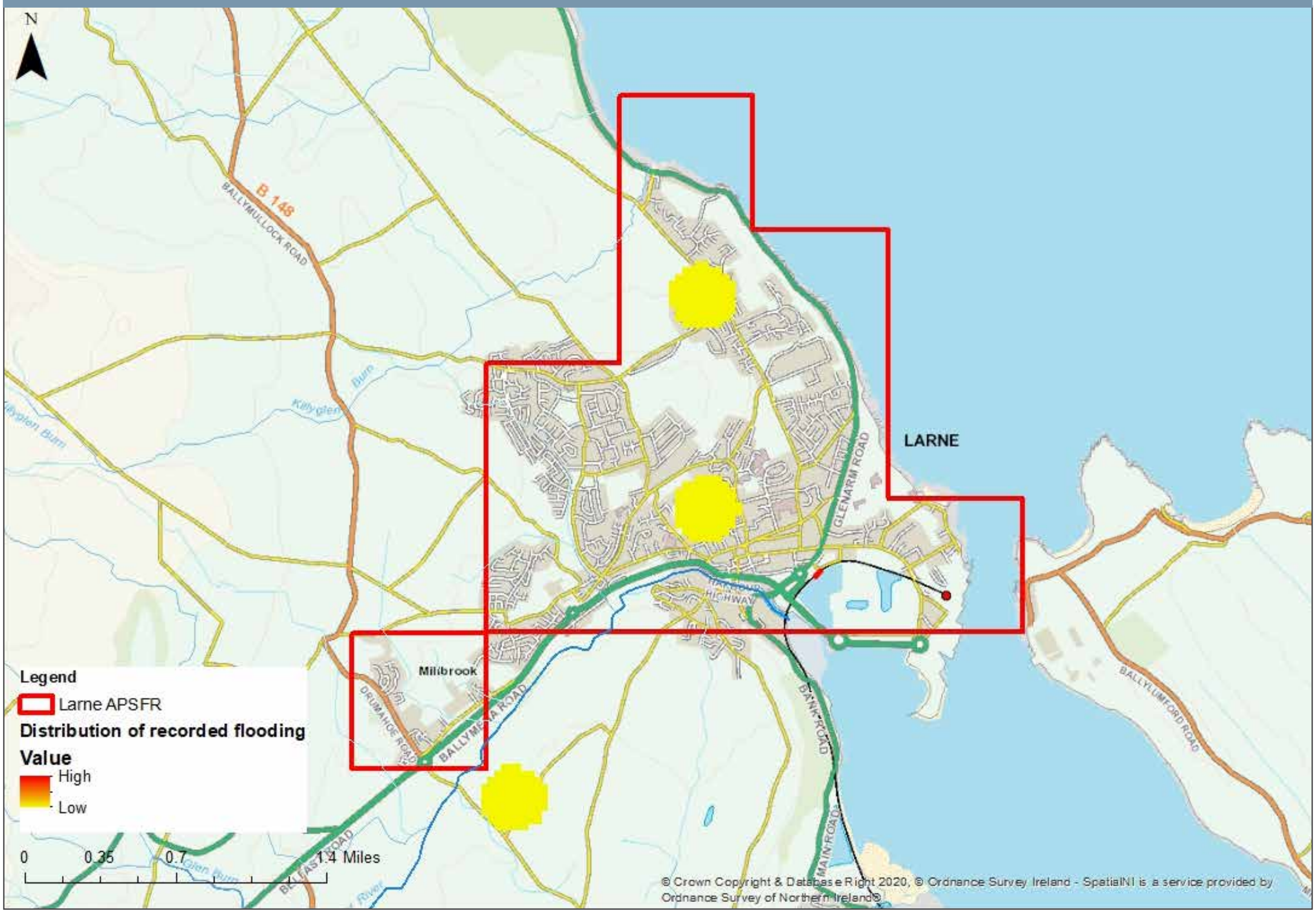
Historic flooding in Larne has mainly comprised of localised problems, caused by a combination of surface water flooding and flooding from smaller watercourses, in particular at Drains Bay.

Figure 5.6-2 below shows the distribution of recorded flooding across Larne.

5.6.2.2 Flood events since 2015

There have been no reports of significant flooding in the Larne APSFR since 2015. Only a small number of properties in the Larne area have reported flooding.

Figure 5.6-2: Heatmap showing recorded flooding in the Larne APSFR



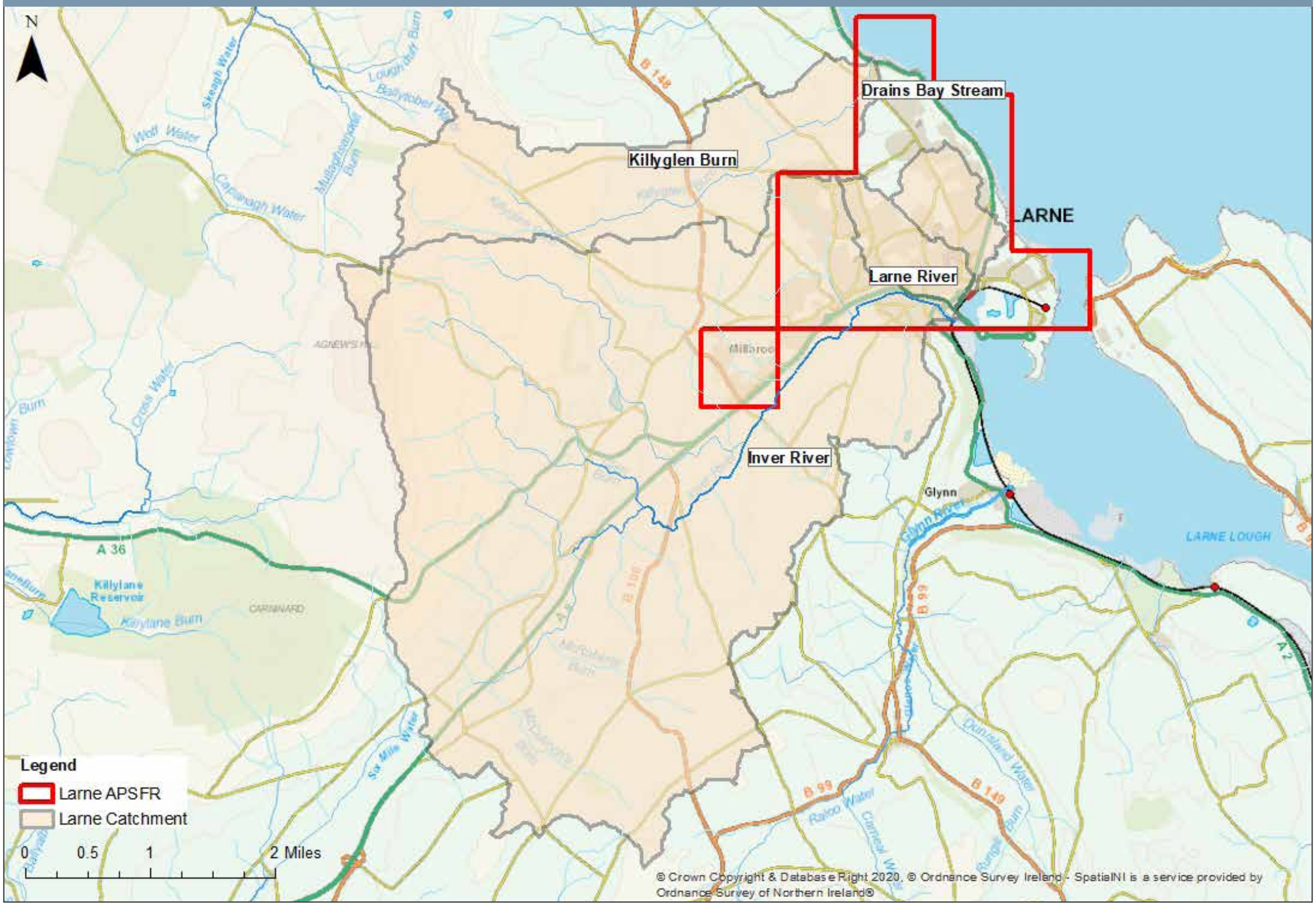
5.6.3 CATCHMENT

5.6.3.1 Catchment characteristics and tributaries

Larne is a coastal town situated on the North East Coast of County Antrim. It is a largely urbanised industrial town and a seaport connecting primarily to Scotland.

The valley of the Inver and Sixmilewater rivers cut across the Antrim plateau to form a through-route to the Irish Sea coast from the lowlands east of Lough Neagh. Both of these rivers have their origins near Shane's Hill 8 km south west of Larne. The Inver River flows through the most southerly tip of the APSFR flowing north-eastwards along a valley for approximately 14 km to the coast, where it enters Larne Lough near the Port of Larne ferry terminal. The Inver River becomes the 'Larne River' in its final reach into the Lough. The Sixmilewater drains in the opposite south westerly direction, towards Ballyclare to eventually drain into Lough Neagh at Antrim. The catchments of the Larne APSFR are shown in Figure 5.6-3 below.

Figure 5.6-3: Catchments in relation to the Larne APSFR



The northern part of the APSFR drains towards Drains Bay and the central and southern parts slope southwards towards the Inver River valley and eastwards to the coast. The APSFR is bounded by hills to the west, while the inner town centre is lower and flatter in nature.

Fluvial flows through the Larne APSFR discharge to the Larne Lough at the harbour and also via a small watercourse called Drains Bay Stream, which enters the Irish Sea at Drains Bay at the northern extent of the APSFR. A number of smaller urban watercourses flow open and in culverts in the immediate urban area. These include the Linn River, Naggy Burn and Glenarm Road Stream watercourses flowing from the northern extremities of the town, southwards towards the town centre; also the Ilse Court Stream draining a southern part of the APSFR, flows northwards into the Inver River near the centre of Larne. The small south eastern catchment of the Circular Road Stream carries flows from an area around Glynn Road and Circular Road directly eastwards into Larne Lough. Three small watercourses drain the south-western part of the APSFR into the Inver River namely the Drumnahoe, Ballyoran and Antiville Road Streams.

5.6.3.2 Urban drainage and wastewater network

NI Water is responsible for the clean drinking water supply, foul and storm water sewerage networks throughout NI.

Within the Larne APSFR, the sewerage network is split between combined systems and separate foul and storm systems. The majority of the NI Water drainage network within the APSFR area is combined at approximately 104 km in length, with the separate system being 85 km of storm and 26 km of foul sewerage network.

NI Water has one WwTW in the Larne APSFR, at the harbour. There are also nine pumping stations and a sludge treatment works within the bounds of the APSFR.

5.6.3.3 Environment

The APSFR encompasses the following WFD waterbodies.

Table 5.6-1: Waterbody classifications in and around the Larne APSFR

Waterbody name	2015 Classification	2018 Classification	2021 Objective	Reason for failure
UKGBNI1NE040405046 Glynn River	Good	Moderate	Good	Soluble Reactive Phosphate
UKGBNI1NE040405047 Larne (Inver) River	Moderate	Good	Good	N/A
UKGBNI6NE050 Larne Lough North	MEP	MEP	GEP	Angiosperms Invertebrates Fish Priority hazardous substances Specific pollutants
UKGBNI6NE060 Larne Lough Mid	Moderate	Moderate	Good	Angiosperms Invertebrates Hydromorphology Priority hazardous substances Specific pollutants
UKGBNI6NE070 Larne Lough South	Good	Moderate	Good	Macrophytes
UKGBNI1NE040403011 Ballygalley Burn	Moderate	Moderate	Good	Invertebrates

More information about status and individual objectives can be viewed at the NIEA Information Request Viewer.

Larne Lough and its tributaries within the APSFR boundary suffer from acute and chronic pollution that is impacting upon their ecological status.

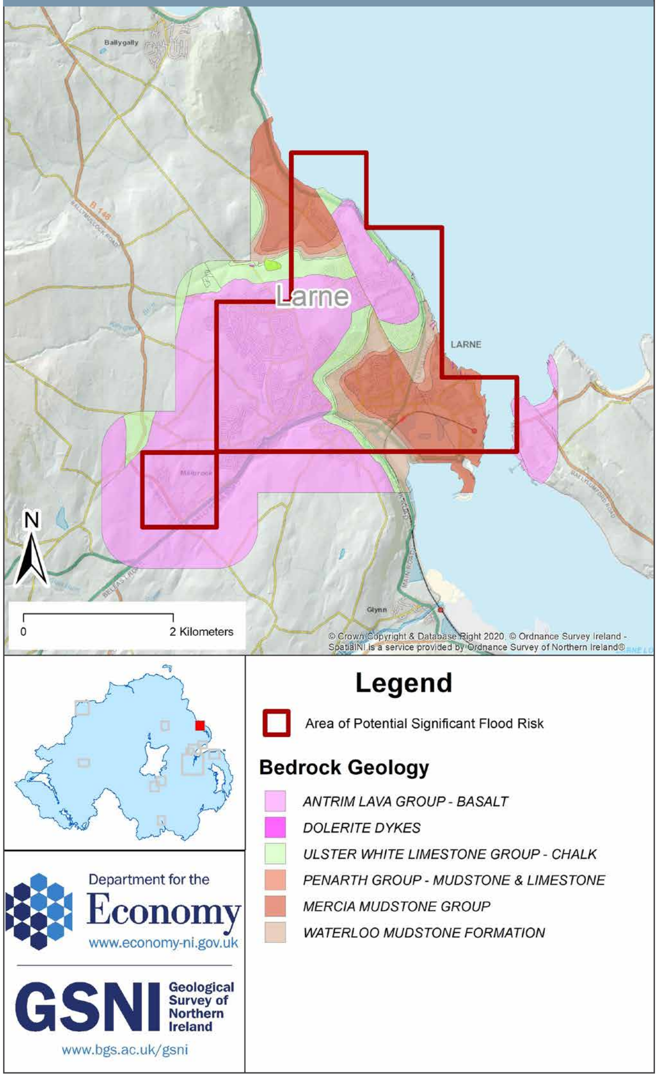
Flood alleviation works such as reducing run off within the catchment, improving the sewerage network by separating the foul and surface drainage and the establishment of blue / green infrastructure such as SuDS could all play a positive role in achieving WFD objectives within these waterbodies.

There are also ASSI and AONB protected sites downstream of the APSFR and advice must be sought from Natural Environment Division before works commence.

5.6.4 GEOLOGY

5.6.4.1 Bedrock Geology

Figure 5.6-4 : Bedrock geology of Larne



From west to east, bedrock under the Larne APSFR is composed of:

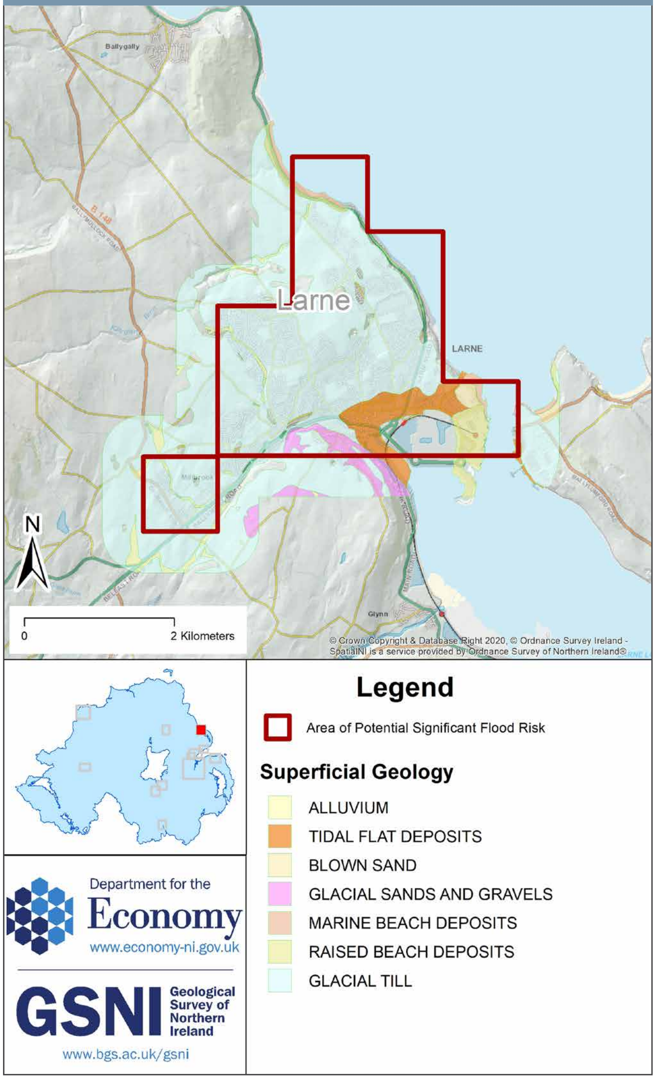
- basalt belonging to the Antrim Lava Group;
- chalk of Ulster White Limestone Formation and;
- mudstone belonging to the Waterloo Mudstone Formation, Penarth Group and Mercia Mudstone Group.

The mudstone dominated bedrock is impermeable and offers no alleviation of surface water flooding. Basalts can contain significant volumes of groundwater in joints, fractures and small cavities, but surface water ingress into these rocks is likely to be extremely slow and therefore offers little or no alleviation of surface water flooding. Chalk can contain cave systems into which surface water can flow and then reappear via springs.

5.6.4.2 Superficial Geology

Glacial till is the dominant superficial deposit covering bedrock across the area, but it has very low permeability, and therefore will do very little to alleviate surface flooding by allowing water to infiltrate into it or the underlying geology. Glacial sand and gravel which occurs in a small proportion of the southern part of the APSFR, will have high porosity and permeability. Such deposits can readily absorb surface water, and so where uncovered by impermeable man-made surfaces, will have a mitigating effect on surface flooding. In the southeast of the APSFR there are raised tidal flat deposits that are most likely clay and silt dominated, and so will not alleviate surface water flooding by allowing water to infiltrate into them or the underlying geology. Also, in the eastern corner of this area there are high porosity and permeability raised beach deposits and blown sand, which will readily absorb rain and surface water where uncovered by impermeable man-made surfaces, and so will have a mitigating effect on surface water flooding.

Figure 5.6-5 : Superficial geology of Larne



5.6.5 SOURCES OF FLOODING

5.6.5.1 Risk to buildings and infrastructure by source

In the NIFRA 2018, Larne ranked 6th of the 45 FRAs in terms of potential adverse consequences of flooding. DfI has undertaken detailed predictive computer mapping and modelling of flooding from rivers and sea, and further strategic mapping for surface water flooding. The results of this mapping can be found on Flood Maps (NI). An analysis of the potential consequences from flooding shows the predominant flood risk is from surface water flooding.

Figure 5.6-6 shows the predicted annual average damages (AAD) by flood source. The graph shows that the highest AAD cost is from surface water sources by a considerable margin. Predicted surface water AAD were just over £2.7 million with tidal sources reaching around £279,000. The total damages from fluvial sources were lowest at approximately £92,000. The Inver River which is the largest watercourse flowing through the APSFR, has not been a particular flooding source. The surface water flood map used to generate these figures also includes the floodplains of some smaller watercourses mentioned in Section 5.6.3.1 above, which may also contribute to the predicted surface water damages.

Figure 5.6-6: Annual Average Damages (£m) by flood source

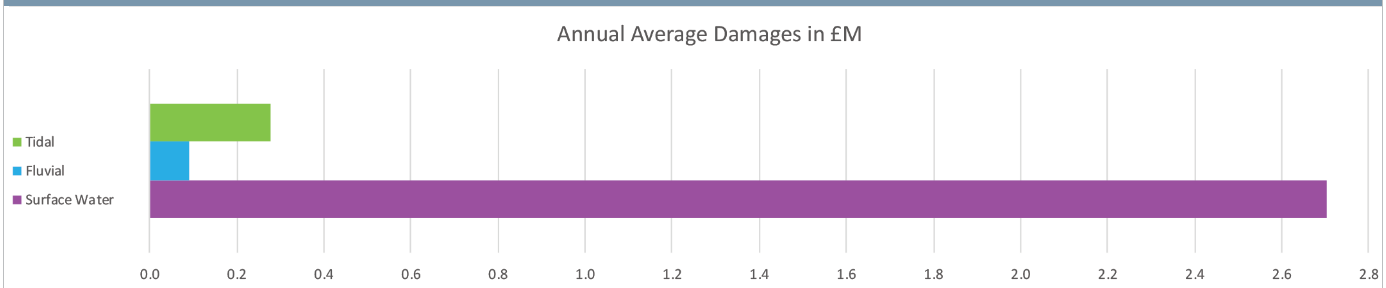
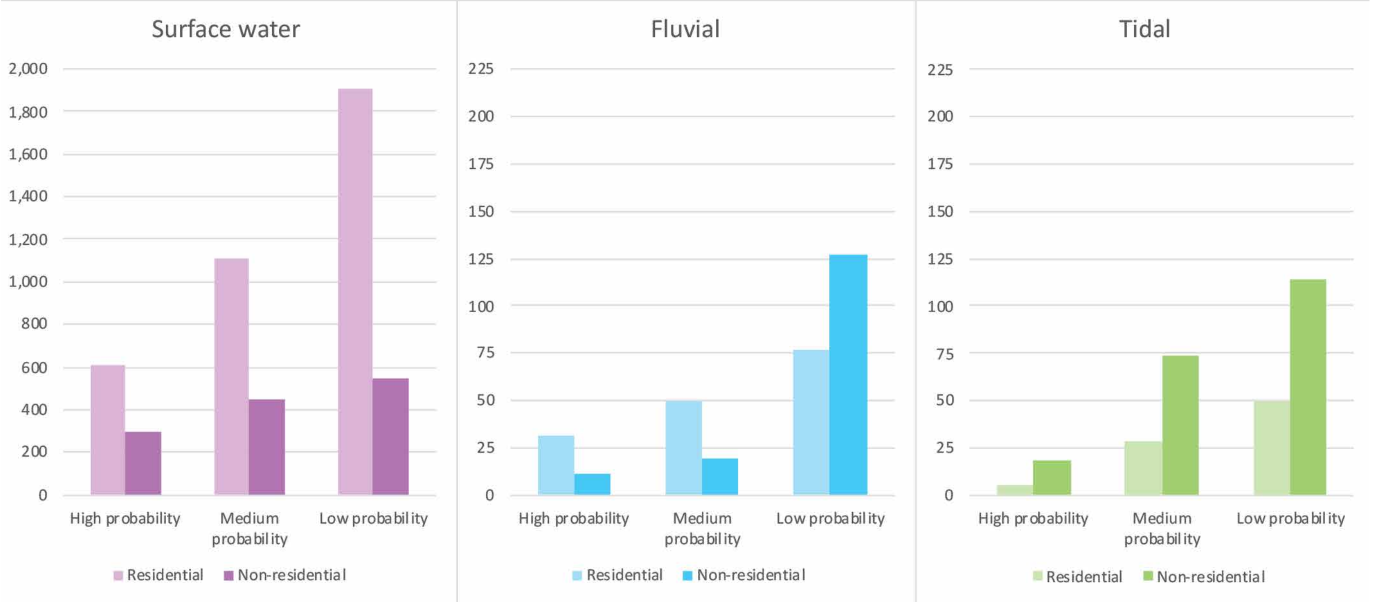


Figure 5.6-7 below shows a similar trend to Figure 5.6-6 in that surface water mapping predicts the highest number of buildings flooded compared to both tidal and fluvial flooding for the high, medium and low probability events. Table 5.6-2 shows the return periods which have been assessed as high, medium and low probability events for surface water, fluvial and tidal flooding.

Table 5.6-2: Return periods for high, medium and low probability

Probability	Surface water	Fluvial	Tidal
High	3.33 % AEP (1 in 30 year)	10 % AEP (1 in 10 year)	10 % AEP (1 in 10 year)
Medium	0.5 % AEP (1 in 200 year)	1 % AEP (1 in 100 year)	0.5 % AEP (1 in 200 year)
Low	0.1 % AEP (1 in 1000 year)	0.1 % AEP (1 in 1000 year)	0.1 % AEP (1 in 1000 year)

Figure 5.6-7: Number of buildings located within the modelled flood extent



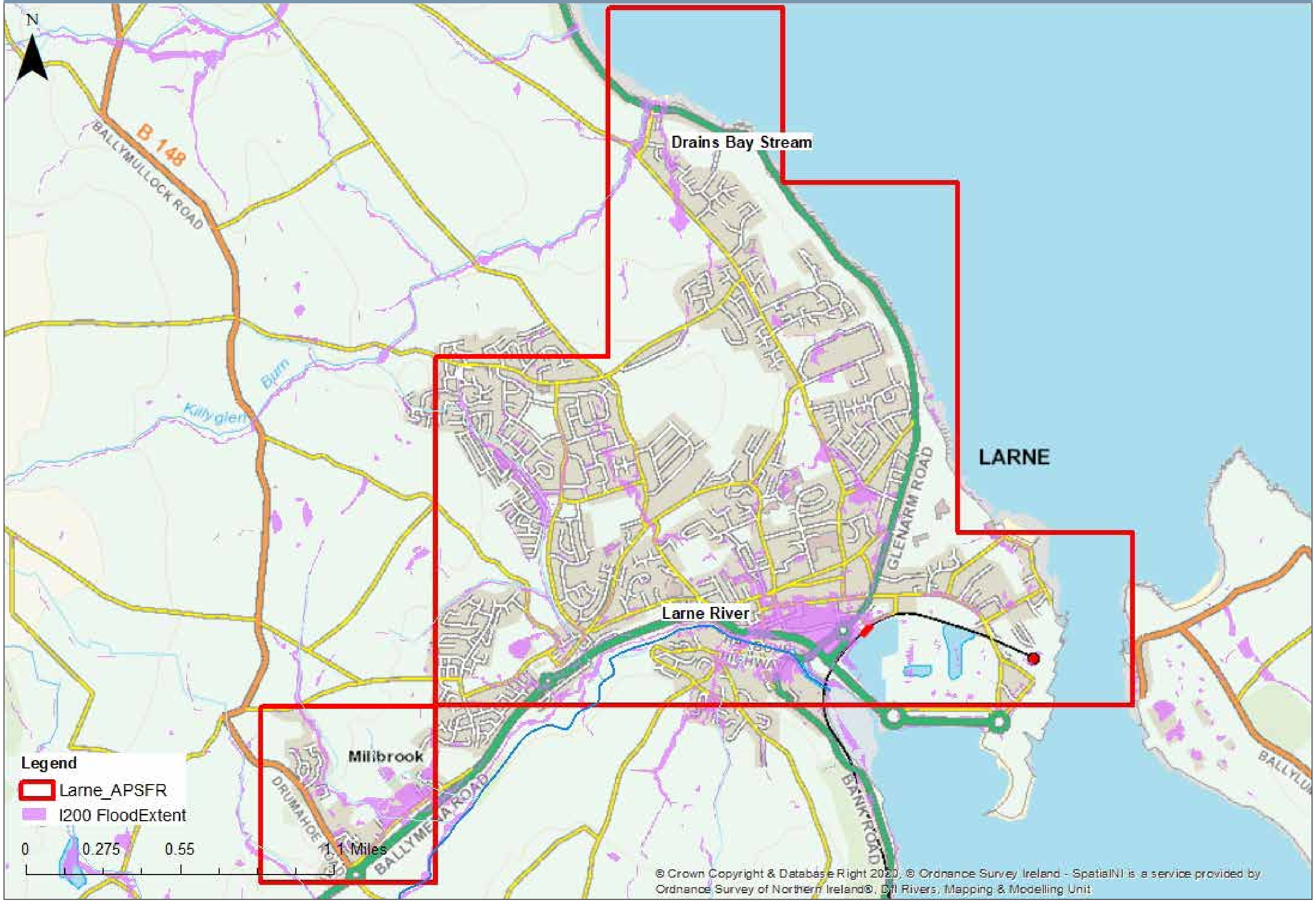
Note that the scale for surface water on Figure 5.6-7 (above), is different to account for significantly higher values than those for fluvial and tidal.

5.6.5.2 Surface water (Pluvial)

Surface water flooding poses the greatest risk to Larne, due to the town having a largely urbanised area which has the potential to generate large amounts of surface water runoff following heavy rainfall events. There are a number of surface water conveyance routes through Larne, which can be seen in Figure 5.6-8 below, including two clear flow routes draining to the north of Larne and a number of flow routes draining towards the flatter, and more susceptible town centre and harbour areas.

Infrastructure at risk from surface water flood events up to 0.1 % AEP (1 in 1000 year) in the Larne APSFR are IPPC sites, care homes, GP surgeries, electricity substations and an environmental designated site. A detailed breakdown of this is included in Appendix D.

Figure 5.6-8: Overview of surface water hazard mapping for a 0.5 % AEP (1 in 200 year) flood event

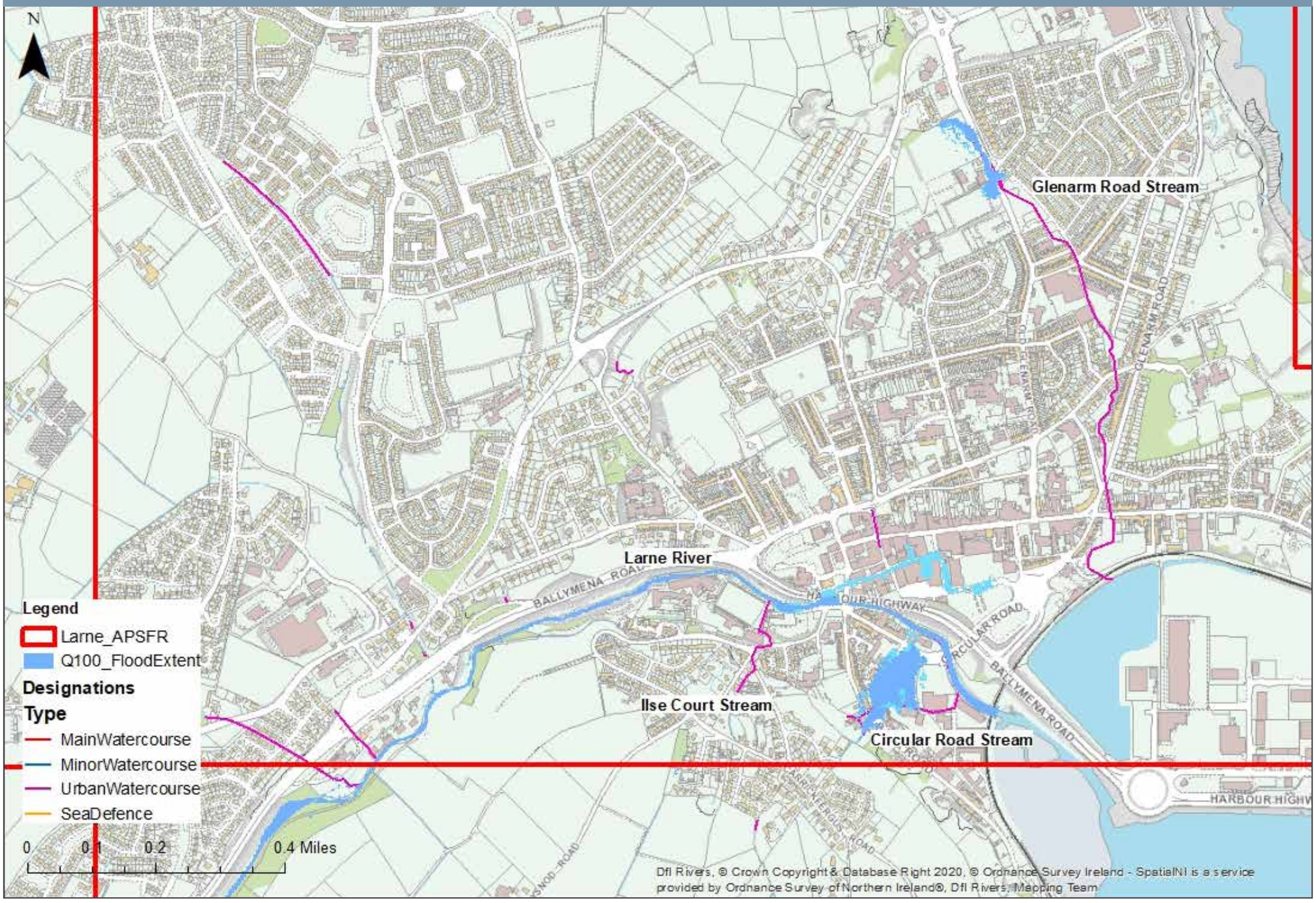


5.6.5.3 Fluvial

There is fluvial risk in the area in between the A8 Harbour Highway and Bank Road near the harbour, this includes large commercial properties and some residential housing along the A2 Glynn Road. The overview of fluvial flood hazard mapping for the Larne APSFR is depicted below in Figure 5.6-9.

Infrastructure at risk from fluvial flood events up to 0.1 % AEP (1 in 1000 year) in the Larne APSFR are IPPC sites, a sewage pumping station, and an environmental designated site. A detailed breakdown of this is included in Appendix D.

Figure 5.6-9: Overview of fluvial hazard mapping for a 1 % AEP (1 in 100 year) flood event

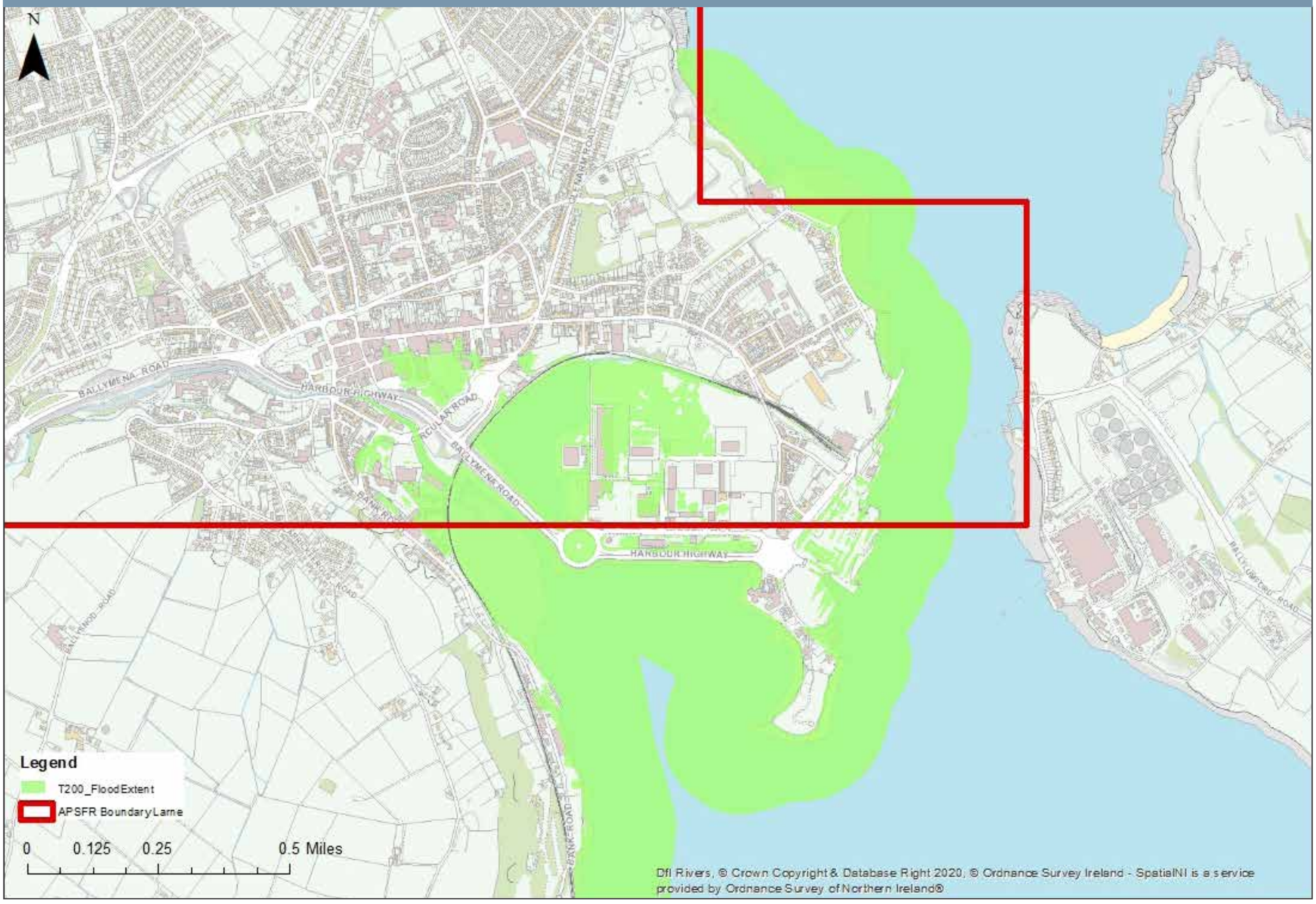


5.6.5.4 Tidal

Larne is at risk from coastal flooding from tidal surges. The main area at risk includes commercial buildings on the low-lying industrial estate at Larne harbour. The extent of risk is shown below in Figure 5.6-10.

Infrastructure at risk from tidal flood events up to 0.1 % AEP (1 in 1000 year) in the Larne APSFR are IPPC sites, care homes, GP surgeries, a police station schools, electricity substations, sewage pumping stations, environmental designated sites and built heritage sites. A detailed breakdown of this is included in Appendix D.

Figure 5.6-10: Overview of tidal hazard mapping for a 0.5 % AEP (1 in 200 year) flood event



5.6.6 CURRENT FLOOD RISK MITIGATION

5.6.6.1 Planning

In addition to national planning policy and advice, DfI Rivers will advise against bringing forward sites or the zoning of any land in preparation for the new Mid and East Antrim Borough Council Local Development Plan, particularly for built development, that has been identified from the flood maps as being within the 1 % AEP (1 in 100 year) fluvial floodplain, 0.5 % AEP (1 in 200 year) tidal floodplain/ reservoir inundation area, or is susceptible to surface water flooding.

5.6.6.2 Flood defences

There are no existing formal flood defences within the vicinity of the Larne APSFR.

5.6.6.3 NI Coastal Flood Response Plan

Due to the tidal flood risk in Larne, the APSFR is included in the Northern Ireland Coastal Flood Response Plan, published in January 2019.

The NI Coastal Flood Response Plan was developed by the Flooding and Severe Weather Working Group of the 3 NI Emergency Preparedness Groups (EPGs). Its aim is to provide a pre-planned response to warnings of coastal flooding and to outline the graduated incident and co-ordinated inter-agency response to a potential or actual tidal flooding event affecting NI. The Plan was completed and tested in early 2017 and it includes coastal areas in the vicinity of Larne. The Plan remains a living document to incorporate any changes to the area and to ensure it is up to date.

5.6.7 ACTIONS IN THE FIRST CYCLE FLOOD RISK MANAGEMENT PLAN

Larne was not identified as a SFRA through the PFRA 2011, but was instead identified as an Area for Further Study (AFS). Further detailed modelling took place for all of those identified as SFRA and AFS, after the first cycle of FRMP. The 49 AFS were not specifically addressed in the first cycle FRMP and therefore no measures specific to Larne were set out through the first cycle FRMP, however the Regional Measures did apply.

5.6.7.1 Prevention

As outlined in Chapter 4, DfI Rivers advises on planning applications regarding the risk of flooding. The basis of this advice is to avoid inappropriate development in areas which are at risk of flooding and to ensure that any development does not increase flood risk elsewhere.

5.6.7.1.1 Planning policy

A new LDP for the Mid and East Antrim Borough Council for the period up to 2030 is being prepared with the adoption of the Plan Strategy in early 2021 and Local Policies Plan in late 2022, during the second FRMP cycle. It will comprise:

- a Plan Strategy to define strategic objectives for future development of the Borough, including strategic policies and a spatial strategy;
- a Local Policies Plan which will include site-specific proposals, designations and zoning to deliver the Strategy.

On adoption, the new LDP will replace the current Plans for the Borough and operational planning policies that were produced by the previous Department of the Environment.

5.6.8 UPDATED PROGRAMME FOR SECOND CYCLE FLOOD RISK MANAGEMENT PLAN

5.6.8.1 Key Messages

The Mid and East Antrim Borough Council LDP is scheduled to be finalised early in the second cycle FRMP. The LDP, alongside current advice on Planning from DfI Rivers, will support mitigation of flood risk in the council area in relation to both new development and redevelopment proposals from the LDPs adoption and through the second FRMP cycle. This will be taken forwards as a measure for the second cycle FRMP for DfI Rivers to work with the council to update the flood risk policy within the new LDP.

5.6.8.2 Enhanced Drainage Area Plan

NI Water is currently taking forward modelling in the form of DAPs across NI for drainage areas with populations typically above 2000. The traditional approach is for all combined and foul sewers to be modelled. For the period April 2021 – March 2027, NI Water will be conducting Enhanced DAPs in each of the APSFR. These Enhanced DAPs extend modelling to include the NI Water storm sewers, which may identify drainage improvement schemes.

Table 5.6-3 below sets out the measures and timescales for the Larne APSFR in the second cycle FRMP.

Table 5.6-3: Proposed measures for Flood Risk Management Plan cycle 2021-2027

Category	Measure summary	Lead authority	Specific measure	Timescale
PREVENTION	Influence local planning policy for development and flood risk	DfI Rivers	By 2022, DfI Rivers will work with Mid and East Antrim Borough Council to update flood risk policy in the Local Development Plan.	2022
	Enhanced Drainage Area Plan	NI Water	By 31st March 2027, NI Water will produce an Enhanced DAP for Larne that sets out actions to mitigate integrated flooding issues.	2027

5.7

BANGOR

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5.7.1 SUMMARY

5.7.1.1 Flood risk area overview

Bangor is a coastal town in County Down, 13 miles (22 km) east of Belfast on the southern shoreline at the mouth of Belfast Lough, in the North Eastern RBD and while it is a coastal town, the main risk of flooding arises from surface water and fluvial sources. Although there are some commercial and industrial estates on the outskirts of the town, Bangor is better known as a commuter town for the Greater Belfast area with the A2 Bangor Road and a direct railway line, providing excellent transport links to Belfast. The town has a population of 61,011 according to the 2011 Census. Minor flooding has occurred in the APSFR, most recently in 2019.

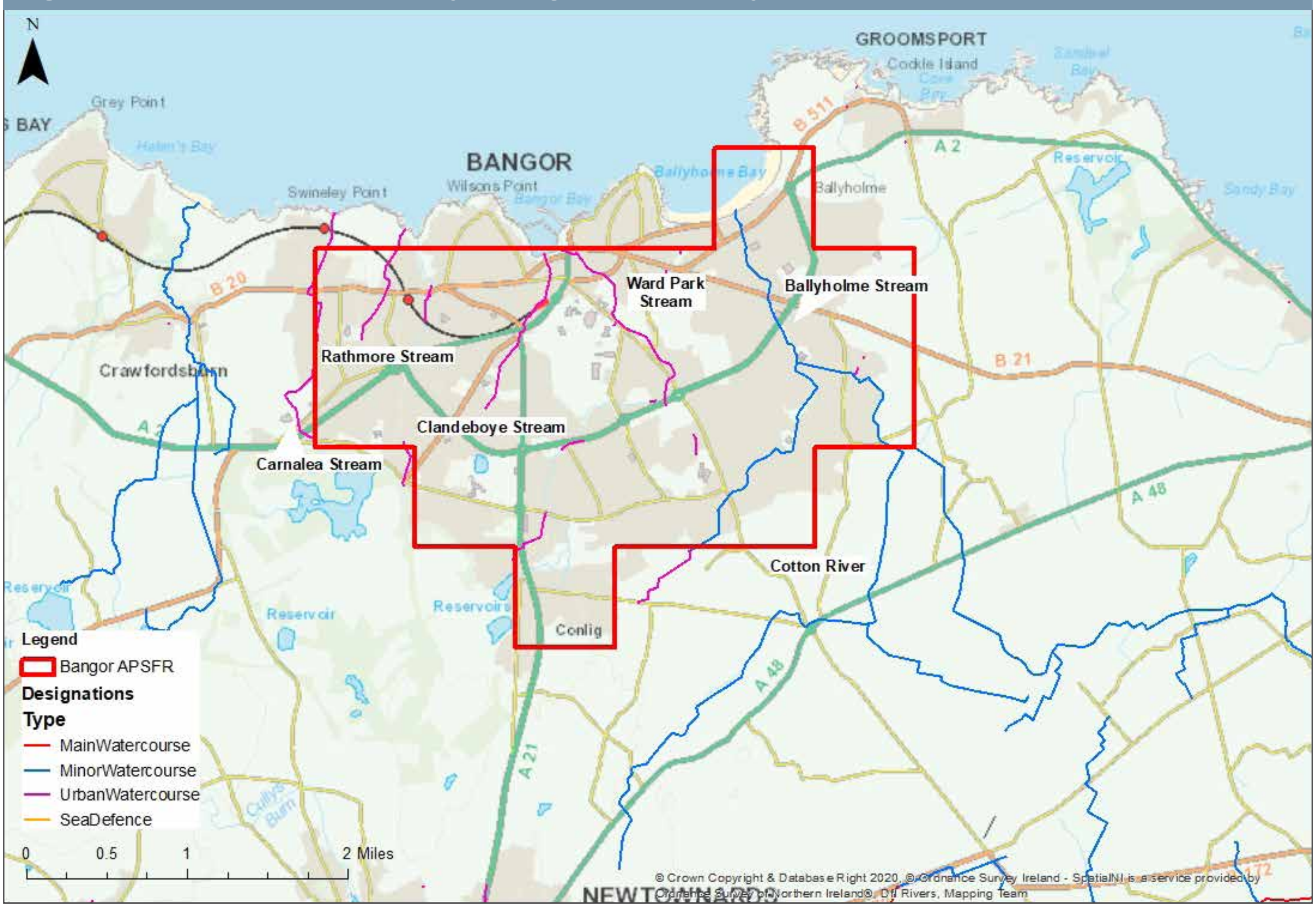
Current Climate Change predictions (up to 2080) estimate that sea levels in Bangor will increase by 3.2 mm/year. Despite this rise, tidal flooding does not pose a significant threat to Bangor as the coastal fringe is generally elevated well above sea level.

Figure 5.7-1 below shows the Bangor APSFR boundary and its wider area with key watercourses.

5.7.1.2 Northern Ireland Flood Risk Assessment (NIFRA) 2018

The APSFR boundary determined by the NIFRA 2018 has slightly changed since the PFRA 2011. The APSFR boundary now extends to cover more of the Donaghadee Road to the east of Bangor and part of Ballyholme Bay.

Figure 5.7-1: Location and boundary of Bangor APSFR and key watercourses



5.7.2 HISTORY

5.7.2.1 Summary of flooding history

Historical records indicate that very few properties have flooded in recent years in the Bangor APSFR. Small fluvial catchments fall gently from the outskirts towards the coast. Around the town centre there are steeper gradients, falling down towards the marina and pier areas, therefore limited pooling of surface water occurs in this area.

Bangor experienced three of the wettest summers on record in 2007, 2008 and 2009, and flooding occurred to areas of Gransha Road and Bloomfield Road in June 2007 due to heavy rainfall overwhelming the drainage system. The Belfast to Bangor railway line was also closed due to flooding. Figure 5.7-2 below shows flooding in the Bloomfield Playing Fields during the heavy rainfall event in June 2007.

There were also reports of flooding in the Rathmore area, towards the western boundary of the APSFR, during August 2008.

5.7.2.2 Flood events since 2015

Minor flooding occurred to the A2 Bangor Road in November 2019. This was due to heavy rainfall in the area and caused disruption to the busy commuter route.

Figure 5.7-2: Conlig Stream (Ward Park Stream catchment) fluvial flooding June 2007

5.7.3 CATCHMENT

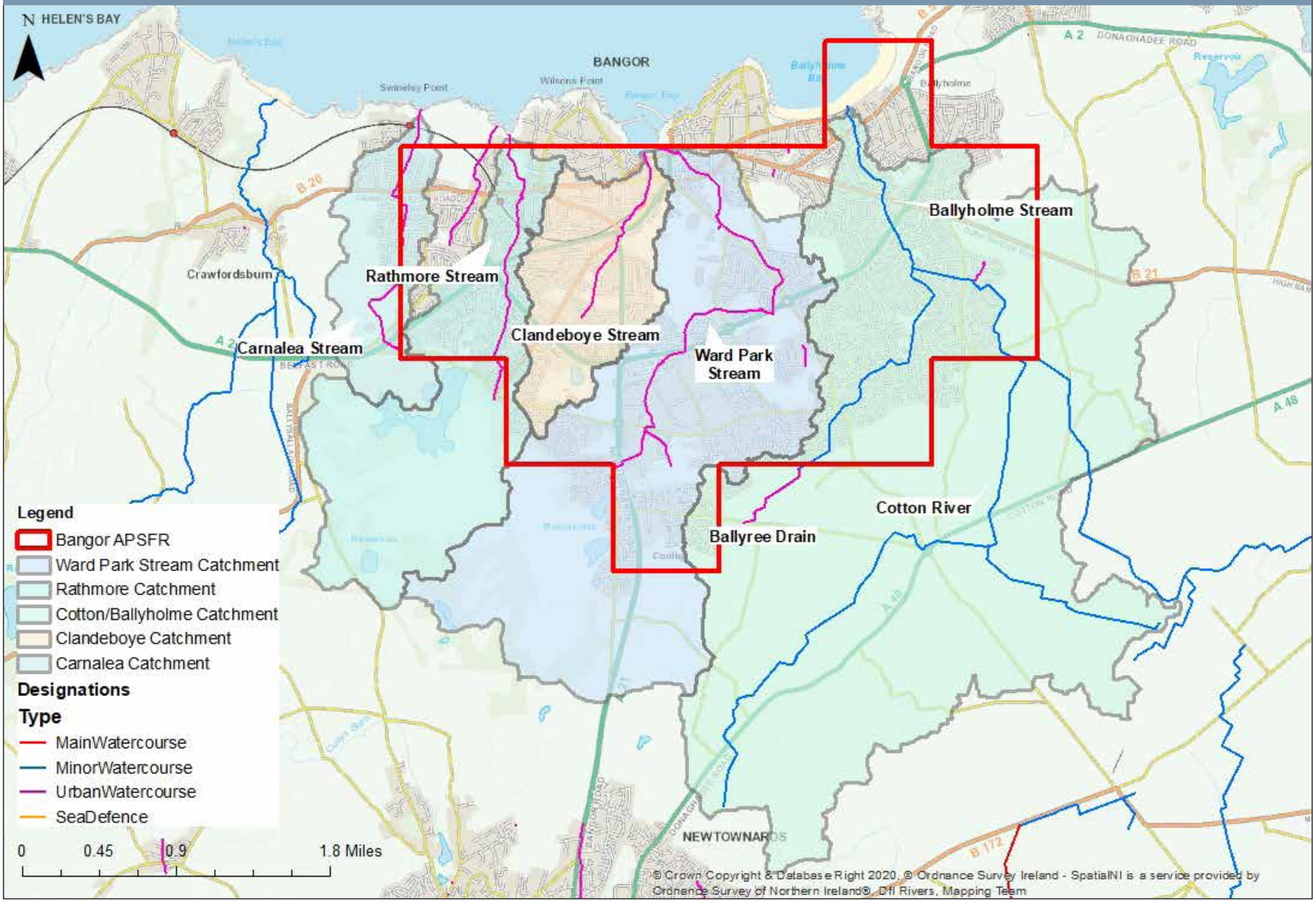
5.7.3.1 Catchment characteristics and tributaries

The Bangor APSFR is situated in the North Eastern RBD, and spans approximately 18 km^2.There are six urban watercourses within the Bangor APSFR each of which drains their small catchment in a northerly direction from the Gauntlet Hills towards the coast. These are, from west to east:

- The Carnalea Stream on the western side of Bangor rises in Clandeboye Estate and is designated (for maintenance by DfI) from Rathgael Road. It flows through the western side of the town within the confines of rear gardens of residential properties, and skirts around the western edge of the Carnalea Golf Club before discharging to Belfast Lough near Swinely Point. The length of this reach is around 2.8 km and flows within an open channel for most of its length with occasional short sections of culverts at road and railway crossings;
- Rathmore Stream is 1.6 km long and begins just upstream of Belmont Avenue in Bangor west. It is culverted through residential areas to Crawfordsburn Road, downstream of where it flows in open channel along the eastern boundary of Carnalea Golf Club before discharging to Belfast Lough at Smelt Mill Bay;
- Clandeboye Stream is a predominantly culverted watercourse which begins at Drumglass Park and outfalls to the marina at Queen's Parade;
- The Beechfield Stream (Rathgael House) and the Conlig stream which flows through the Balloo Industrial Estate on the Ring Road, south of the town centre, form the upper catchment of the Ward Park Stream. From the Gransha Road Roundabout, the Ward Park Stream flows mostly in open channel through Ward Park. At the downstream extent of Ward Park, the stream is culverted under Hamilton Road and the 'Flagship' Shopping Centre, eventually discharging to Bangor Marina near Bridge Street;
- The Cotton River, which rises in the Cotton townland to the south east of Bangor is around 6.5 km in length and the largest of Bangor's watercourses. It flows in an open channel through Ballycrochan and Kilmaine before being culverted under the A2 East Circular Road. In its lower reach, the river is known as the Ballyholme Stream before it discharges to Ballyholme Bay at Morningside;
- The Ballyree Drain is a tributary of the Cotton River and rises in the farmland upstream of the Green Road. It flows as an open watercourse through farmland before flowing through the residential areas of the Upper Gransha Road before joining the Cotton River just upstream of Kilmaine Primary School.

Figure 5.7-3 below shows these six watercourses and their catchment boundaries across Bangor APSFR.

Figure 5.7-3: Catchments in relation to the Bangor APSFR



5.7.3.2 Urban drainage and wastewater network

NI Water is responsible for the clean drinking water supply, foul and storm water sewerage networks throughout NI.

The majority of the NI Water drainage network within the APSFR is separated; there is approximately 185 km of storm sewers and 170 km of foul sewers. The total length of combined sewer network is approximately 115 km.

The area of Bangor is served by the North Down WwTW situated 5 km east of the APSFR just outside Donaghadee. There are also nine NI Water wastewater pumping stations within the ASPFR boundary.

5.7.3.3 Environment

The APSFR encompasses the following WFD waterbodies:

Table 5.7-1: Waterbody classifications in and around the Bangor APSFR

Waterbody name	2015 Classification	2018 Classification	2021 Objective	Reason for failure
UKGBNI1NE050502084: Ballyholme River	Bad Ecological Potential	Bad Ecological Potential	Poor Ecological Potential	Fish
UKGBNI1NE050502083: Crawfordsburn River	Moderate	Moderate	Good	Benthic Invertebrates Soluble Reactive Phosphorus
UKGBNI6NE090: Belfast Lough Inner	Moderate		Moderate	Alien Species Priority Hazardous Substances
UKGBNI6NE080: Belfast Lough Outer	Good		Good	Alien Species

More information about status and individual objectives can be viewed at the NIEA Information Request Viewer.

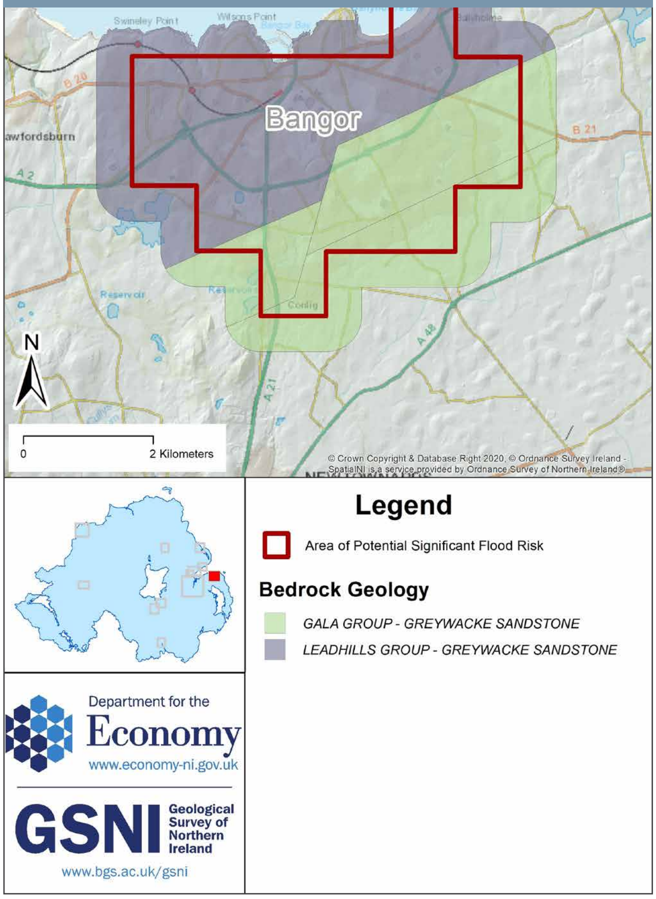
Belfast Lough and its peripheral waterbodies suffer from acute and chronic pollution that is impacting upon their ecological status.

Flood alleviation works such as reducing run off within the catchment, improving the sewerage network by separating the foul and surface drainage and the establishment of blue / green infrastructure such as SuDS could all play a positive role in achieving WFD objectives within these waterbodies.

5.7.4 GEOLOGY

5.7.4.1 Bedrock Geology

Figure 5.7-4: Bedrock geology of Bangor



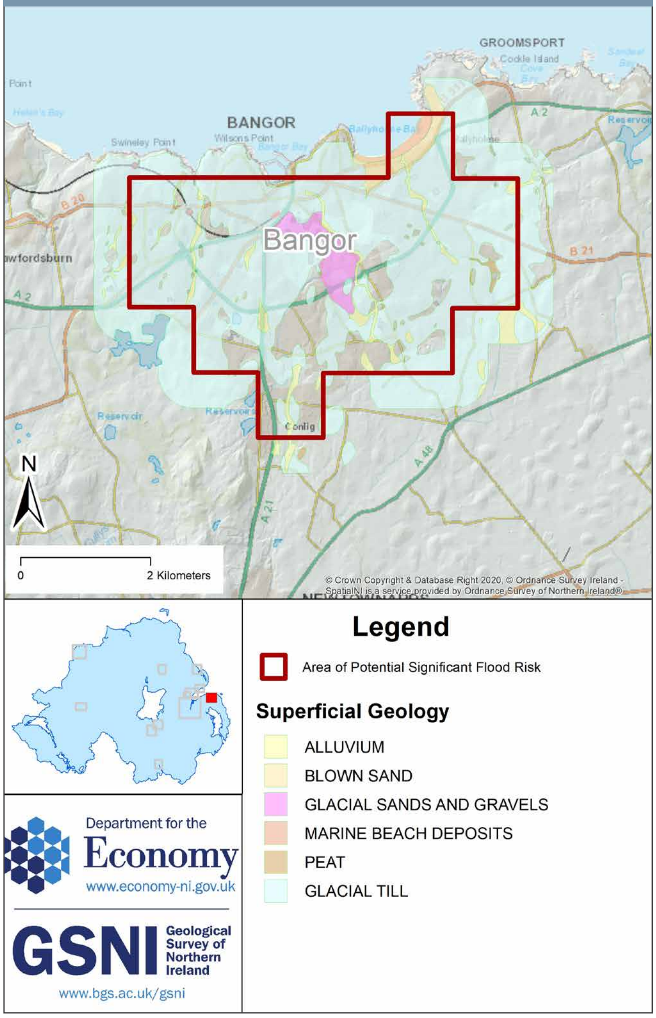
Bedrock under the Bangor APSFR is composed of greywacke sandstone of the Leadhills and Gala groups. These rocks typically contain only limited groundwater in fractures and joints in the shallow subsurface. Surface water ingress into these rocks will be extremely slow and so they offer virtually no alleviation of surface water flooding.

5.7.4.2 Superficial Geology

Glacial till is the dominant superficial deposit covering bedrock across the area, but it has very low permeability, and therefore will not alleviate surface flooding by allowing water to infiltrate into it or the underlying geology.

In a small central part of the Bangor APSFR, adjacent to a narrow strip of river alluvium, is an area of glacial sand and gravel that will have high porosity and permeability. Such deposits can readily absorb rain and surface water, and so where the superficial geology is unaltered, it will have a mitigating effect on surface water flooding. However, once the storage within these deposits approaches capacity, it is possible that they could start to be a source of longer duration groundwater flooding especially in low lying valley floor areas. This central area of Bangor is considerably urbanised and substantially surfaced which may limit its mitigating effect on surface water flooding. Also, a designated open watercourse, the Ward Park Stream, runs just to the north-west of this area and provides a suitable conduit for storm water run-off. It may also be able to provide drainage for some groundwater flooding.

Figure 5.7-5 : Superficial geology of Bangor



5.7.5 SOURCES OF FLOODING

5.7.5.1 Risk to buildings and infrastructure by source

In the NIFRA 2018, Bangor was ranked 7th of the 45 FRAs in terms of potential adverse consequences of flooding. DfI has undertaken detailed predictive computer mapping and modelling of flooding from rivers and sea, and further strategic mapping for surface water flooding. The results of this mapping can be found on Flood Maps (NI). An analysis of the potential consequences from flooding shows the predominant flood risk is from surface water flooding. Although situated on the coast, Bangor is not shown to be at risk from tidal flooding even in the most extreme events. This is due to the high level of the coastal fringe and the steep elevation of the town down towards the coast.

Figure 5.7-6 shows that the predicted annual average damages (AAD) for surface water flooding were around £2.8 million whereas the fluvial flooding damages reached approximately £179,000. It should be noted, however, that the surface water modelling does pick up some of the floodplains from smaller watercourses.

Figure 5.7-6: Annual Average Damages (£m) by flood source

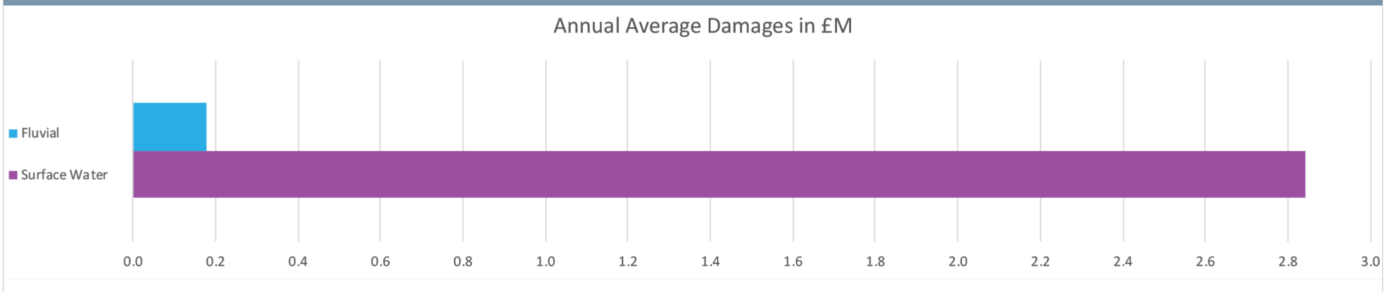
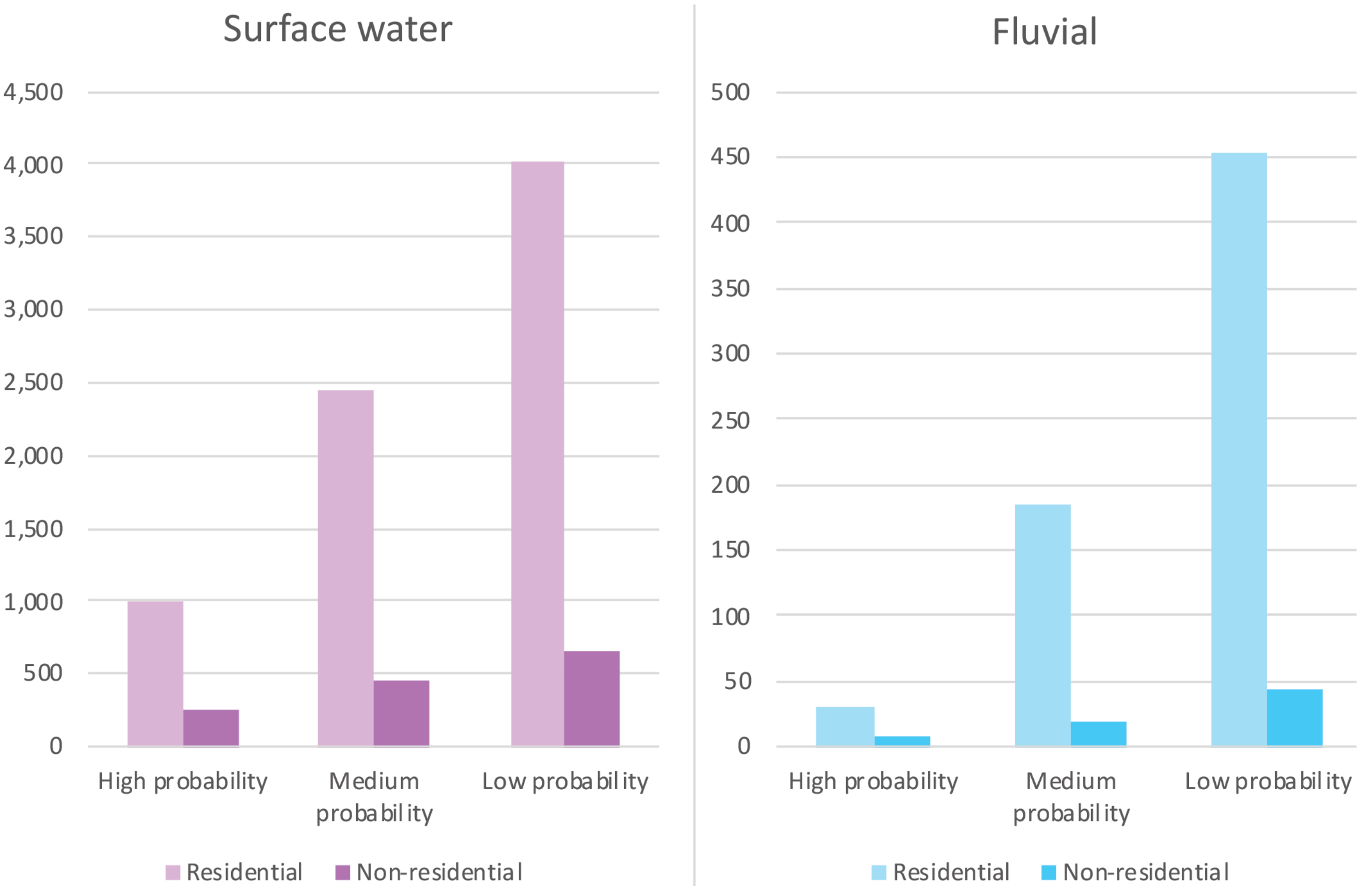


Figure 5.7-7 below shows a similar trend that the surface water mapping predicts a higher number of residential and non-residential buildings flooded compared to fluvial sources for the high, medium and low probability events. Table 5.7-2 shows the return periods and probabilities which have been assessed as high, medium and low probability events for surface water and fluvial flooding.

Table 5.7-2: Return periods for high, medium and low probability

Probability	Surface water	Fluvial
High	3.33 % AEP (1 in 30 year)	10 % AEP (1 in 10 year)
Medium	0.5 % AEP (1 in 200 year)	1 % AEP (1 in 100 year)
Low	0.1 % AEP (1 in 1000 year)	0.1 % AEP (1 in 1000 year)

Figure 5.7-7: Number of buildings located within the modelled flood extent



Note that the scale for surface water flooding on Figure 5.7-7 above, is different to account for significantly higher values than those for fluvial.

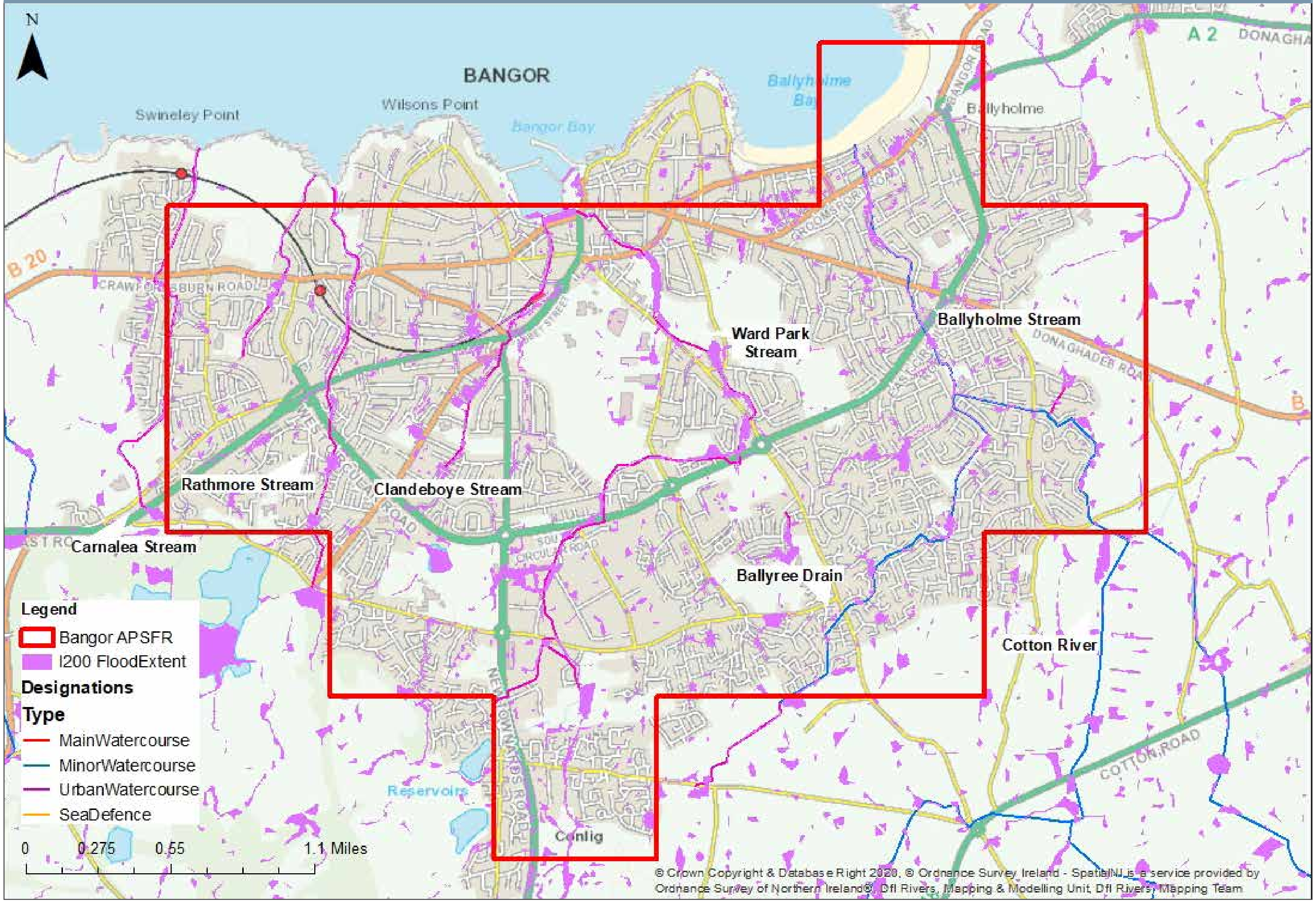
5.7.5.2 Surface water (Pluvial)

Due to the urbanised nature of Bangor, the large area of impermeable roads and surfaces causes surface runoff and flooding in some areas during times of high rainfall, as occurred along the A2 in 2019. However, the fairly steeply sloping landform towards the coast can help to discourage surface water from pooling significantly and therefore reduce the duration of flooding. Figure 5.7-8 below shows an overview of the surface water flood risk in the APSFR.

It should be noted that the surface water mapping picks up the floodplains of the smaller urban watercourses.

Infrastructure at risk from surface water flood events up to 0.1 % AEP (1 in 1000 year) in the Bangor APSFR are an IPPC site, a fire station, hospital, school, NI Water pumping stations, electricity substations, environmental designated sites and built heritage sites. A detailed breakdown of this is included in Appendix D.

Figure 5.7-8: : Overview of surface water hazard mapping for a 0.5 % AEP (1 in 200 year) flood event



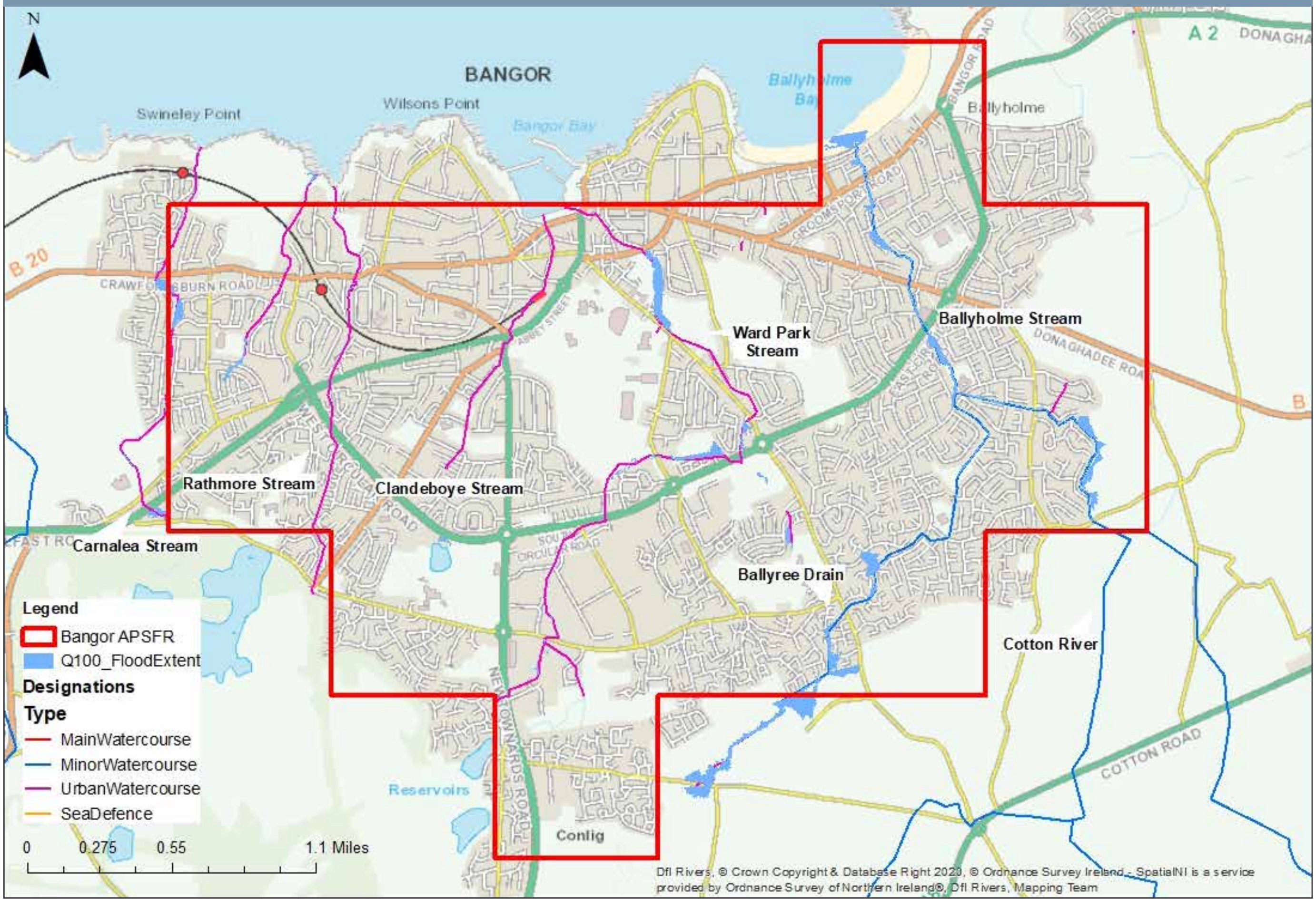
5.7.5.3 Fluvial

Figure 5.7-9 below shows an overview of the watercourses in the area and the fluvial risk at the 1 % AEP (1 in 100 year) flood event.

The fluvial flood extents as shown on the maps below show that there is no tangible risk to property at the 1 % AEP (1 in 100 year) flood event for Clandeboye Stream. There is a minimal risk of fluvial flooding in this event from the Ward Park Stream, Rathmore Stream and Carnalea. Some fluvial flood risk is also shown from the Cotton River and its tributaries.

Infrastructure at risk from fluvial flood events up to 0.1 % AEP (1 in 1000 year) in the Bangor APSFR are NI Water sewage pumping stations, electricity substations, environmental designated sites and a heritage site. A detailed breakdown of this is included in Appendix D.

Figure 5.7-9: Overview of fluvial hazard mapping for a 1 % AEP (1 in 100 year) flood event



5.7.6 CURRENT FLOOD RISK MITIGATION

5.7.6.1 Planning

In addition to national planning policy and advice, DfI Rivers will advise against bringing forward sites or the zoning of any land in preparation for the new Ards and North Down Borough Council Local Development Plan, particularly for built development, that has been identified from the flood maps as being within the 1 % AEP (1 in 100 year) fluvial floodplain, 0.5 % AEP (1 in 200 year) tidal floodplain/ reservoir inundation area, or is susceptible to surface water flooding.

5.7.6.2 Flood defences

There are no formal flood defences in Bangor, however, past major improvement schemes to upgrade urban watercourses in Bangor include the Ward Park Stream and the lower reach of the Clandeboye Stream at Southwell Road; these works were undertaken by Rivers Agency (now DfI Rivers) in the early 1990s. The most extensive scheme, undertaken on the Ward Park Stream, accommodated flows from development outside the Ring Road and comprised culverting of the watercourse through the developed area in the vicinity of Gransha Road to outlet into the pondages in Ward Park. Works on this watercourse were also undertaken downstream of the Park during construction of the Flagship Centre, beneath which the watercourse is culverted. Other minor watercourse drainage improvements have taken place on the local watercourses gradually over many years.

NI Water has carried out a phased investment in the water and wastewater network across Bangor to introduce new pumping stations and increase capacity and water quality. Further investment will be continued from 2020 where modern, automated wastewater infrastructure will be installed.

5.7.6.3 Sustainable drainage

Clandeboye Primary School in Bangor has become the first school in NI to be served by a soft sustainable drainage system, by creating a rainwater garden to intercept surface water runoff and therefore attenuate and reduce the amount of water entering the nearby Clandeboye Stream. This demonstration project was led by the DfI and NI Water and has been the subject of a number of awards.

5.7.7 ACTIONS IN THE FIRST CYCLE FLOOD RISK MANAGEMENT PLAN

In the first cycle FRMP, there was one measure set out specifically for the Bangor APSFR. Table 5.7-3 shows a summary of measures within the Bangor APSFR and their progress.

Table 5.7-3: Progress tracking for Flood Risk Management Plan measures 2015-2021

Category	Measure code from First Cycle FRMPs	Measure description	Progress
PROTECTION	UKNI_NE_APSFR_04_01	Ballyholme Stream Flood Alleviation Scheme	Included in long term works programme.

5.7.7.1 Prevention

No particular Prevention measures specific to Bangor were set out in the first cycle FRMP.

As outlined in Chapter 4, DfI Rivers advises on planning applications regarding the risk of flooding. The basis of this advice is to avoid inappropriate development in areas which are at risk of flooding and to ensure that any development does not increase flood risk elsewhere.

In addition to national planning policy and advice, DfI Rivers will advise against bringing forward sites or the zoning of any land that has been identified from the flood maps as being within the 1 % AEP (1 in 100 year) fluvial floodplain, 0.5 % AEP (1 in 200 year) tidal floodplain/reservoir inundation area, or is susceptible to surface water flooding in preparation for the new Ards and North Down Local Development Plan (due for adoption 2022-2023).

The main (undeveloped) areas at risk of flooding within the Bangor APSFR are around the urban watercourses where the risk of fluvial flooding is greatest. These are some areas around the Ward Park Stream and its tributaries the Conlig Stream and Navar Drive Stream; several areas to the east and west of Carnalea Stream; both sides of the Rathmore Stream and both sides of the Cotton River/Ballyree Drain.

5.7.7.1.1 Planning policy

A new LDP for the Ards and North Down Borough Council for the period up to 2032 is being prepared with the adoption of the Plan Strategy in 2024/2025 and Local Policies Plan in 2028, during the second FRMP cycle. It will comprise:

- a Plan Strategy to define strategic objectives for future development of the Borough, including strategic policies and a spatial strategy;
- a Local Policies Plan which will include site-specific proposals, designations and zoning to deliver the Strategy.

On adoption, the new LDP will replace the current Plans for the Borough and operational planning policies that were produced by the previous Department of the Environment.

5.7.7.2 Protection

The only specific measure which was set out through the first cycle FRMP for the Bangor APSFR was the Ballyholme Stream FAS.

The Feasibility study for this is listed on the DfI Rivers Prioritised Capital Works Programme for development, although it has not not been started yet. It forms part of the long term works plan.

5.7.7.3 Preparedness

There has been no specific flood risk management under the preparedness category for Bangor. Regional measures for preparedness are outlined in Chapter 4 of this Plan.

5.7.8 UPDATED PROGRAMME FOR SECOND CYCLE FLOOD RISK MANAGEMENT PLAN

5.7.8.1 Key Messages

Although there are no specific measures set out under Prevention for the Bangor APSFR in the first cycle FRMP, the Ards and North Down Borough Council LDP is scheduled to be finalised early in the second cycle FRMP. The LDP, alongside current advice on Planning from DfI Rivers, will support mitigation of flood risk in the council area in relation to both new development and redevelopment proposals from the LDPs adoption and through the second FRMP cycle. This will be taken forwards as a measure for the second cycle FRMP for DfI Rivers to work with the council to update the flood risk policy within the new LDP.

The Ballyholme Stream FAS measure for Bangor as set out through the first cycle FRMP, has not yet been started due to prioritisation on the DfI Rivers long term programme for capital schemes. The study will be progressed to the second cycle FRMP.

5.7.8.2 Enhanced Drainage Area Plan

NI Water is currently taking forward modelling in the form of DAPs across NI for drainage areas with populations typically above 2000. The traditional approach is for all combined and foul sewers to be modelled. For the period April 2021 – March 2027 NI Water will be conducting Enhanced DAPs in each of the APSFR. These Enhanced DAPs extend modelling to include the NI Water storm sewers, which may identify drainage improvement schemes.

Table 5.7-4 below sets out the measures and timescales for the Bangor APSFR in the second cycle FRMP.

Table 5.7-4: Proposed measures for Flood Risk Management Plan cycle 2021-2027

Category	Measure summary	Lead authority	Specific measure	Timescale
PREVENTION	Enhanced Drainage Area Plan	NI Water	By 31^{st} March 2027, NI Water will produce an Enhanced DAP for Bangor that sets out actions to mitigate integrated flooding issues.	2027
	Influence local planning policy for development and flood risk	DfI Rivers	By 2025, DfI Rivers will work with Ards and North Down Borough Council to update flood risk policy in the Local Development Plan	2025
PROTECTION	Flood alleviation works	DfI Rivers	By 2027, DfI Rivers will undertake feasibility work with regards to a FAS for the Cotton River/ Ballyholme Stream and its tributaries. Should this identify a viable scheme this will be followed by detailed design and construction.	2027

5.8

PORTADOWN AND CRAIGAVON

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5.8.1 SUMMARY

5.8.1.1 Flood risk area overview

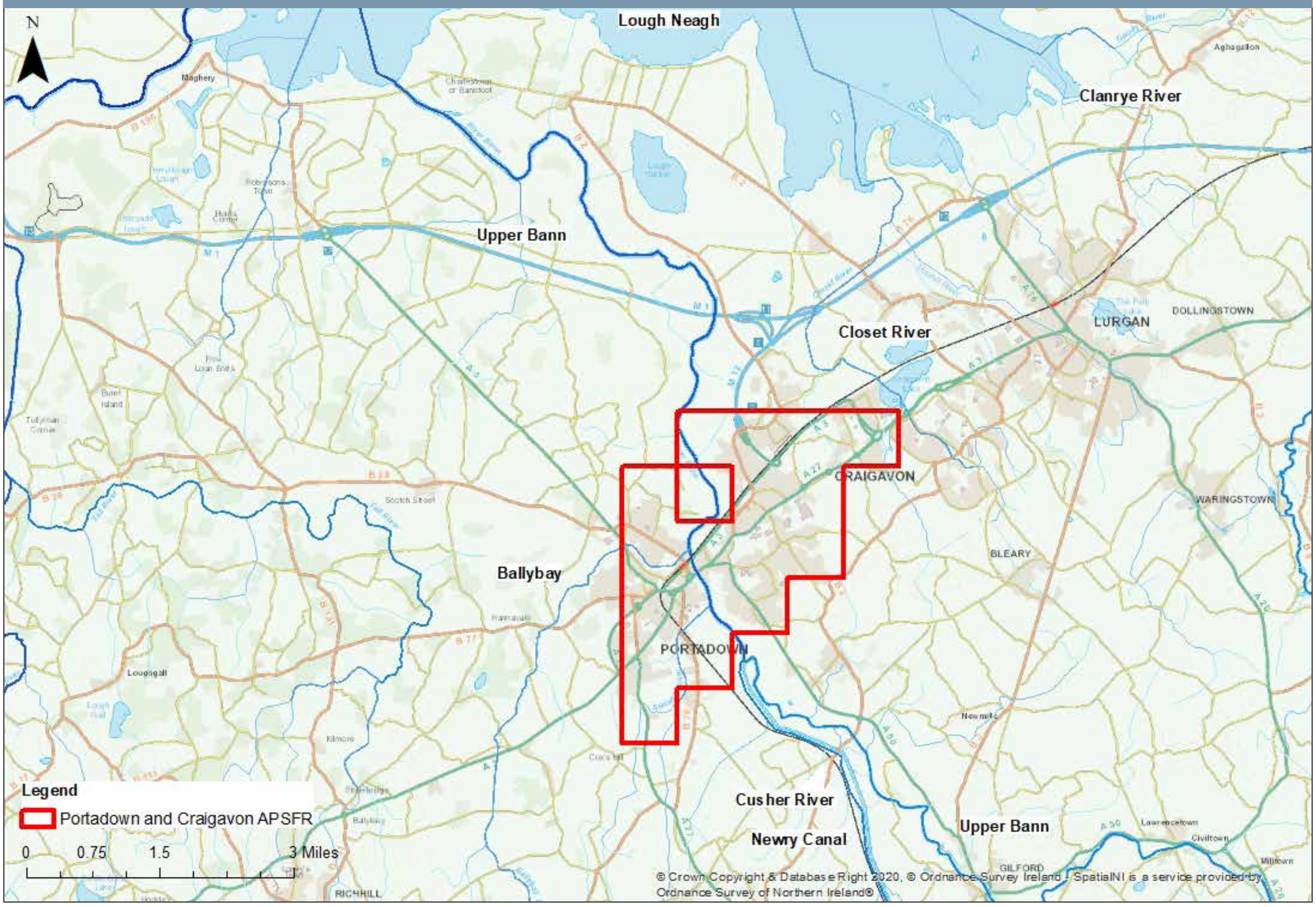
Portadown and Craigavon are adjoining towns in County Armagh, with a combined population of approximately 38,000 according to the 2011 Census. They are both in the Neagh Bann IRBD. Portadown straddles the River Bann in the north of the county, about 24 miles (39 km) southwest of Belfast and hosts a major railway junction on the North/South line. Craigavon is a relatively new town; whose construction began in the mid-1960s. It was designed as the centre of a new linear city linking Portadown with the neighbouring town of Lurgan. For a variety of reasons, the linear city was never fully realised and today the separate towns of Portadown and Craigavon fall within the Armagh City, Banbridge and Craigavon Borough Council area. The core boundary of the Portadown and Craigavon APSFR is located within the Upper Bann Local Flood Management Area.

The area of Portadown and Craigavon is at risk from both fluvial and surface water sources. The most recent severe flooding came with four consecutive storms in the winter of 2015/2016.

5.8.1.2 Northern Ireland Flood Risk Assessment (NIFRA) 2018

According to the NIFRA (2018) the APSFR is at risk from fluvial and surface water sources which could impact property and people in the area. The boundary of the APSFR as defined through the NIFRA 2018 is shown in Figure 5.8-1.

Figure 5.8-1: Location and boundary of Portadown and Craigavon APSFR and key watercourses



5.8.2 HISTORY

5.8.2.1 Summary of flooding history

Historical flooding in Portadown includes significant flood events in April 1986, October 1987, August 2008, October 2011, November 2014 and Winter 2015/2016 arising from fluvial sources and affecting both residential and commercial properties, as well as local infrastructure. Craigavon is further east of the River Bann and therefore is not as susceptible to fluvial flooding. The main risk identified through predictive modelling in Craigavon is surface water, although there has been little recorded evidence of this.

Flooding from the River Bann in October 1987 and August 2008 was of a similar magnitude. In 2008, the Moyallan gauging station on the River Bann upstream of Portadown recorded the flood event as the largest in its 27 years of data. Severe flooding occurred throughout NI and the RoI which resulted in considerable disruption to the Enterprise Train Service as a result of the inundation of the main North/South railway line in Portadown.

The Rivers Bann and Cusher overtopped their banks and defences in October 2011, flooding the North/South railway line (shown in Figure 5.8-2 below), an industrial estate on Tandragee Road, a factory and a number of public roads. This flood is believed to have been a 3 % AEP (1 in 33 year) event on the River Cusher and 1 % AEP (1 in 100 year) event on the River Bann.

November 2014 saw several homes suffer flood damage in the Woodgrove/Ashgrove Road area and along Park Road. Flooding also occurred along Lurgan Road, Gilford Road and the Bann Boulevard, which is thought to have come from the Ballybay/Corcrain River.

Figure 5.8-2: Flooding of the North/South railway line to the south of Portadown, October 2011

5.8.2.2 Flood events since 2015

NI experienced a total of four consecutive storm/significant rainfall events from November 2015 through to January 2016, and recorded rainfall peaked at greater than a 1 % AEP (1 in 100 year) event.

The cumulative effect of consecutive storms Desmond, Eva, Frank and Gertrude caused flooding during December 2015/ January 2016 and resulted in out-of-bank flooding from the River Bann. The main areas affected around Portadown and Craigavon were towards the south of the APSFR boundary at Markethill Road, the A50 Gilford Road and the B2 Drumnacanvey Road near Drumnacanvey Lodge.

The River Bann levels in the vicinity of Portadown are heavily influenced by the levels of Lough Neagh which is only 10 km downstream. In January 2016, over 50 properties in the Portadown and Craigavon areas were flooded from Lough Neagh; some for a prolonged period while the water levels remained high. This flood event is regarded as significant because of the extreme hydrological conditions, the extent of land affected by flood water adjacent to Lough Neagh and because of the longevity of the inundation. The weather conditions and the resulting high flows in rivers draining into Lough Neagh (the largest inland lough in the UK) caused Lough levels to rise to 13.67 m OD (Belfast), the highest recorded in 31 years of records. Outflows from the Lough, down the Lower Bann River, were also the highest ever recorded with sluice gates on the river fully open for many months.

Most recently, heavy rainfall on the evening of the 15th June 2020 resulted in surface water flooding as drains were unable to cope with the intensity of the rainfall and brought flash floods to several areas of Portadown, affecting roads and driving conditions, around the Thomas Street/Annagh area and the Garvaghy Road.

In Craigavon, heavy rainfall in February 2020 resulted in surface water flooding around the Brownlow area inundating some footpaths and underpasses.

Figure 5.8-3: Flooding of Portadown and Craigavon area, January 2016

5.8.3 CATCHMENT

5.8.3.1 Catchment characteristics and tributaries

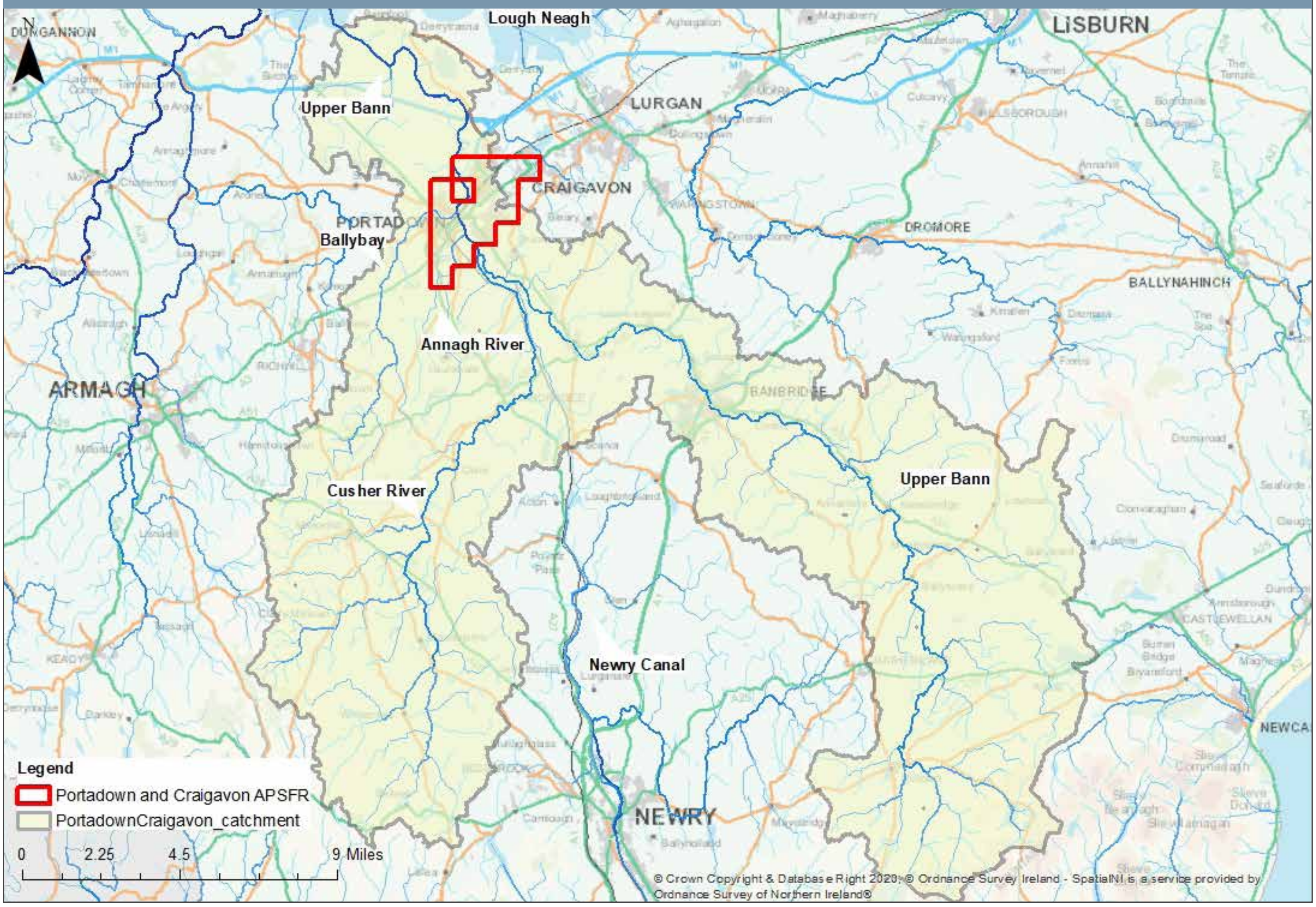
The River Bann is the principal river in the area draining a catchment of approximately 650 km2, as shown in Figure 5.8-4 below. The River Bann generally flows in a northerly direction through the APSFR and outfalls into Lough Neagh. The Cusher River is the largest tributary of the River Bann which drains the catchment from the west around Markethill. The confluence of the Cusher River and the River Bann is at the southern boundary of the Portadown and Craigavon APSFR, at the same point where the rivers also meet the Newry Canal, near Portadown golf club.

Other tributaries of the River Bann include the Annagh River and Kilmoriarty River which flow from south west of Portadown, joining the River Bann at the north east extent of Mahon Industrial Estate. The Ballybay/Corcrain River also joins the River Bann, just downstream of Shillington Bridge.

The eastern part of the APSFR (not shown within the wider Bann catchment in Figure 5.8-4) drains a short distance towards Lough Neagh through the Kernan Stream, which becomes the Closet River and outfalls into Lough Neagh.

Eight main watercourses discharge into Lough Neagh and inflows can, at times, be several times greater than outflows from the Lough. This situation can significantly raise the levels of water in the Lough,

Figure 5.8-4: Catchments in relation to the Portadown and Craigavon APSFR



which can in turn influence the levels of the lower reaches of these shallow gradient, inflowing watercourses; including the River Bann. The land adjacent to the Bann on which Portadown and Craigavon are sited, has a close hydraulic connection to Lough Neagh, even though it is approximately 10 km away, and this makes the area susceptible to flooding when Lough levels are high.

5.8.3.2 Urban drainage and wastewater network

NI Water is responsible for the clean drinking water supply, foul and storm water sewerage networks throughout NI.

The majority of the NI Water drainage network within the APSFR is separated; there is approximately 115 km of storm sewers and 125 km of foul sewers. The total length of combined sewer network is approximately 65 km.

The Portadown and Craigavon area is served by Ballynacor WwTW approximately 1.5 km from Lough Neagh. There are also 11 NI Water wastewater pumping stations in the ASPFR.

5.8.3.3 Environment

The APSFR encompasses the following WFD waterbodies:

Table 5.8-1: Waterbody classifications in and around the Portadown and Craigavon APSFR

Waterbody name	2015 Classification	2018 Classification	2021 Objective	Reason for failure
UKGBNI1NB030308091: Annagh River	Bad Ecological Potential	Bad Ecological Potential	Poor Ecological Potential	Invertebrates
UKGBNI1NB030308243: Lough Neagh Peripheral	Poor Ecological Potential	Poor Ecological Potential	Moderate Ecological Potential	N/A
UKGBNI1NB030308110: Ballybay River	Moderate	Moderate	Good	Invertebrates Macrophytes Phytobenthos Soluble Reactive Phosphorus
UKGBNI1NB030308209: Closet River	Moderate	Moderate	Good	Invertebrates BOD Soluble Reactive Phosphorus

More information about status and individual objectives can be viewed at the NIEA Information Request Viewer.

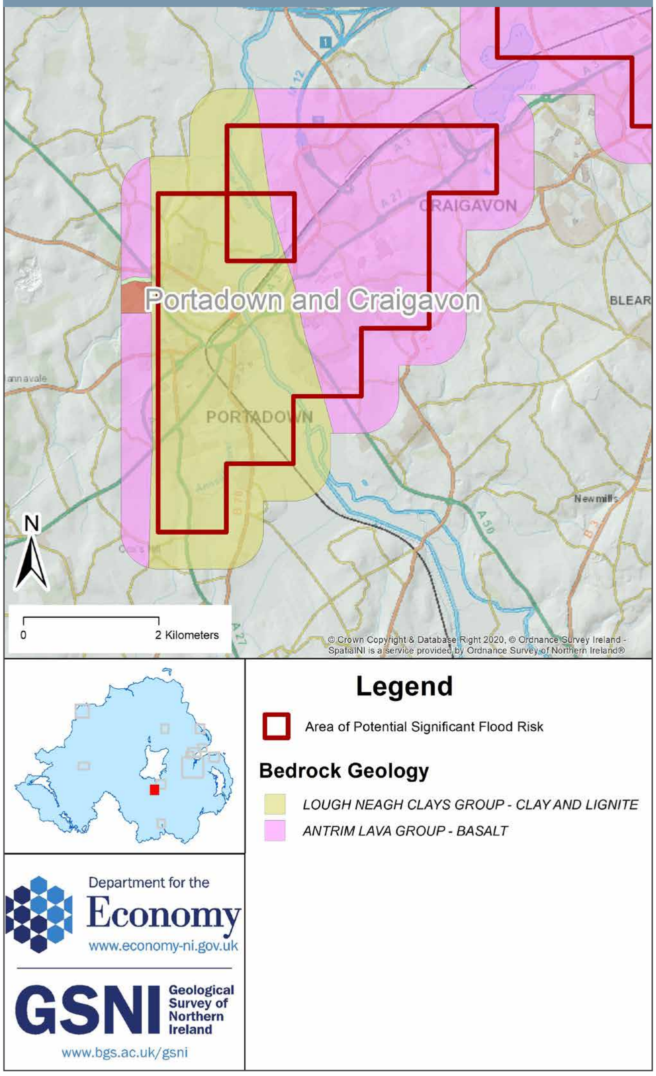
The rivers within the APSFR boundary suffer from acute and chronic pollution that is impacting upon their ecological status.

Flood alleviation works such as reducing run off within the catchment, improving the sewerage network by separating the foul and surface drainage and the establishment of blue / green infrastructure such as SuDS could all play a positive role in achieving WFD objectives within these waterbodies.

5.8.4 GEOLOGY

5.8.4.1 Bedrock Geology

Figure 5.8-5: Bedrock geology of Portadown and Craigavon



Bedrock under the Portadown and Craigavon APSFR is composed of:

- clay of the Lough Neagh Group in the west and;
- basalt of the Antrim Lava Group in the east.

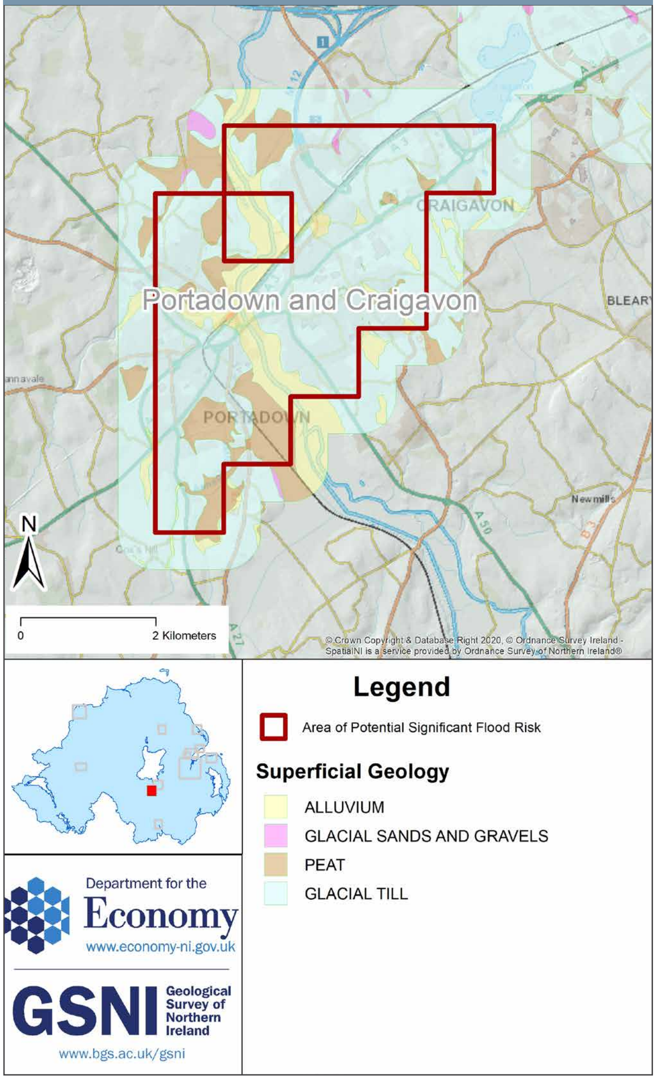
The clay is impermeable containing no groundwater, and whilst the basalt can contain significant volumes of groundwater in joints, fractures and small cavities, in this area it tends to be isolated from surface water by a layer of glacial till.

5.8.4.2 Superficial Geology

Till derived from basalt tends to be silt dominated and has very low permeability. It does very little to alleviate surface water flooding by allowing water to infiltrate into it or the underlying geology.

Large areas of river alluvium, such as those present either side of the Upper Bann River, are typically composed of sand, silt and cobbles. When not fully saturated, alluvium can take in rainwater and help alleviate flooding. However, river alluvium tends to be quite thin and low lying, and these are the first areas to flood in response to rising river water levels. Low-lying areas of peat are also found in the region which when not fully saturated, can absorb rainwater and help alleviate flooding.

Figure 5.8-6 : Superficial geology of Portadown and Craigavon



5.8.5 SOURCES OF FLOODING

5.8.5.1 Risk to buildings and infrastructure by source

According to the NIFRA 2018, Portadown and Craigavon APSFR is ranked 8th of the 45 FRAs, in terms of potential adverse consequences of flooding. DfI has undertaken detailed predictive computer mapping and modelling of flooding from rivers and sea, and further strategic mapping for surface water flooding. The results of this mapping can be found on Flood Maps (NI).

In Portadown, properties are at particular risk from fluvial flooding due to high water levels in the River Bann either directly from the River Bann overtopping its banks or by backing up into the smaller tributaries. Flooding in Portadown is complex as there are several flood mechanisms within the urban area including the confluence of three streams, drainage capacity and influence from Lough Neagh.

Figure 5.8-7 shows the predicted annual average damages (AAD) by fluvial and surface water sources. Predicted fluvial AAD were just over £2.2 million with surface water damages reaching approximately £2 million.

Figure 5.8-7: Annual Average Damages (£m) by flood source

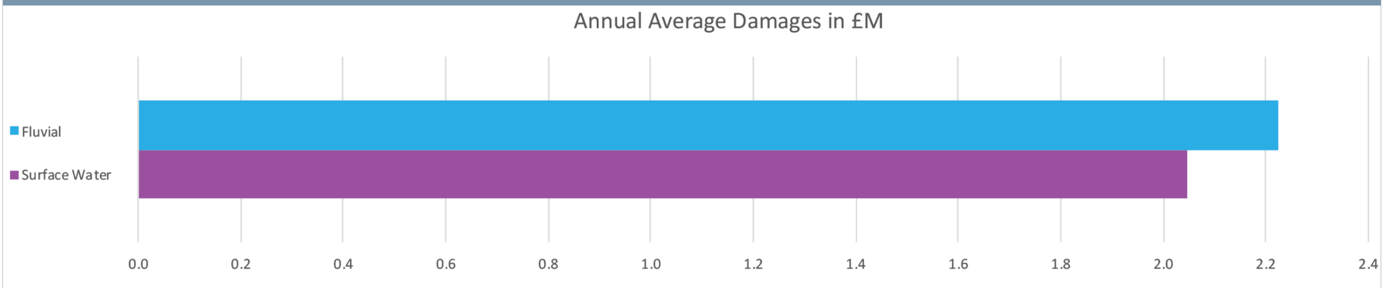
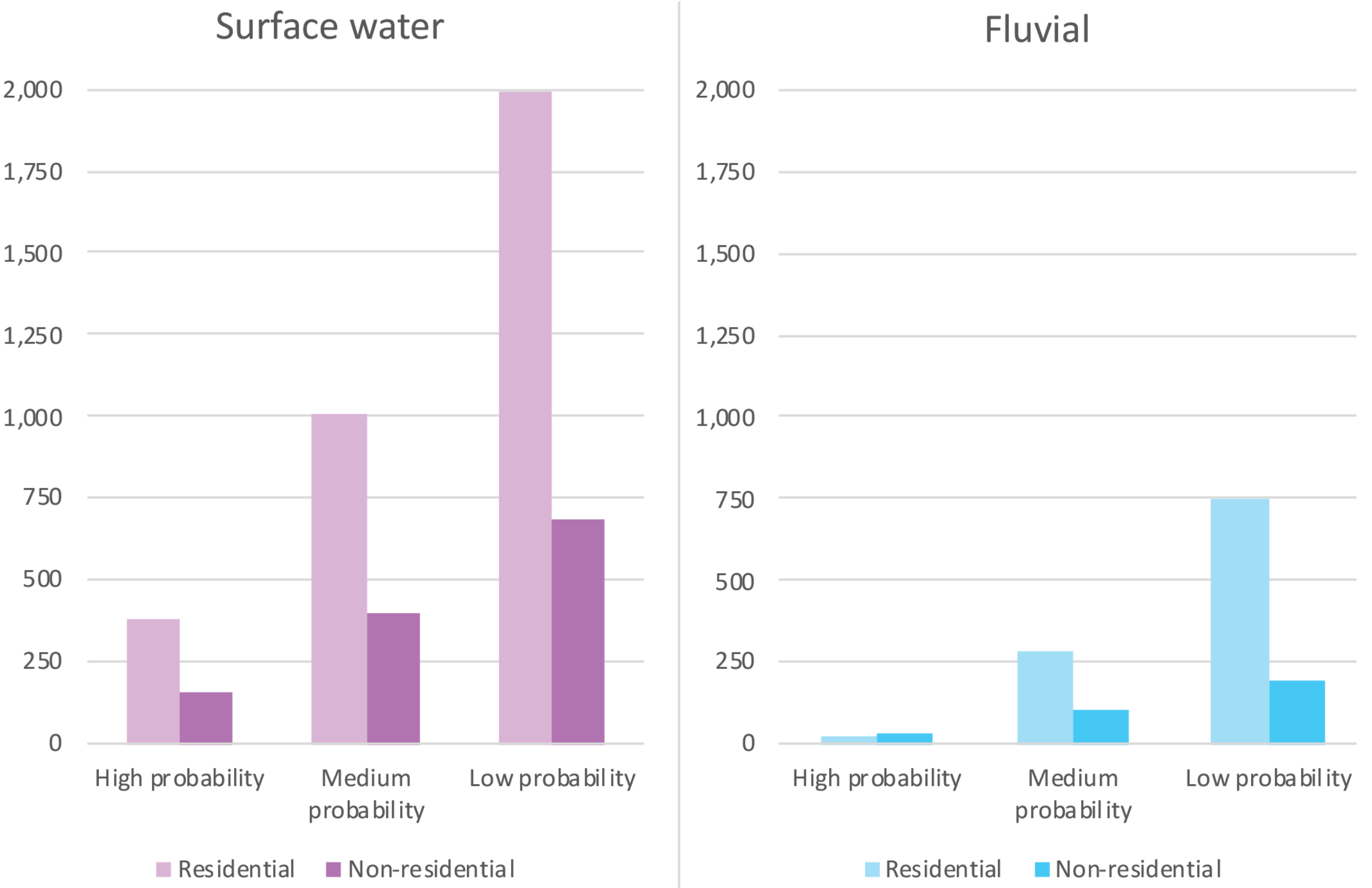


Figure 5.8-8 below shows a different trend to Figure 5.8-7 in that the surface water mapping predicts a higher number of buildings flooded compared to fluvial sources for the high, medium and low probability events. Table 5.8-2 shows the return periods which have been assessed as high, medium and low probability events for surface water and fluvial flooding.

Table 5.8-2: Return periods for high, medium and low probability

Probability	Surface water	Fluvial
High	3.33 % AEP (1 in 30 year)	10 % AEP (1 in 10 year)
Medium	0.5 % AEP (1 in 200 year)	1 % AEP (1 in 100 year)
Low	0.1 % AEP (1 in 1000 year)	0.1 % AEP (1 in 1000 year)

Figure 5.8-8: Number of buildings located within the modelled flood extent

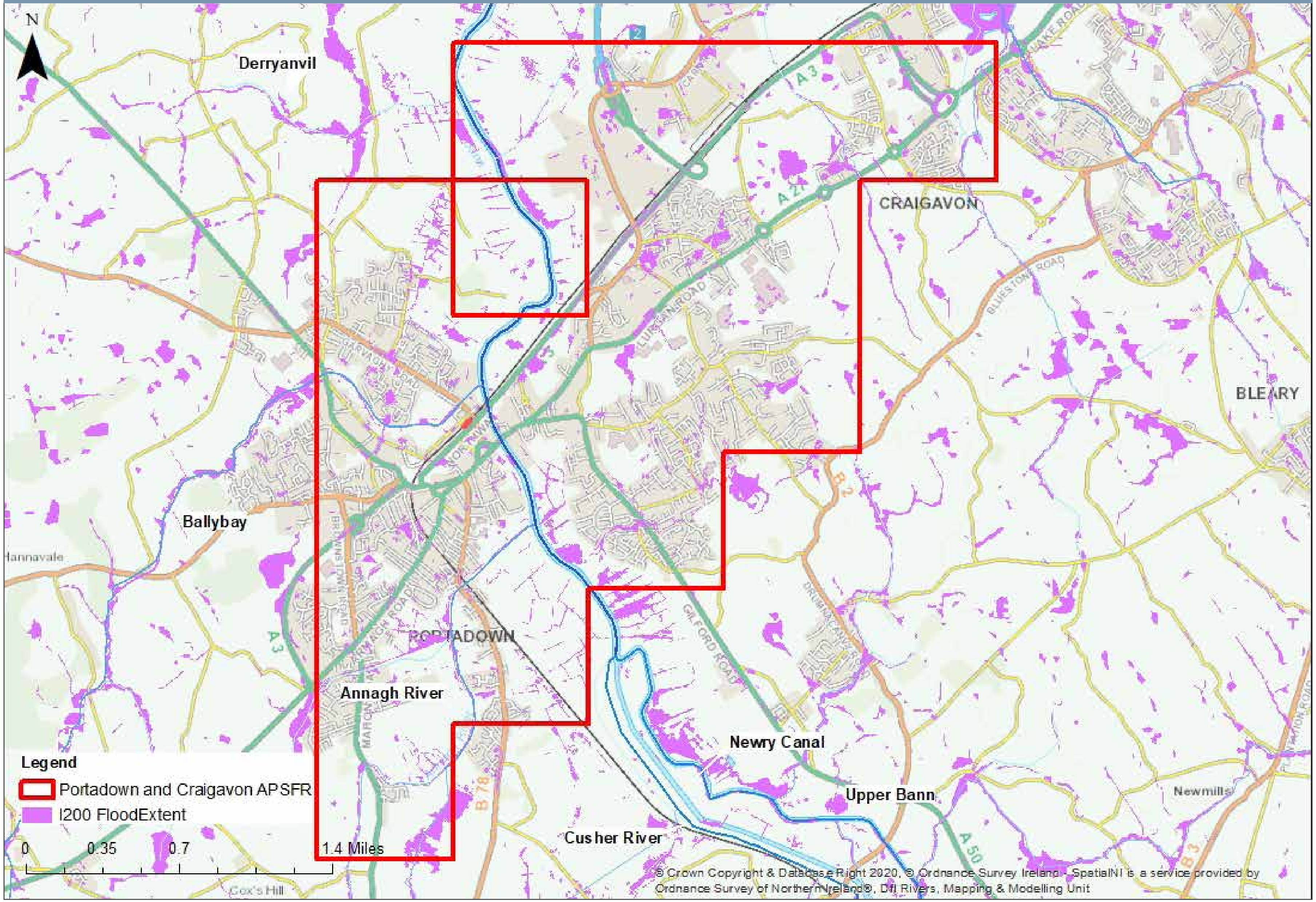


5.8.5.2 Surface water (Pluvial)

The hazard map below in Figure 5.8-9 shows the distribution of surface water flood risk according to the 0.5 % AEP (1 in 200 year) modelled flood extent throughout the APSFR. Areas of surface water flood risk include pockets of residential areas to the east of Northway in the north of the APSFR towards Craigavon, along with some smaller pockets across the APSFR. It should be noted, however, that the surface water modelling also picks up some of the floodplains from smaller watercourses.

Infrastructure at risk from surface water flood events up to 0.1 % AEP (1 in 1000 year) in the Portadown and Craigavon APSFR are IPPC sites, GP surgeries, a hospital, a police station, electricity substations, ASSIs, a nature reserve and heritage sites. A detailed breakdown of this is included in Appendix D.

Figure 5.8-9: : Overview of surface water hazard mapping for a 0.5% AEP (1 in 200 year) flood event



5.8.5.3 Fluvial

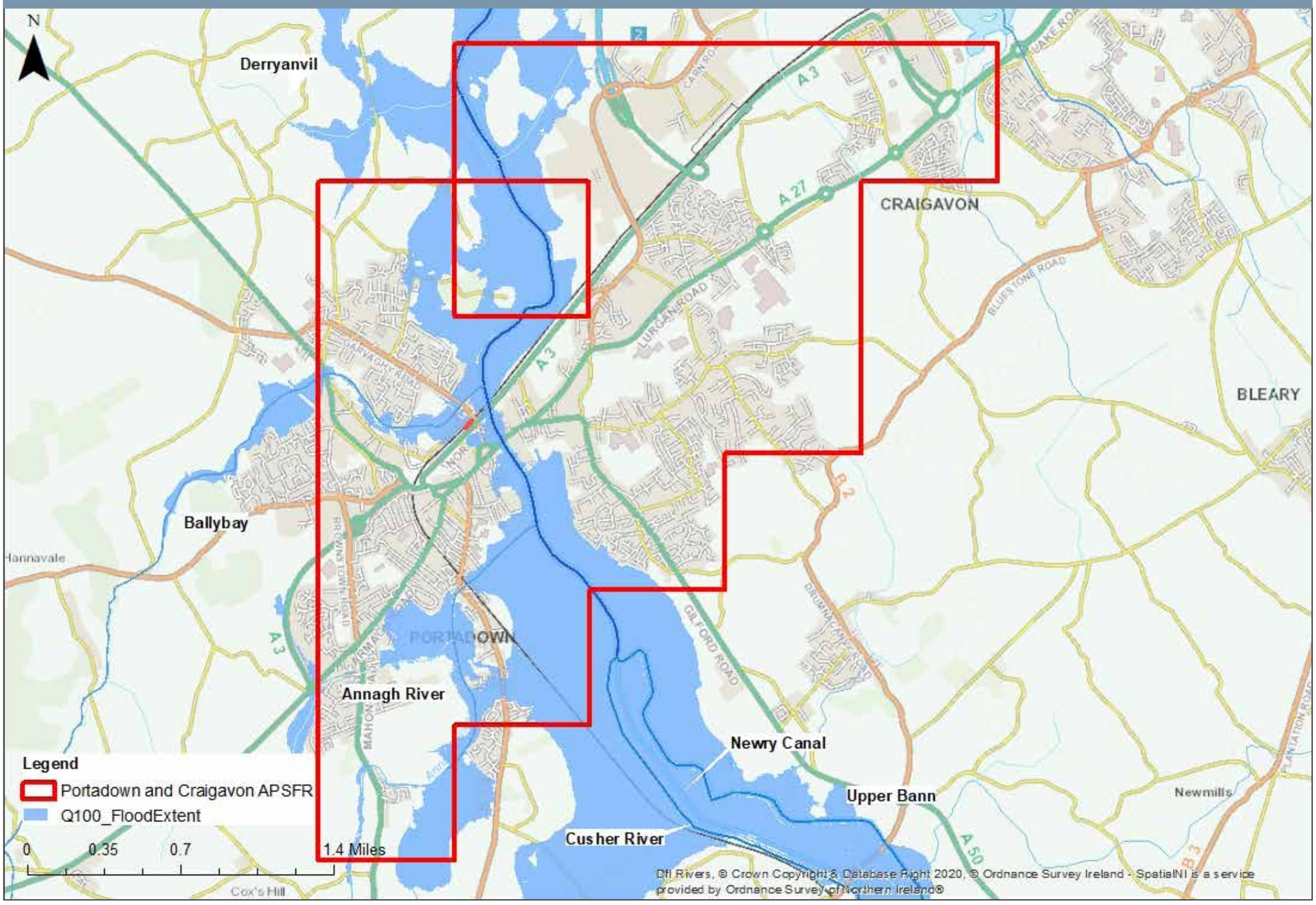
Lough Neagh has a significant impact during flooding, as it creates a backwater effect up the River Bann which extends into Portadown. The significant volume of water carried in the River Bann also creates a backwater effect in the tributaries of the river, and the fluvial flood risk upstream of Lough Neagh can be seen in Figure 5.8-10 below.

When the River Bann is in peak flood, the Kilmoriarty Stream and the Annagh River both experience a backwater effect whilst the Ballybay/Corcrain River to the north west of Portadown backs up to the bridge at Corcrain Road. Each of these three tributaries also flood independently of the River Bann.

Across the APSFR, the fluvial flood risk is predominantly around the floodplains of the River Bann, in Portadown. Overtopping and out-of-bank flooding occurs from the River Bann and its tributaries Ballybay and Annagh in central Portadown, affecting both residential and commercial areas. The south of Portadown is also affected by the confluence of the River Bann with the Cusher River, as well as the Annagh tributary, and this is where key infrastructure such as the North/South railway line is affected.

Other key infrastructure in the area at risk is Portadown Health and Care Centre, which is at risk of flooding during a 1 % AEP (1 in 100 year) event and several industrial heritage assets including bridges and factories.

Figure 5.8-10: Overview of fluvial hazard mapping for a 1% AEP (1 in 100 year) flood event



Fluvial flooding also poses an environmental risk to the area; the River Bann is a designated salmonid river, there are ASSI at risk to the north and south of Portadown. There is also a small area of ancient woodland to the south east of Portadown at risk during a 1 % AEP (1 in 100 year) event.

Infrastructure at risk from fluvial flood events up to 0.1 % AEP (1 in 1000 year) in the Portadown and Craigavon APSFR are an IPPC site, GP surgeries, NI Water sewage pumping stations, electricity substations, environmental designated sites and built heritage sites. A detailed breakdown of this is included in Appendix D.

5.8.6 CURRENT FLOOD RISK MITIGATION

5.8.6.1 Planning

In addition to national planning policy and advice, DfI Rivers will advise against bringing forward sites or the zoning of any land in preparation for the new Armagh City, Banbridge and Craigavon Borough Council Local Development Plan, particularly for built development, that has been identified from the flood maps as being within the 1 % AEP (1 in 100 year) fluvial floodplain, 0.5 % AEP (1 in 200 year) reservoir inundation area, or is susceptible to surface water flooding.

5.8.6.2 Flood defences

There are no formal flood defences in the Portadown and Criagavon APSFR, although there are some agricultural defences outside the APSFR boundary both upstream and downstream of Portadown on the River Bann.

5.8.7 ACTIONS IN THE FIRST CYCLE FLOOD RISK MANAGEMENT PLAN

In the first cycle FRMP, there were four measures set out specifically for the Portadown and Craigavon APSFR.

Good progress has been made on the Portadown and Craigavon APSFR Protection measures, with all three potential Capital Works Schemes having completed feasibility and being progressed through detailed design under the Portadown FAS. The Preparedness measure to establish an Upper Bann River/Ballybay River local community resilience group will be progressed in the second cycle FRMP period.

Table 5.8-3 shows a summary of measures within the Portadown and Craigavon APSFR and their progress.

Table 5.8-3: Progress tracking for Flood Risk Management Plan measures 2015-2021

Category	Measure code from First Cycle FRMPs	Measure description	Progress
PROTECTION	UKNI_NB_APSFR_02_01	Upper Bann River/ Annagh River – Flood Alleviation Scheme	Detailed design ongoing.
	UKNI_NB_APSFR_02_02	Upper Bann River/ Ballybay River - Flood Alleviation Scheme	Detailed design ongoing.
	UKNI_NB_APSFR_02_04	Upper Bann River/ Ballynagowan River - Flood Alleviation Scheme	Detailed design ongoing.
PREPAREDNESS	UKNI_NB_APSFR_02_03	Upper Bann River/ Ballybay River - Establishment of local community resilience group	Included in long term works programme.

5.8.7.1 Prevention

No particular Prevention measures specific to Portadown and Craigavon were set out in the first cycle FRMP.

As outlined in Chapter 4, DfI Rivers advises on planning applications regarding the risk of flooding. The basis of this advice is to avoid inappropriate development in areas which are at risk of flooding and to ensure that any development does not increase flood risk elsewhere.

5.8.7.1.1 Planning policy

A new Local Development Plan (LDP) for the Armagh City, Banbridge and Craigavon Borough Council for the period up to 2030 is being prepared with the adoption of the Plan Strategy in 2020/2021 and Local Policies Plan in 2022/2023, during the second FRMP cycle. It will comprise:

- a Plan Strategy to define strategic objectives for future development of the Borough, including strategic policies and a spatial strategy;
- a Local Policies Plan which will include site-specific proposals, designations and zoning to deliver the Strategy.

On adoption, the new LDP will replace the current Plans for the Borough and operational planning policies that were produced by the previous Department of the Environment.

5.8.7.2 Protection

Three separate measures were set out in the first cycle for flood alleviation schemes along the River Bann, collectively known as the Portadown FAS. These schemes are at the detailed design stage and site investigations are near completion. The resulting proposed scheme should alleviate flooding to over 300 properties in Portadown and the surrounding area through construction of flood defences along the Bann, Annagh, Ballybay and Ballynagowan Rivers.

5.8.7.3 Preparedness

A measure was set out through the first cycle to establish a local community resilience group for the Bann and Ballybay rivers. This comes under the umbrella of work being undertaken by the RCRG across NI to carry out engagement with communities. The local community resilience group in this area has not yet been progressed.

5.8.8 UPDATED PROGRAMME FOR SECOND CYCLE FLOOD RISK MANAGEMENT PLAN

5.8.8.1 Key Messages

Although no specific measures around the Prevention of flooding were proposed for the Portadown and Craigavon APSFR in the first cycle FRMPs, the Armagh City, Banbridge and Craigavon LDP is scheduled to be finalised early in the second cycle FRMP. The LDP, alongside current advice on Planning from DfI Rivers, will support mitigation of flood risk in the council area in relation to both new development and redevelopment proposals from the LDPs adoption and through the second FRMP cycle. This will be taken forwards as a measure for the second cycle FRMP for DfI Rivers to work with the council to update the flood risk policy within the new LDP.

Measures under the Protection category have progressed for Portadown and Craigavon; the three FAS proposed for the Rivers Bann, Ballybay and Ballynagowan have been progressed to detailed design and therefore construction is due to take place during the second cycle FRMP.

Some community engagement has been undertaken in the Ashgrove Road/ Woodgrove area and Lough Neagh area by RCRG during the first cycle FRMP, and some further engagement remains to be carried out during the second cycle.

5.8.8.2 Enhanced Drainage Area Plan

NI Water is currently taking forward modelling in the form of DAPs across NI for drainage areas with populations typically above 2000. The traditional approach is for all combined and foul sewers to be modelled. For the period April 2021 – March 2027 NI Water, will be conducting Enhanced DAPs in each of the APSFR. These Enhanced DAPs extend modelling to include the NI Water storm sewers, which may identify drainage improvement schemes.

Table 5.8-4 below sets out the measures and timescales for the Portadown and Craigavon APSFR in the second cycle FRMP.

Table 5.8-4: Proposed measures for Flood Risk Management Plan cycle 2021-2027				
Category	**Measure summary**	**Lead authority**	**Specific measure**	**Timescale**
PREVENTION	Enhanced Drainage Area Plan	NI Water	By 31st March 2027, NI Water will produce an Enhanced DAP for Portadown and Craigavon that sets out actions to mitigate integrated flooding issues.	2027
	Influence local planning policy for development and flood risk	DfI Rivers	By 2022, DfI Rivers will work with Armagh City, Banbridge and Craigavon Borough Council to update flood risk policy in the Local Development Plan	2022
PROTECTION	Flood alleviation works	DfI Rivers	By 2022, DfI Rivers will undertake detailed design work for the Upper Bann River/ Annagh River flood alleviation scheme, after which the scheme will be constructed.	2022
	Flood alleviation works	DfI Rivers	By 2022, DfI Rivers will undertake detailed design work for the Upper Bann River/Ballybay River flood alleviation scheme, after which the scheme will be constructed.	2022
	Flood alleviation works	DfI Rivers	By 2022, DfI Rivers will undertake detailed design work for the Upper Bann River/ Ballynagowan River flood alleviation scheme, after which the scheme will be constructed.	2022
PREPAREDNESS	Community engagement though RCRG in the Upper Bann River / Ballybay River area and other areas requiring support	RCRG	The RCRG will progress engagement in further local community groups, as appropriate or as required, to increase community resilience to flooding.	2027

5.9

OMAGH

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5.9.1 SUMMARY

5.9.1.1 Flood risk area overview

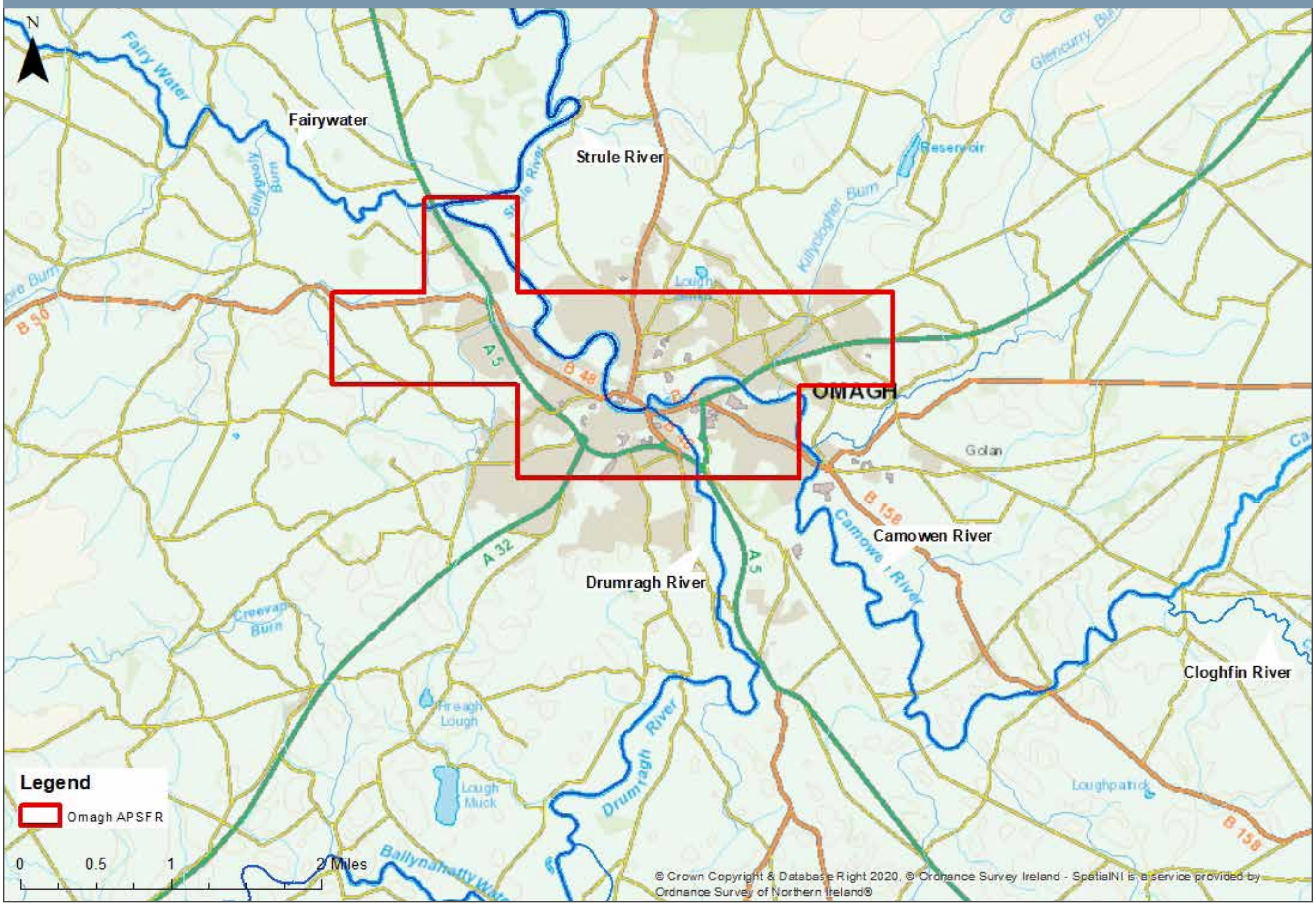
Omagh is a town situated in the North Western IRBD, where the Drumragh and Camowen rivers join to form the River Strule as shown in Figure 5.9-1 below. The town had a population of 19,682, according to the 2011 Census, and has a long history of fluvial flooding suffering major events in 1909, 1929, 1954, 1956, 1969, 1987, 2011 and minor flooding in August 2014.

Omagh is situated within the Strule Local Flood Management Area and surrounded by six other Local Flood Risk Management Areas; Derg and Strule, Owenkillew, Ballinderry, Blackwater, Colebrooke and Lough Erne Lower.

5.9.1.2 Northern Ireland Flood Risk Assessment (NIFRA) 2018

The Omagh APSFR boundary has slightly increased in size from PFRA 2011. The new NIFRA boundary includes the Hospital Road area to the southeast of Omagh, and an area to the west of the A5. The boundary for the Omagh APSFR is shown in Figure 5.9-1.

Figure 5.9-1: : Location and boundary of Omagh APSFR and key watercourses



5.9.2 HISTORY

5.9.2.1 Summary of flooding history

Omagh has significantly flooded on eight occasions in the last century. Fluvial flooding occurs in the heart of the town, due to the confluence of two main watercourses, the Drumragh River and the Camowen River. The close proximity of these watercourses to the urban area is shown in Figure 5.9-2 below.

Flood protection works, which included channel improvements, flood banks and concrete flood walls were commenced in the mid-1950s. The defences completed in 1961 provided a standard of protection (SoP) for a 2 % AEP (1 in 50 year) flood event. These defences were exceeded during an estimated 1 % AEP (1 in 100 year) flood event which occurred in 1969, and as a consequence, further works to improve the defences were undertaken in the 1970s. In 1987 the defences were overtopped yet again, by the largest flood event on record, which was estimated at the time to be a 0.6 % AEP (1 in 170 year) flood event. Further flood alleviation works were completed in 2013/14 to replace flood walls.

5.9.2.2 Flood events since 2015

There are no records of flooding in Omagh since the beginning of the first cycle FRMP. The most recent flooding, which occurred in August 2014, affected approximately 20 properties around the Hospital Road area.

Figure 5.9-2: River levels through Omagh at the confluence of the Drumragh and Camowen Rivers in October 2011.

5.9.3 CATCHMENT

5.9.3.1 Catchment characteristics and tributaries

Omagh is the largest urban area in the predominantly rural Strule River catchment. The main tributaries, the Drumragh River and the Camowen River, rise in the hills to the east of Omagh and flow in a north westerly direction, towards Omagh where they join to form the River Strule. The Strule is, in turn, a major tributary of the River Foyle and its peak flows are the largest of any river in NI. The confluence of the Drumragh and Camowen rivers is in the heart of Omagh surrounded by both residential and commercial properties.

Figure 5.9-3 below shows the watershed boundaries for the tributaries which feed into the River Strule catchment.

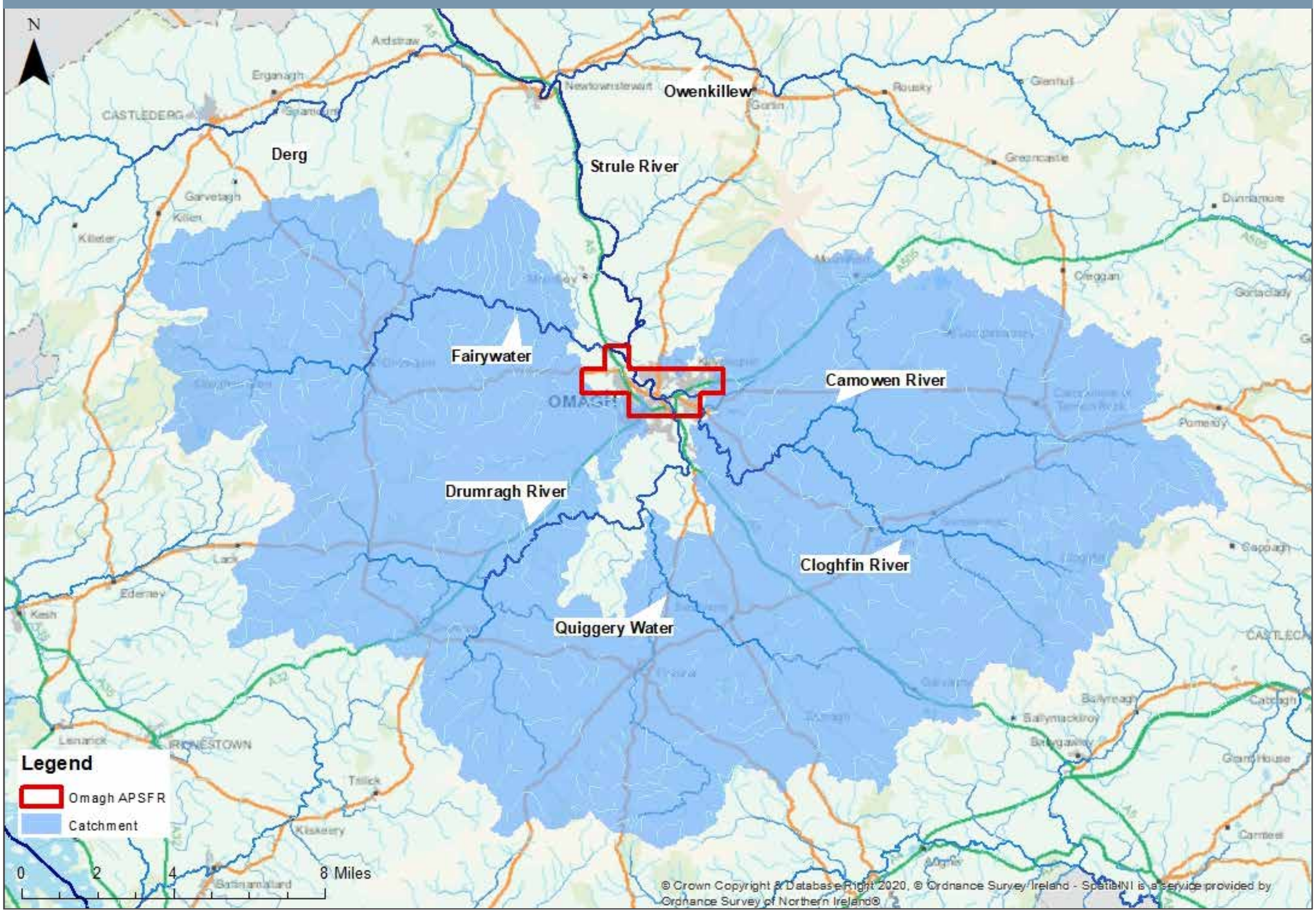
5.9.3.2 Urban drainage and wastewater network

NI Water is responsible for the clean drinking water supply, foul and storm water sewerage networks throughout NI.

The majority of the NI Water drainage network within the Omagh APSFR is combined, at approximately 81 km in length, with the separate system being 58 km of storm and 33 km of foul sewerage network.

NI Water has one WwTW situated outside the Omagh APSFR on Rash Road. There are also 11 pumping stations within the bounds of the APSFR.

Figure 5.9-3: Catchments in relation to the Omagh APSFR



5.9.3.3 Environment

The APSFR encompasses the following WFD waterbodies, as shown in Table 5.9-1 below.

Table 5.9-1: Waterbody classification in and around the Omagh APSFR

Waterbody name	2015 Classification	2018 Classification	2021 Objective	Reason for failure
UKGBNI1NW010102006 Drumragh River	Moderate	Moderate	Good	Soluble Reactive Phosphorus Diatoms Fish (Hydro-morphology)
UKGBNI1NW010108258 Strule River	Moderate	Moderate	Good	Soluble Reactive Phosphorus Diatoms (Hydro-morphology)
UKGBNI1NW010102041 Fairywater River (Dunwish)	Moderate	Moderate	Good	Fish
UKGBNI1NW010108257 Camowen River (Omagh)	Good	Moderate	Good	Soluble Reactive Phosphorus (Hydro-morphology)
UKGBNI1NW010102039 Glenscollip Burn	Good	Moderate	Good	Soluble Reactive Phosphorus

NB Hydromorphology can only downgrade an overall classification from High to Good.

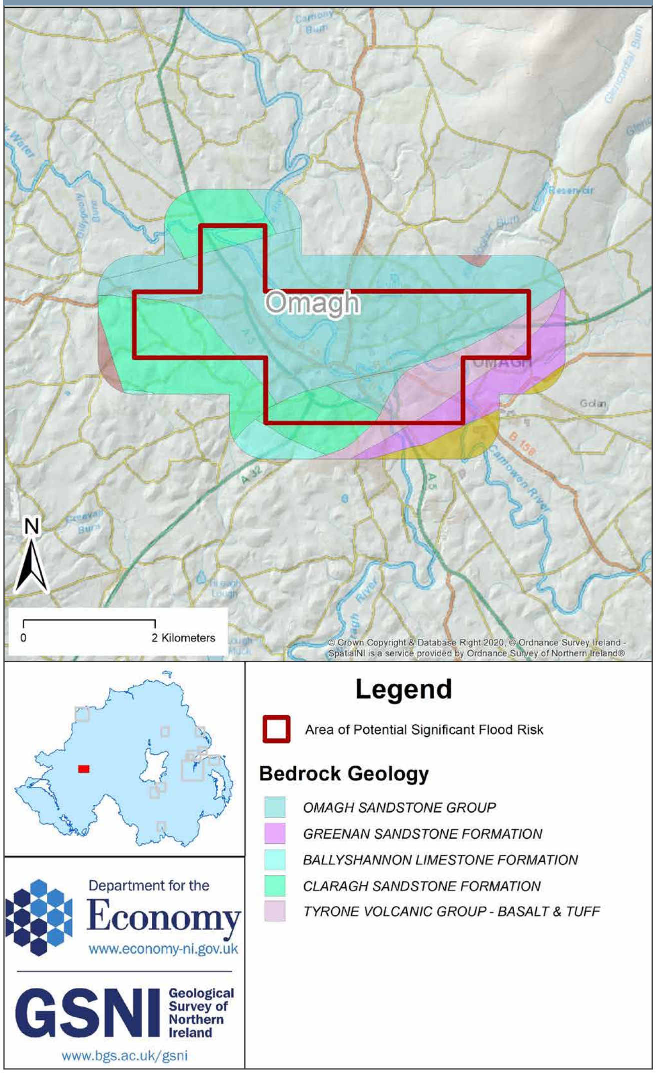
More information about status and individual objectives can be viewed at the NIEA Information Request Viewer.

The Strule River and the tributaries within the APSFR boundary suffer from acute and chronic pollution that is impacting upon their ecological status. Flood alleviation works such as reducing run off within the catchment, improving the sewerage network by separating the foul and surface drainage and the establishment of blue / green infrastructure such as SuDS could all play a positive role in achieving WFD objectives within these waterbodies.

5.9.4 GEOLOGY

5.9.4.1 Bedrock Geology

Figure 5.9-4: Bedrock geology of Omagh



The Omagh APSFR is underlain by low porosity and permeability sandstones of the:

- Omagh Sandstone Group;
- Claragh Sandstone Formation and;
- Greenan Sandstone Formation.

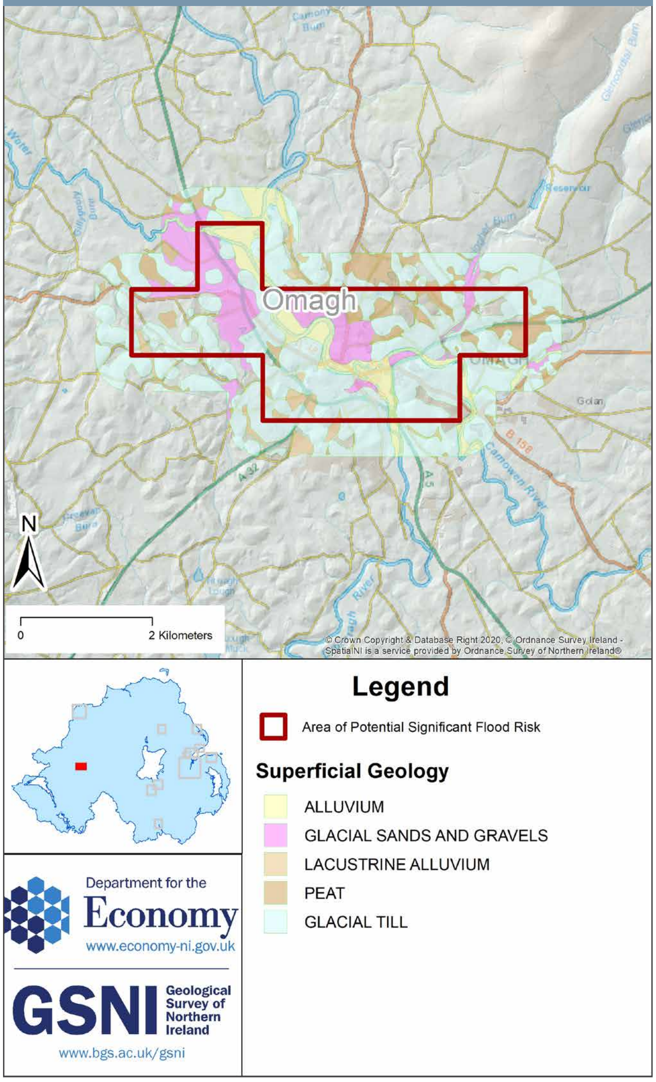
Figure 5.9-4 shows the bedrock geology. In the east, bedrock is composed of indurated basalt and tuff of the Tyrone Volcanic Group. Surface water ingress into these rocks is likely to be extremely slow and so they offer very little alleviation of surface water flooding.

5.9.4.2 Superficial Geology

Figure 5.9-5 shows the superficial geology. Glacial till is the dominant superficial deposit covering bedrock across the area, but it has very low permeability, and so will do very little to alleviate surface flooding by allowing water to infiltrate into it or the underlying geology. Within this APSFR there are two main areas of valley constrained deposits of glacial sand and gravel, to the centre and north of the River Strule and to the west of the APSFR, that have high porosity and permeability. Such deposits can readily absorb rain and surface water, and so where uncovered by impermeable man-made surfaces, they will have a mitigating effect on surface water flooding. However, once the storage within these deposits approaches capacity, it is possible that they could start to be a source of longer duration groundwater flooding especially in low lying valley floor areas and topographic depressions.

Large areas of river alluvium, such as those present either side of the River Strule, are typically composed of sand, silt and cobbles. When not fully saturated, alluvium can take in rainwater and help alleviate flooding. However, river alluvium tends to be quite thin and low lying, and these are the first areas to flood in response to rising river water levels. Low lying areas of peat are also found in the region which when not fully saturated can absorb rainwater and help alleviate flooding.

Figure 5.9-5 : Superficial geology of Omagh



5.9.5 SOURCES OF FLOODING

5.9.5.1 Risk to buildings and infrastructure by source

According to NIFRA 2018, the town of Omagh, in terms of potential adverse consequences of flooding, is ranked 9th of the 45 FRAs. DfI Rivers has undertaken detailed predictive computer mapping and modelling of flooding from rivers and sea, and further strategic mapping for surface water flooding. The results of this mapping are available on Flood Maps (NI). An analysis of the potential consequences from flooding shows the predominant flood risk is from fluvial flooding.

Figure 5.9-6 shows the predicted annual average damages (AAD) by fluvial and surface water flood sources. Predicted fluvial AAD were just under £2 million with surface water damages reaching approximately £527,000.

Figure 5.9-6: Annual Average Damages (£m) by flood source

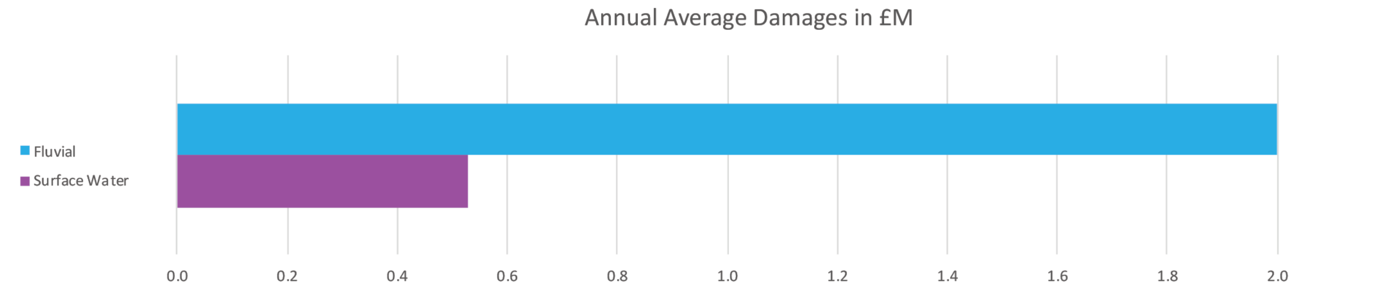
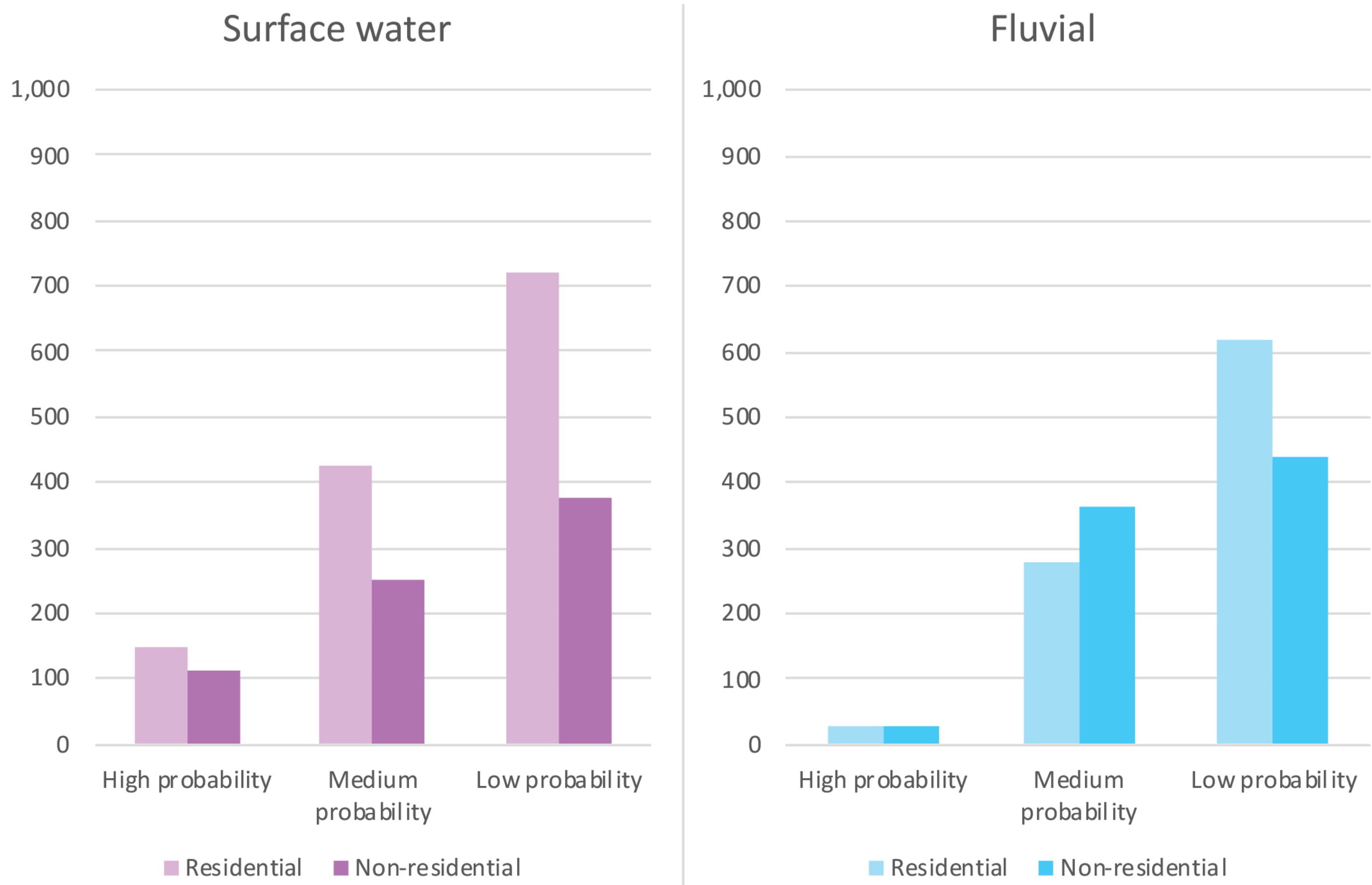


Figure 5.9-7 below shows a different trend to Figure 5.9-6 in that predicted surface water flooding affects the higher number of residential buildings when compared to fluvial sources. However, fluvial sources affect more non-residential buildings for the medium and high probability events. Table 5.9-2 shows the return periods which have been assessed as high, medium and low probability events for surface water and fluvial flooding.

Table 5.9-2: Return periods for high, medium and low probability

Probability	Surface water	Fluvial
High	3.33 % AEP (1 in 30 year)	10 % AEP (1 in 10 year)
Medium	0.5 % AEP (1 in 200 year)	1 % AEP (1 in 100 year)
Low	0.1 % AEP (1 in 1000 year)	0.1 % AEP (1 in 1000 year)

Figure 5.9-7: Number of buildings located within the modelled flood extent



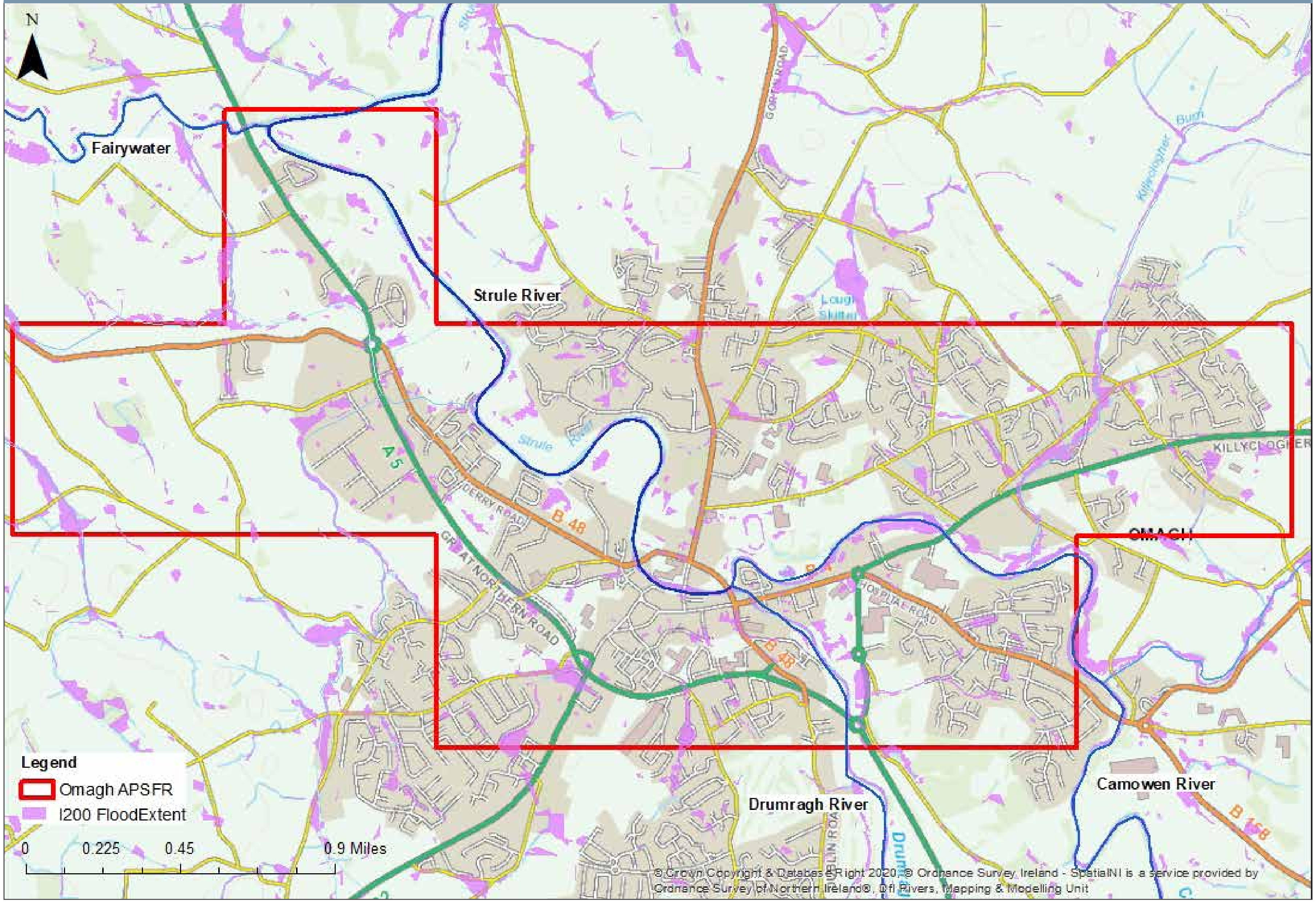
In a high probability event, the risk is predominantly from surface water flooding, as the existing flood defences provide fluvial protection. However in a low probability event, fluvial flooding has a greater impact on buildings, people and infrastructure as the defences can be overtopped where the flood event exceeds the current SoP.

5.9.5.2 Surface water (Pluvial)

Omagh is susceptible to surface water flooding partly due to surface water being unable to enter watercourses during flood conditions. In these conditions, water has to be pumped over the flood defences by systems known as 'back-drainage'. Recent flood reports relate to areas of the town near the confluence of the Drumragh and Camowen Rivers and the reach of the River Strule, just downstream of the confluence. Figure 5.9-8 shows the distribution of surface water flood risk across the APSFR.

Infrastructure at risk from surface water flood events up to 0.1 % AEP (1 in 1000 year) in the Omagh APSFR are IPPC sites, fire station, electricity substations and a built heritage site. A detailed breakdown of this is included in Appendix D.

Figure 5.9-8: Overview of surface water hazard mapping for a 0.5 % AEP (1 in 200 year) flood event.



5.9.5.3 Fluvial

The main areas of the town identified as being at fluvial flood risk are the areas in the centre of Omagh that surround the Strule, Camowen and Drumragh Rivers, where the risk is to both residential and non-residential properties. The main flood risk along these rivers is a result of flood water conveying around the back of the lock keeper's cottage at King James Bridge and the overtopping of flood defences through the town in excess of their SoP. The overall extent of fluvial flood risk is shown in Figure 5.9-10.

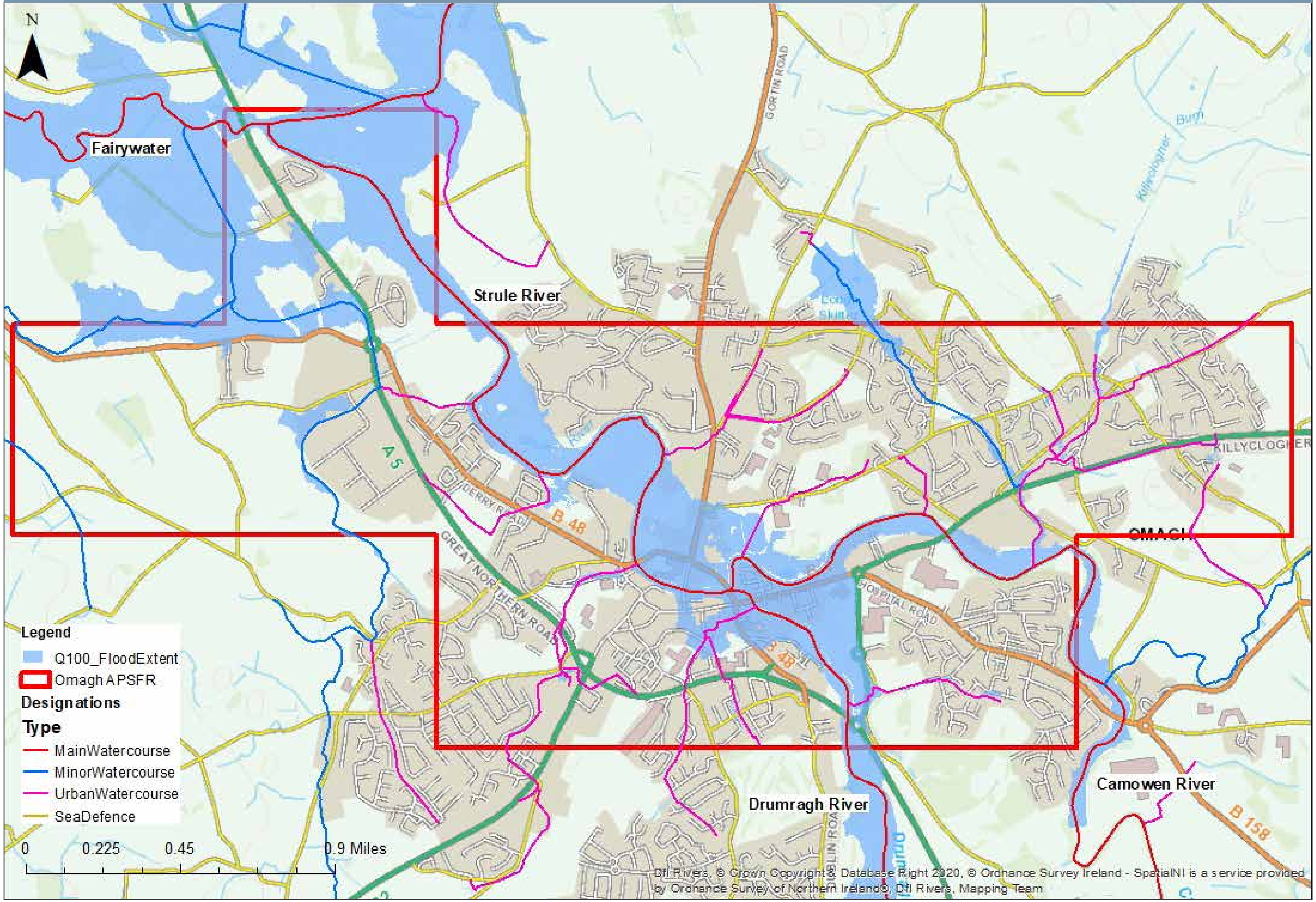
Flooding from smaller urbanised watercourses has also occurred on occasions, due to thunderstorms.

An example of this was in June 2007, when the Johnston Park Stream flooded part of the central shopping area and car parks at Kevlin Avenue and Scarffe's Entry (Figure 5.9-9, left image) and properties at Tamlaght Road (Figure 5.9-9, right image).

Infrastructure at risk from fluvial flood events up to 0.1 % AEP (1 in 1000 year) in the Omagh APSFR are IPPC sites, care homes, fire station, schools, electricity substations and a built heritage site. A detailed breakdown of this is included in Appendix D.

Figure 5.9-9: Flooding from smaller urbanised watercourses

Figure 5.9-10: Overview of fluvial hazard mapping for a 1 % AEP (1 in 100 year) flood event



5.9.6 CURRENT FLOOD RISK MITIGATION

5.9.6.1 Planning

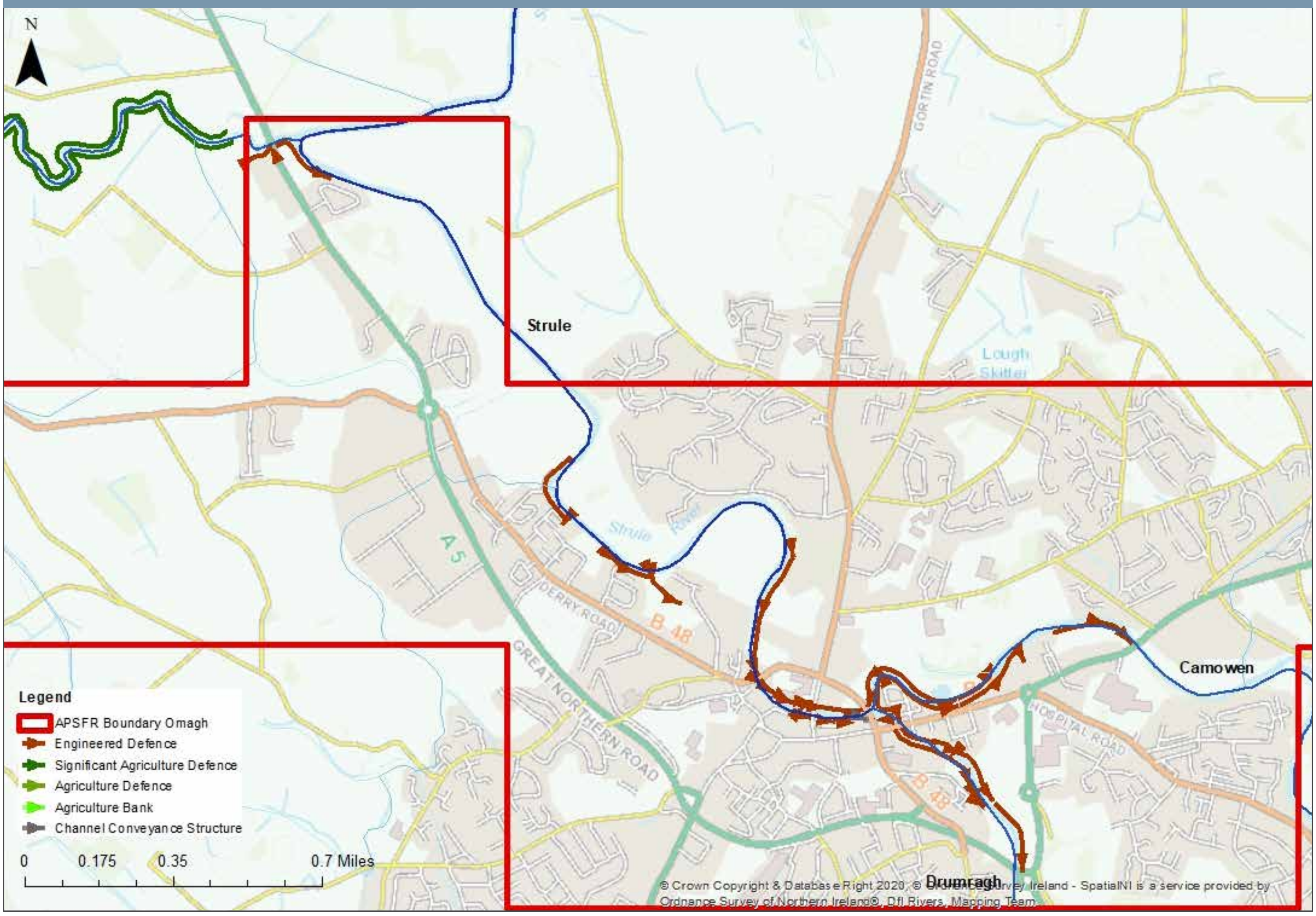
In addition to national planning policy and advice, DfI Rivers will advise against bringing forward sites or the zoning of any land in preparation for the new Fermanagh and Omagh District Council Local Development Plan, particularly for built development, that has been identified from the flood maps as being within the 1 % AEP (1 in 100 year) fluvial floodplain, 0.5 % AEP (1 in 200 year) reservoir inundation area, or is susceptible to surface water flooding.

5.9.6.2 Flood defences

Figure 5.9-11 below shows the existing flood defences in the vicinity of the Omagh APSFR. There are engineered river flood defences on the Rivers Strule, Camowen and Drumragh protecting the centre of Omagh, up to a 2 % AEP (1 in 50 year) SoP.

Subsequent to the 1987 flood event a major scheme to upgrade the defences was undertaken in the early 1990s, and since that time the defences have not been overtopped. Although there has been some, albeit much reduced, flooding due to surface water and small watercourse drainage problems behind the defences, most notably in 1999 and 2007.

Figure 5.9-11: Flood defences in Omagh APSFR



NI Water operate three storm water pumping stations within Omagh town centre to address the risk of surface water flooding. The pumps lift the water over the flood defences and discharge to the river.

A new flood defence was recently completed in February 2019, on the left bank of the River Strule adjacent to Hunter Crescent, to the north-west of the central part of the APSFR. This new defence replaces an old sub-standard structure. Since its construction, this new defence has successfully provided protection to the properties in Hunter Crescent from a flood in February 2020.

It should be noted that this scheme was not included as part of first cycle FRMPs because of the uncertainty about when it would progress. However, the scheme was able to be accelerated and included as part of a major Strathroy Link Road scheme.

Figure 5.9-12: Hunter Crescent Defences during a flood in February 2020

5.9.7 ACTIONS IN THE FIRST CYCLE FLOOD RISK MANAGEMENT PLAN

In the first cycle FRMP, there were five specific measures for the Omagh APSFR.

The Omagh Community Resilience Group was established in 2016 and therefore this measure's progress is marked as complete. This resilience group differs from others in NI, because it is represented predominantly by owners of commercial rather than residential properties. However, other protection measures have not progressed as the Omagh feasibility study found, in 2016, that the proposed schemes were not economically viable.

Table 5.9-3 shows a summary of the measures within the Omagh APSFR and their progress.

5.9.7.1 Prevention

No particular Prevention measures specific to Omagh were set out in the first cycle FRMP.

As outlined in Chapter 4, DfI Rivers advises on planning applications regarding the risk of flooding. The basis of this advice is to avoid inappropriate development in areas which are at risk of flooding and to ensure that any development does not increase flood risk elsewhere.

Table 5.9-3: Progress tracking for Flood Risk Management Plan measures 2015-2021

Category	Measure code from First Cycle FRMPs	Measure description	Progress
PROTECTION	UKNI_NW_APSFR_02_01	Omagh Fluvial Flood Risk Assessment and Flood Alleviation Scheme	Feasibility study completed. Scheme not presently viable.
	UKNI_NW_APSFR_02_03	Killyclogher Burn and Mullaghmore Burn – Flood Alleviation Scheme	To progress to feasibility stage in the near future.
	UKNI_NW_APSFR_02_04	Dromore Road Stream – Flood Alleviation Scheme	Linked to Omagh FAS.
	UKNI_NW_APSFR_02_05	Fairy Water / Strule River – Flood Alleviation Scheme	Linked to Omagh FAS.
PREPAREDNESS	UKNI_NW_APSFR_02_02	Omagh Community Resilience Group	Complete.

5.9.7.1.1 Planning policy

A new LDP for the Fermanagh and Omagh District Council area, for the period up to 2030 is being prepared with the adoption of the Plan Strategy in 2021/2022 and Local Policies Plan in 2024/2025, during the second FRMP cycle. It will comprise:

- a Plan Strategy to define strategic objectives for future development of the District, including strategic policies and a spatial strategy;
- a Local Policies Plan which will include site-specific proposals, designations and zoning to deliver the Strategy.

On adoption, the new LDP will replace the current Plans for the District and operational planning policies that were produced by the previous Department of the Environment.

5.9.7.2 Protection

Four measures from the first FRMP cycle to progress FASs in the Omagh APSFR, have not yet commenced. The Omagh Town Centre Flood Alleviation Study is not progressing, due to the feasibility study identifying that the proposed scheme is not currently viable. An accelerated study, concentrated on the Strule River, was completed in conjunction with proposals for the Education Campus. However, project programmes could not align and introduced too much programme risk for the Shared Education Campus project. Concerns regarding the viability of the flood alleviation project, has meant that this study remains on the DfI Rivers works programme, and a further assessment around upstream flood storage is being considered.

Two other measures, Dromore Road Stream and Fairy Water / Strule River Flood Alleviation Schemes have also not progressed due to their linkage to this scheme. A further Capital Works Scheme in the Omagh area for Killyclogher Burn and Mullaghmore Burn is due to progress to feasibility stage in the near future.

In addition to the measures set out in the first cycle Flood Risk Management Plan, the new Hunter Crescent Flood Defences were completed in February 2019. These defences were included in the DfI Rivers works programmes and accelerated to allow construction to be completed as part of the Strathroy Link Road. Figure 5.9-13 below shows a new floodwall being constructed in front of the old defence structure.

5.9.7.3 Preparedness

The local Community Resilience Group in Omagh was established in 2016, and contacts have been maintained with property owners. This measure is marked as complete.

Figure 5.9-13: Floodwall construction as part of the Hunter Crescent Flood Defence scheme

5.9.8 UPDATED PROGRAMME FOR SECOND CYCLE FLOOD RISK MANAGEMENT PLAN

5.9.8.1 Key Messages

Although there are no specific measures set out under Prevention for the Omagh APSFR in the first cycle FRMP, the Fermanagh and Omagh District Council LDP is scheduled to be finalised early in the second cycle FRMP. The LDP, alongside current advice on Planning from DfI Rivers, will support mitigation of flood risk in the council area in relation to both new development and redevelopment proposals from the LDPs adoption and through the second FRMP cycle. This will be taken forward as a measure for the second cycle FRMP for DfI Rivers to work with the council to update the flood risk policy within the new LDP.

Measures set out for Protection are undetermined due to schemes not being viable following a feasibility study. Further alternative studies will be set out for the second cycle Plan.

Community resilience engagement as set out through the Preparedness measures has been completed in the first FRMP cycle.

5.9.8.2 Enhanced Drainage Area Plan

NI Water is currently taking forward modelling in the form of DAPs across NI for drainage areas with populations typically above 2000. The traditional approach is for all combined and foul sewers to be modelled. For the period April 2021 – March 2027, NI Water will be conducting Enhanced DAPs in each of the APSFR. These Enhanced DAPs extend modelling to include the NI Water storm sewers, which may identify drainage improvement schemes.

Table 5.9-4 below sets out the measures and timescales for the Omagh APSFR in the second cycle FRMP.

Table 5.9-4: Proposed objectives for Flood Risk Management Plan cycle 2021-2027

Category	Measure summary	Lead authority	Specific measure	Timescale
PREVENTION	Influence local planning policy for development and flood risk	DfI Rivers	By 2024, DfI Rivers will work with Fermanagh and Omagh District Council to update flood risk policy in the Local Development Plan.	2024
	Enhanced Drainage Area Plan	NI Water	By 31st March 2027, NI Water will produce an Enhanced DAP for Omagh that sets out actions to mitigate integrated flooding issues	2027
PROTECTION	Implementation of Flood Alleviation Schemes	DfI Rivers	By 2023, DfI Rivers will undertake further feasibility work with regards to a flood alleviation scheme for Omagh Town Centre. Should this identify a viable scheme this will be followed by detailed design and construction.	2023

5.10

NEWTOWNABBEY

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5.10.1 SUMMARY

5.10.1.1 Flood risk area overview

Newtownabbey is a large settlement in County Antrim, situated to the north of Belfast with a population in excess of 65,000, according to the 2011 Census. Sometimes considered to be a suburb of Belfast, it is separated from the rest of the city by Cavehill and the M2 motorway. It is close to, and just east of the Glengormley and Mallusk APSFR and just south-west of the Carrickfergus APSFR.

The Newtownabbey APSFR is in the North Eastern RBD, and is at risk from both fluvial and surface water sources. There was major flooding in 2002 due to extreme rainfall, and since then minor flooding has been recorded in the winters of 2018 and 2019 when roads were flooded, again due to heavy rainfall.

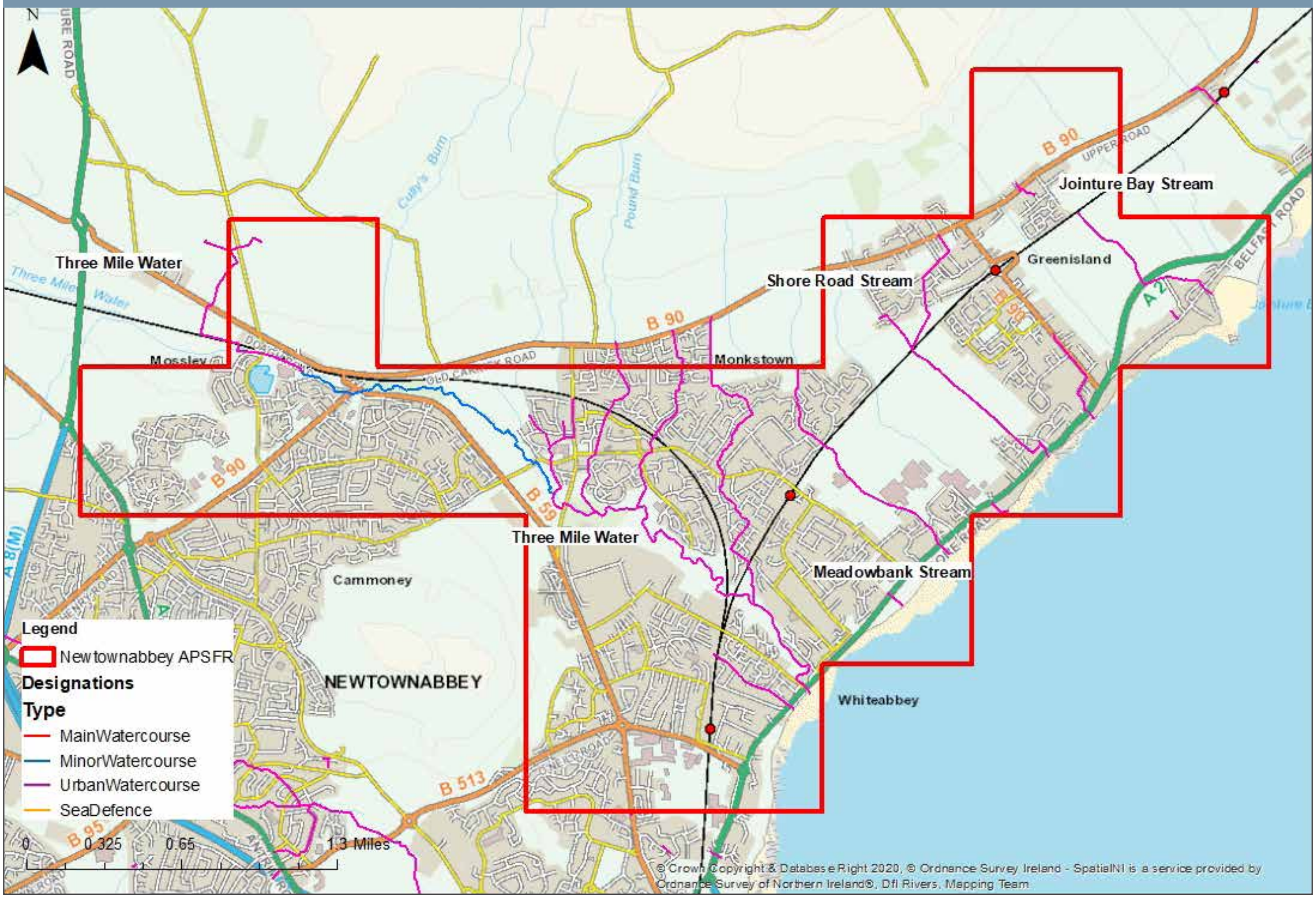
The Newtownabbey APSFR is located entirely within the Belfast Lough and Tidal Lagan Local Flood Management Area and is surrounded by the Sixmilewater and Larne Local Flood Management Areas to the North. The APSFR boundary and key watercourses are shown in Figure 5.10-1 below.

5.10.1.2 Northern Ireland Flood Risk Assessment (NIFRA) 2018

The NIFRA 2018 stated that Newtownabbey is at risk of flooding from fluvial and surface water sources which could adversely impact on people and property in the area.

The area identified to be at risk has increased in size from that considered in the PFRA 2011. The new boundary extends to the south including the area of Whiteabbey, including Whiteabbey Hospital. The boundary has also been extended to the north-east to include areas beyond the B90 Station Road, Greenisland and A2 Shore Road.

Figure 5.10-1: Location and boundary of Newtownabbey APSFR and key watercourses



5.10.2 HISTORY

5.10.2.1 Summary of flooding history

The Newtownabbey/Whiteabbey area has experienced both fluvial and surface water flooding in the past. The flooding mechanisms are complex as water comes from overland flows, watercourses and the sewerage/drainage systems. Notable events which caused significant flooding of the Shore Road and Whiteabbey Village areas occurred in September 1999 and again in June 2002.

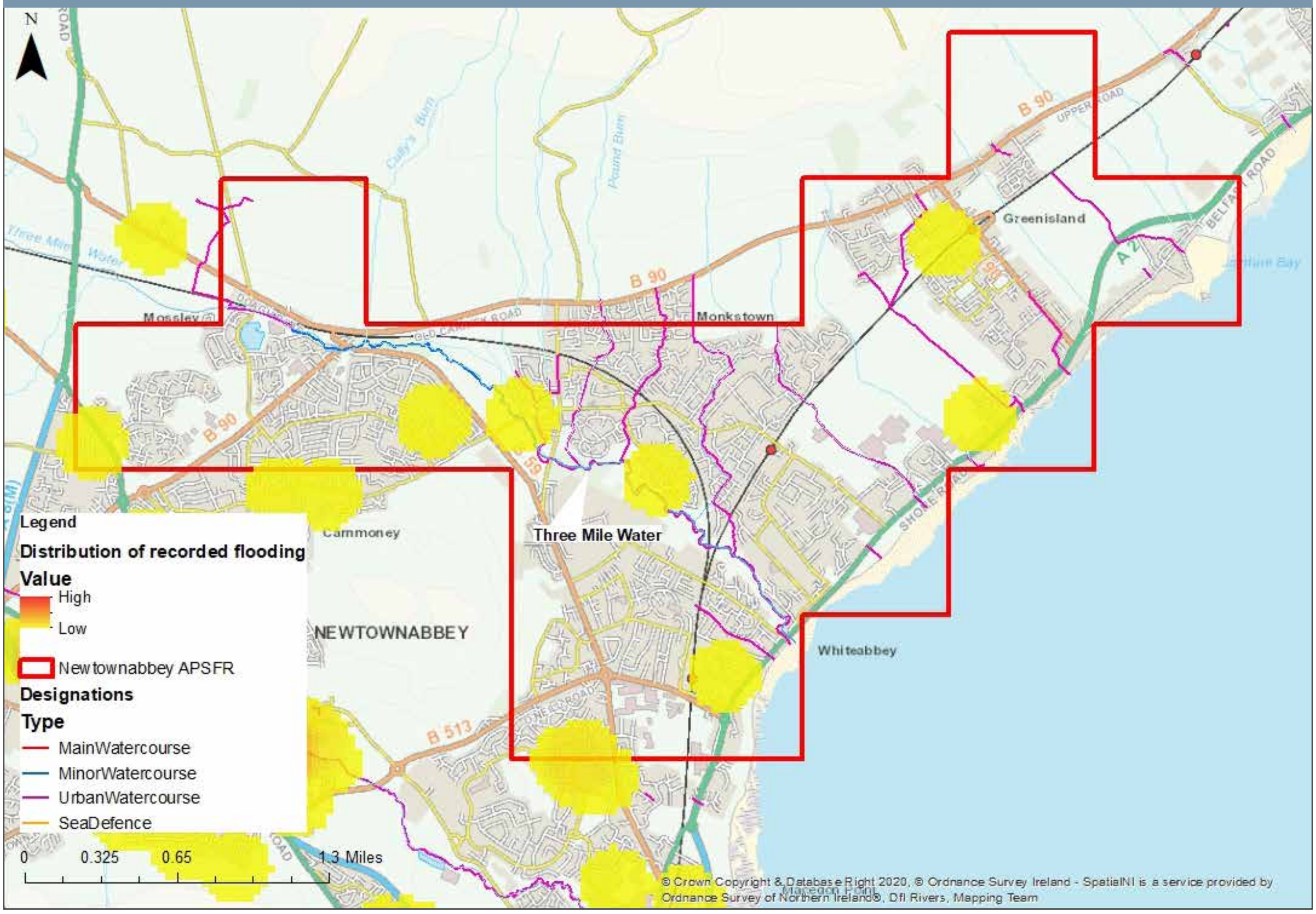
The event in June 2002 was particularly severe and was caused by short duration high intensity rainfall, which the Met Office reports at the time indicated had a storm return period of 0.33 % AEP (1 in 300 years). This extreme rainfall resulted in widespread surface water flooding and disruption in the area causing internal flooding of at least 40 residential and 15 commercial properties in Whiteabbey. There was also flooding reported in the Monkstown Avenue/Glenville Road, Twinburn and Whiteabbey Village areas.

The distribution of recorded flooding in the Newtownabbey APSFR is shown below in Figure 5.10-2.

5.10.2.2 Flooding since 2015

More recently in the winters of 2018 and 2019 surface water flooding affected low lying areas in Newtownabbey. Limited damage was reported, although there was disruption to traffic in the Shore Road area, due to these adverse conditions.

Figure 5.10-2: Heatmap showing recorded flooding in the Newtownabbey APSFR



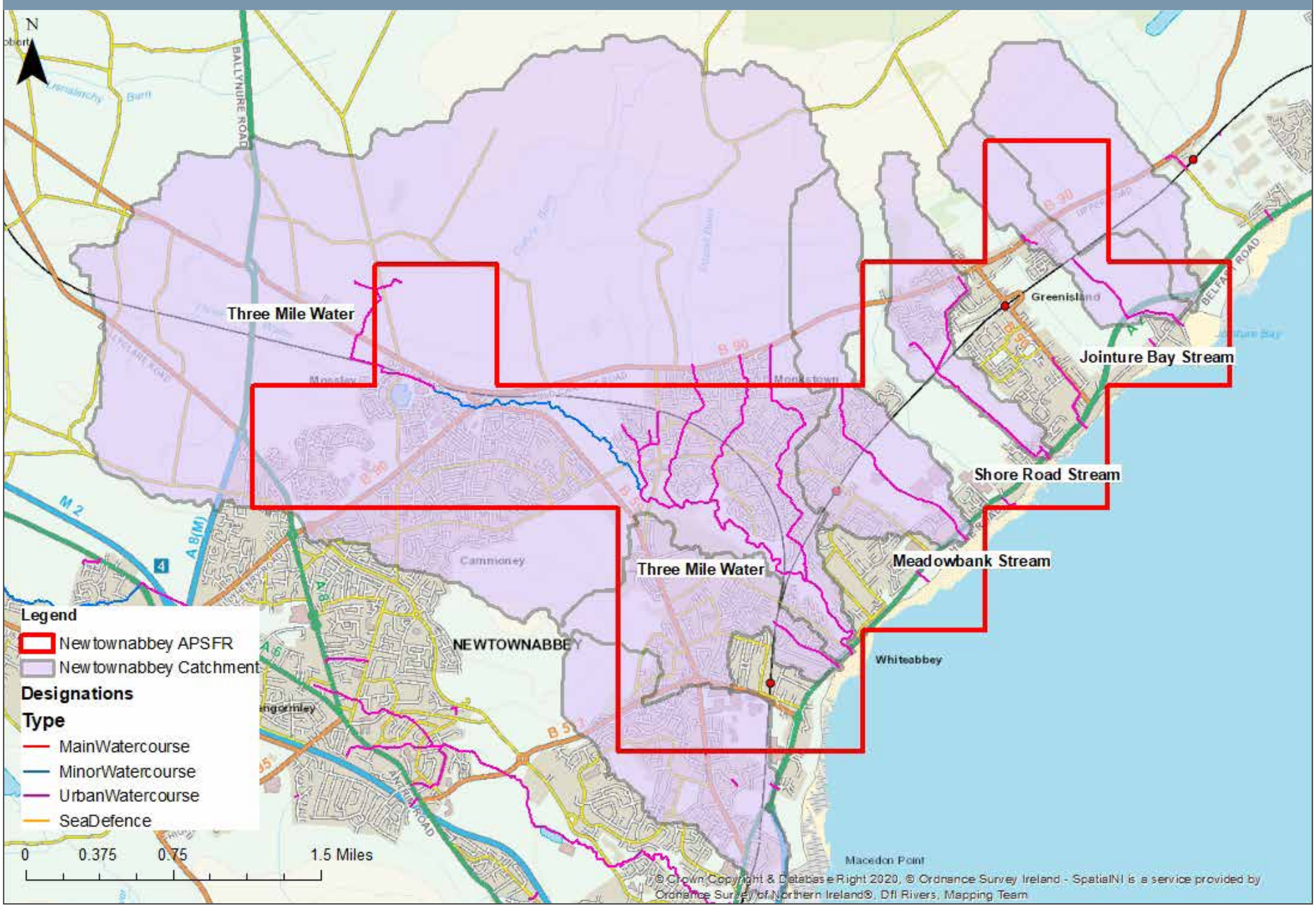
5.10.3 CATCHMENT

5.10.3.1 Catchment characteristics and tributaries

Newtownabbey comprises a substantial number of urban residential communities and traditional farming communities, the Newtownabbey APSFR is largely focused on the urban areas of Monkstown, Jordanstown, Whiteabbey and Greenisland. These residential areas are drained by a series of watercourses that arise from the slopes of the Antrim Plateau Escarpment to the west and northwest, their catchments drain generally eastwards towards Belfast Lough. Apart from the Three Mile Water which has a significant and predominantly rural catchment exceeding 20 km², all of the other watercourses have small and largely urban catchments which are typically less than 2 km². Most of the watercourses, again with the exception of the Three Mile Water are heavily engineered and extensively culverted through the urban areas. Figure 5.10-3 below shows the series of small catchments which capture watercourses and overland flows across the Newtownabbey APSFR to the sea outfall.

The APSFR has a coastal fringe at the north shore of Belfast Lough and each watercourse has a sea outfall at various locations along the shoreline between Whiteabbey and Greenisland. The western periphery of Newtownabbey drains towards the Glengormley and Mallusk APSFR.

Figure 5.10-3: : Catchments in relation to the Newtownabbey APSFR



5.10.3.2 Urban drainage and wastewater network

NI Water is responsible for the clean drinking water supply, foul and storm water sewerage networks throughout NI.

The majority of the NI Water drainage network within the APSFR is separated; there is approximately 135 km of storm sewer and 115 km of foul sewer. The total length of the combined sewer network is less than 100km.

The Newtownabbey area is served by the Greenisland WwTW, which is situated outside the APSFR boundary, adjacent to the A2 towards Carrickfergus. There are also seven NI Water pumping stations within the area.

NI Water has a programme of work to removed properties on the DG5 register that are subject to internal flooding. Within PC15 the regulatory target is to remove 62 properties from the risk register by company action across NI. Commercial Way in Newtownabbey has been considered for solutions during PC15; and where solutions have been determined economically viable, they have been implemented.

5.10.3.3 Environment

The APSFR encompasses the following WFD waterbodies:

Table 5.10-1: Waterbody classifications in and around the Newtownabbey APSFR

Waterbody name	2015 Classification	2018 Classification	2021 Objective	Reason for failure
UKGBNI1NE050501118: Three Mile Water	Moderate	Moderate	Moderate	Benthic Invertebrates Phytobenthos Soluble Reactive Phosphorus
UKGBNI1NE050501120: Woodburn River	Moderate Ecological Potential	Moderate Ecological Potential	Moderate Ecological Potential	Soluble Reactive Phosphorus
UKGBNI6NE090: Belfast Lough Inner	Moderate		Moderate	Alien Species Priority Hazardous Substances

More information about status and individual objectives can be viewed at the NIEA Information Request Viewer.

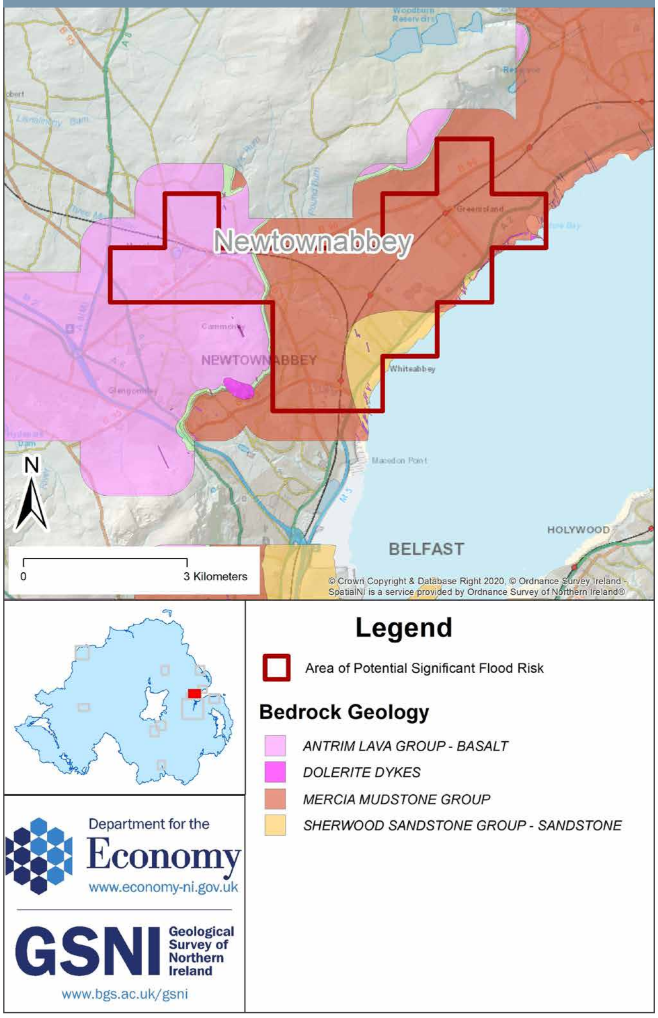
Belfast Lough and its peripheral waterbodies suffer from acute and chronic pollution that is impacting upon their ecological status.

Flood alleviation works such as reducing run off within the catchment, improving the sewerage network by separating the foul and surface drainage and the establishment of blue / green infrastructure such as SuDS could all play a positive role in achieving WFD objectives within these waterbodies.

5.10.4 GEOLOGY

5.10.4.1 Bedrock Geology

Figure 5.10-4 : Bedrock geology of Newtownabbey



From west to east, the Newtownabbey APSFR is underlain by:

- basalt of the Antrim Lava Group;
- chalk of the Ulster White Limestone Formation;
- mudstone of the Mercia Mudstone Group and;
- sandstone of the Sherwood Sandstone Group.

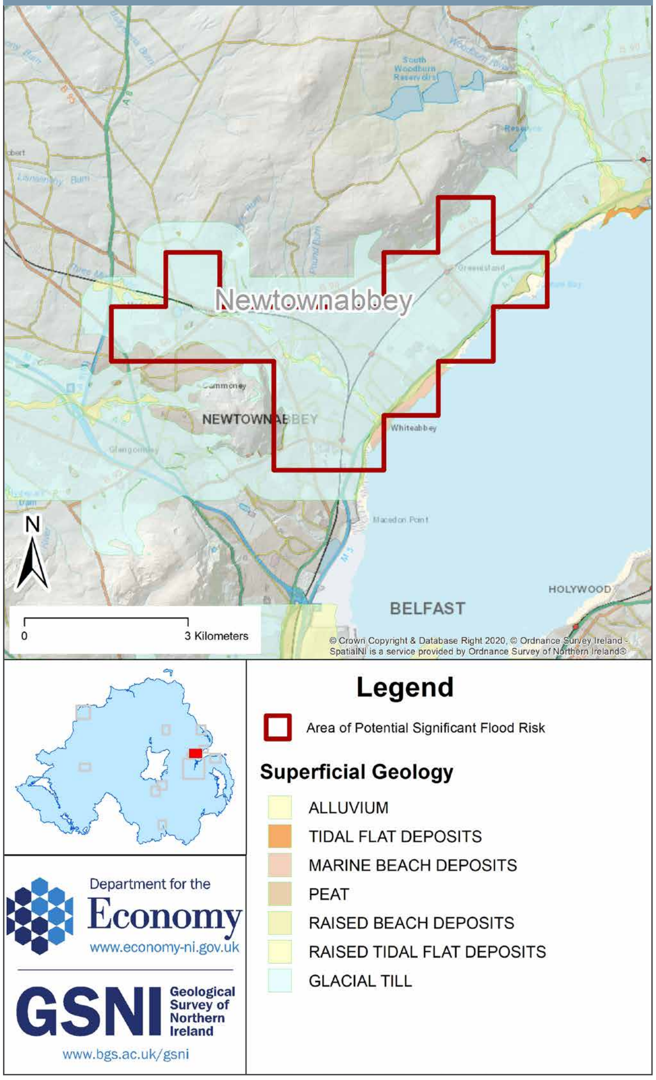
Basalts can contain significant volumes of groundwater in joints, fractures and small cavities, but surface water ingress into these rocks is likely to be extremely slow and so they offer very little alleviation of surface water flooding. Chalk can contain cave systems into which surface water can flow and then reappear via springs downslope. The mudstone dominated Mercia Mudstone Group is impermeable and offers no alleviation of surface water flooding. Where exposed, sandstones of the Sherwood Sandstone Group are likely to take in some surface water.

5.10.4.2 Superficial Geology

Glacial till is the dominant superficial deposit covering bedrock across the area, but it has very low permeability, and so will do very little to alleviate the considerable mapped surface water flood risk in the Newtownabbey APSFR as it will not allow water to infiltrate into it or the underlying geology.

Raised beach deposits of sand and gravel occur in strips along the coast. Such deposits can readily absorb surface water and so where uncovered by impermeable man-made surfaces, could have a mitigating effect on surface flooding. However, because this strip occurs along the coast on the periphery of the urban area, its effects on surface water are likely to be minimal.

Figure 5.10-5: Superficial geology of Newtownabbey



5.10.5 SOURCES OF FLOODING

5.10.5.1 Risk to buildings and infrastructure by source

According to the NIFRA 2018, the town of Newtownabbey in terms of potential adverse consequences of flooding, is ranked 10th of the 45 FRAs in NI. DfI has undertaken detailed predictive computer mapping and modelling of flooding from rivers and sea, and further strategic mapping for surface water flooding. The results of this mapping can be found on [Flood Maps (NI)](). An analysis of the potential consequences from flooding shows the predominant flood risk is from surface water sources. It should be noted, however, that the surface water mapping picks up the floodplains of some of the smaller urban watercourses.

Figure 5.10-6 shows the predicted annual average damages (AAD) by flood source. The graph shows that the highest AAD cost is from surface water sources by a considerable margin. Predicted surface water AAD were just under £1.8 million, whereas the fluvial flooding damages totalled approximately £146,000. Despite being a coastal APSFR, tidal flood hazard mapping does not affect the area or produce any damages.

Figure 5.10-6: Annual Average Damages (£m) by flood source

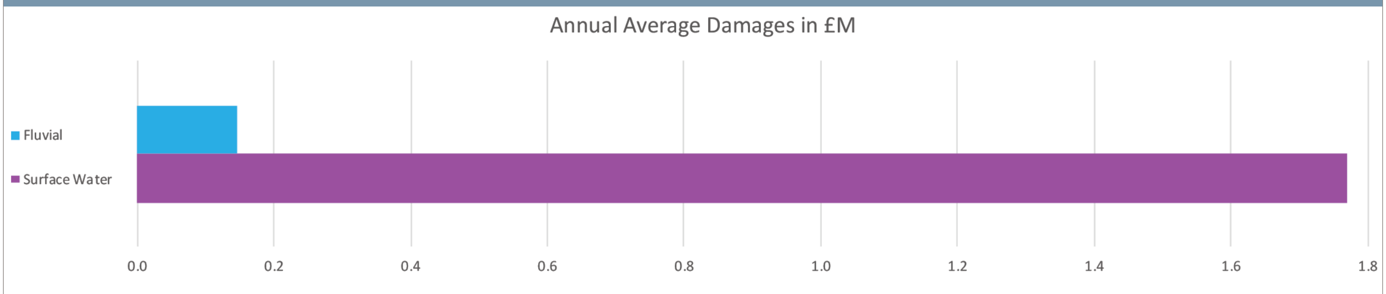
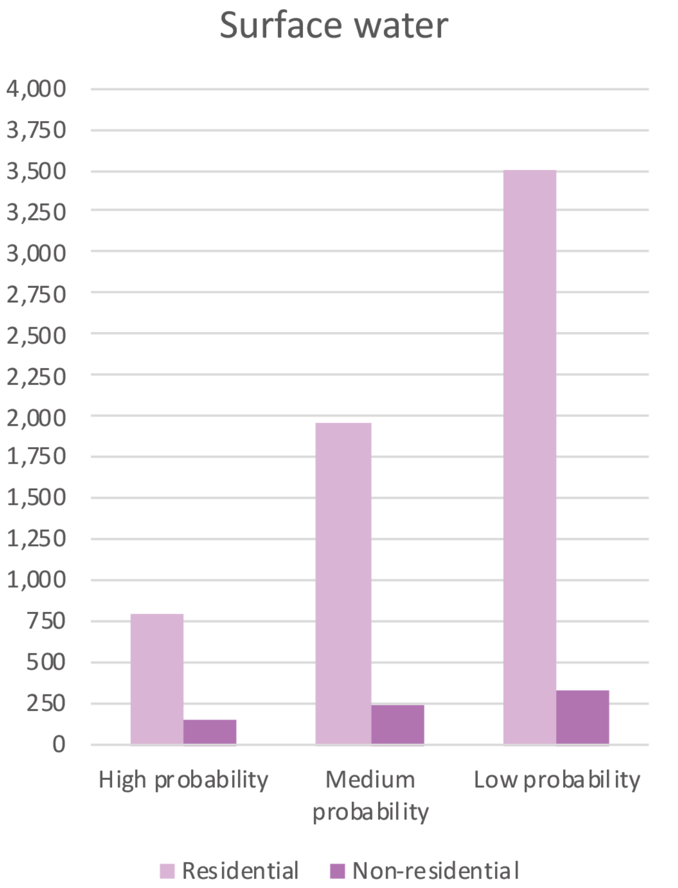


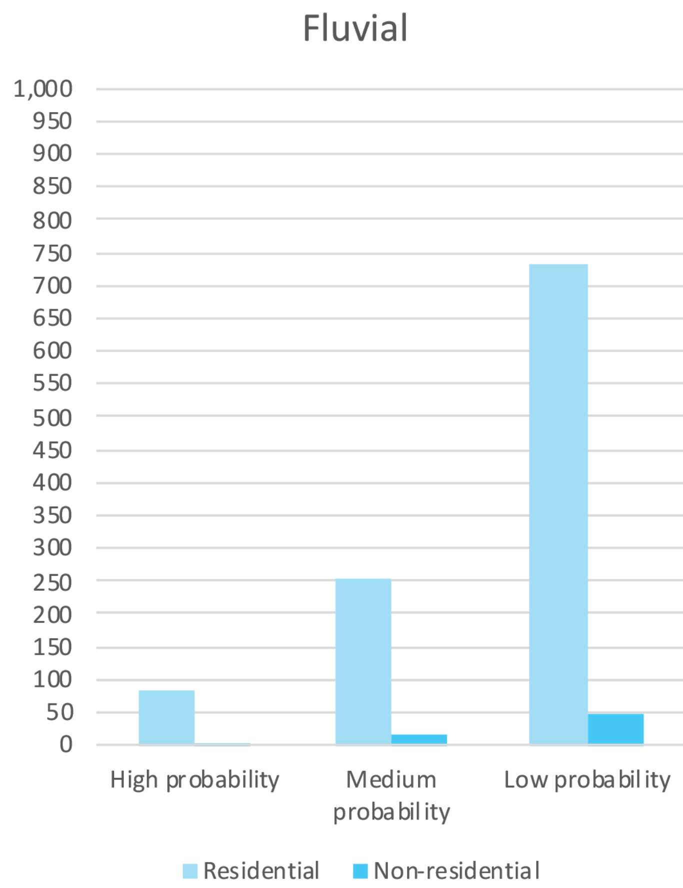
Figure 5.10-7 below shows a similar trend to Figure 5.10-6 in that surface water mapping predicts the highest number of buildings flooded compared to fluvial flooding for the high, medium and low probability events. Table 5.10-2 shows the return periods which have been assessed as high, medium and low probability events for surface water and fluvial flooding.

Table 5.10-2: Return periods for high, medium and low probability

Probability	Surface water	Fluvial
High	3.33 % AEP (1 in 30 year)	10 % AEP (1 in 10 year)
Medium	0.5 % AEP (1 in 200 year)	1 % AEP (1 in 100 year)
Low	0.1 % AEP (1 in 1000 year)	0.1 % AEP (1 in 1000 year)

Figure 5.10-7: Number of buildings located within the modelled flood extent





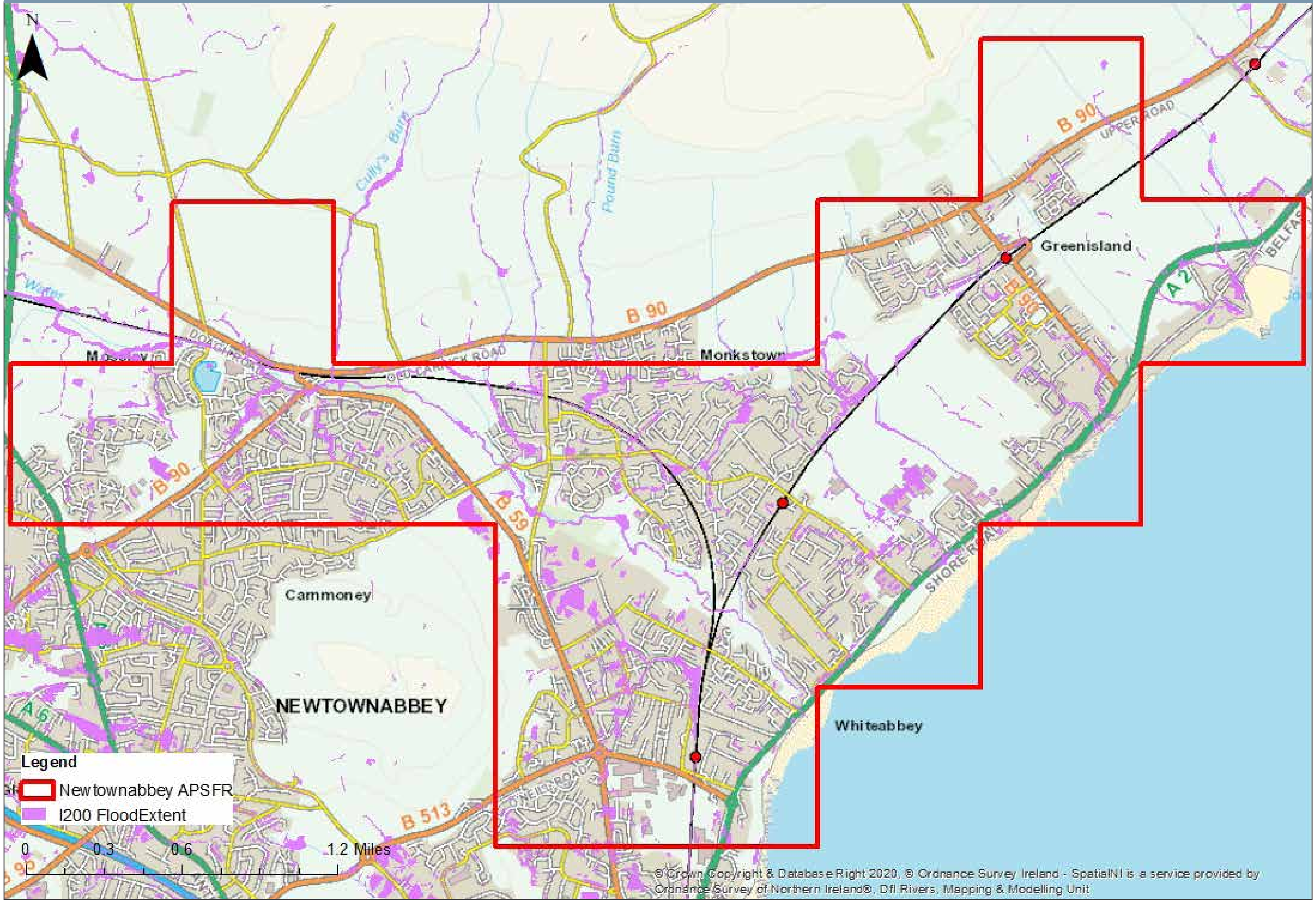
Note that the scale for surface water on Figure 5.10-7 above, is different to account for significantly higher values than those for fluvial.

5.10.5.2 Surface water (Pluvial)

Surface water flood risk as depicted in the overview map below in Figure 5.10-8 shows dispersed pockets of flooding and surface water flow routes. The map details areas with a history of flooding, including Twinburn, Monkstown Avenue/Glenville Road and Shore Road/Whiteabbey Village. Mossley, the area to the west of the APSFR, has not been reported as an area with a history of flooding, although the surface water flood maps predict surface water flow routes with risk shown to a number of residential areas.

Infrastructure at risk from surface water flood events up to 0.1 % AEP (1 in 1000 year) in the Newtownabbey APSFR are IPPC sites, care homes, a hospital, police stations, schools, electricity substations, environmental designated sites and built heritage sites. A detailed breakdown of this is included in Appendix D.

Figure 5.10-8: Overview of surface water hazard mapping for a 0.5 % AEP (1 in 200 year) flood event

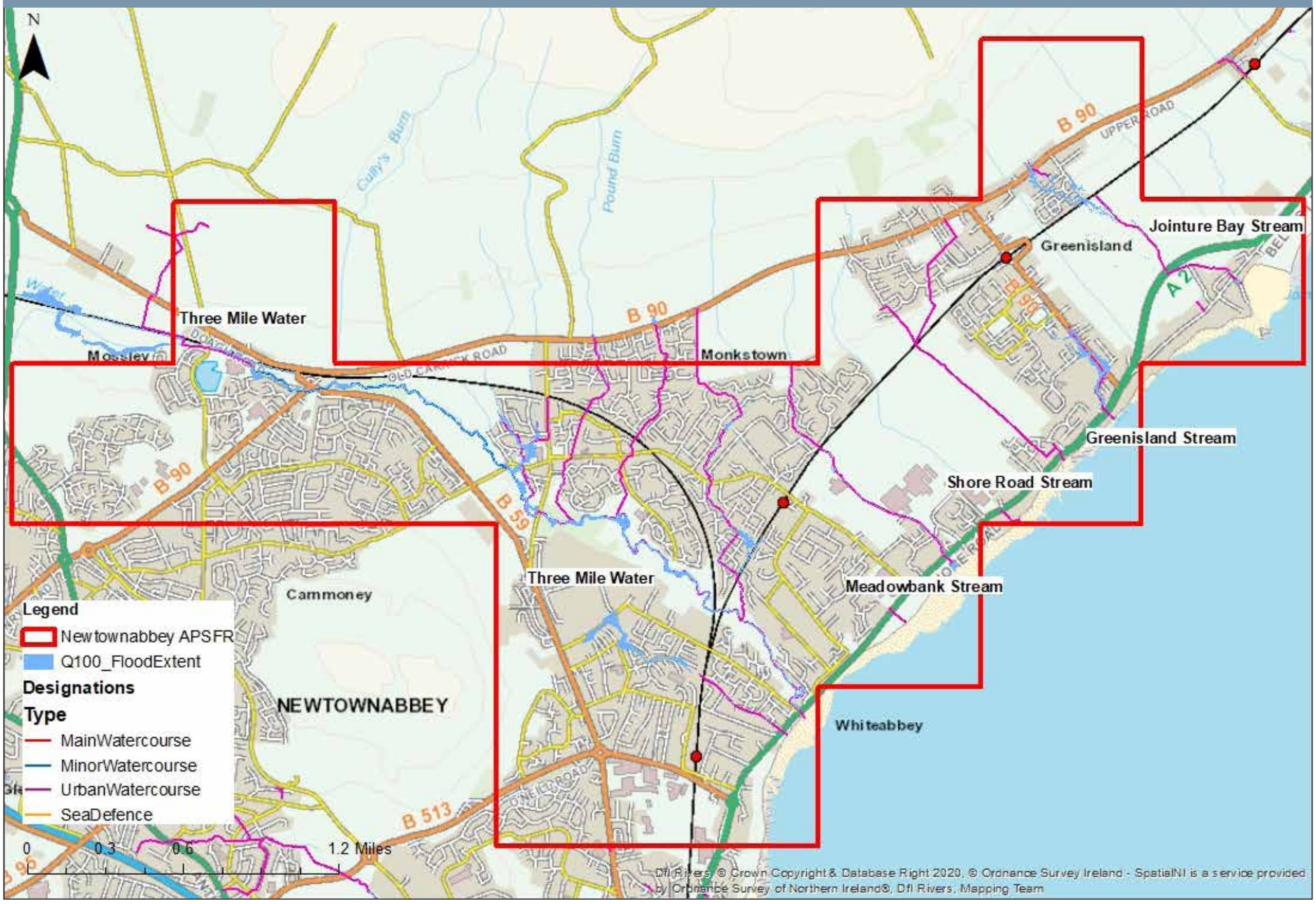


5.10.5.3 Fluvial

The mapping show that there are over 260 commercial and residential properties at risk from fluvial flooding in a 1 % AEP (1 in 100 year) event. The overview map of fluvial flood risk below shows the flood extent in small areas around the urban watercourses. Due to the flood modelling techniques used, the surface water mapping in most cases highlights that these watercourses have a more extensive floodplain than shown on Figure 5.10-9, coupled with contributing overland flow paths.

Infrastructure at risk from fluvial flood events up to 0.1 % AEP (1 in 1000 year) in the Newtownabbey APSFR are an IPPC site, electricity substations, environmental designated sites and listed buildings. A detailed breakdown of this is included in Appendix D.

Figure 5.10-9: Overview of fluvial hazard mapping for a 1 % AEP (1 in 100 year) flood event



5.10.6 CURRENT FLOOD RISK MITIGATION

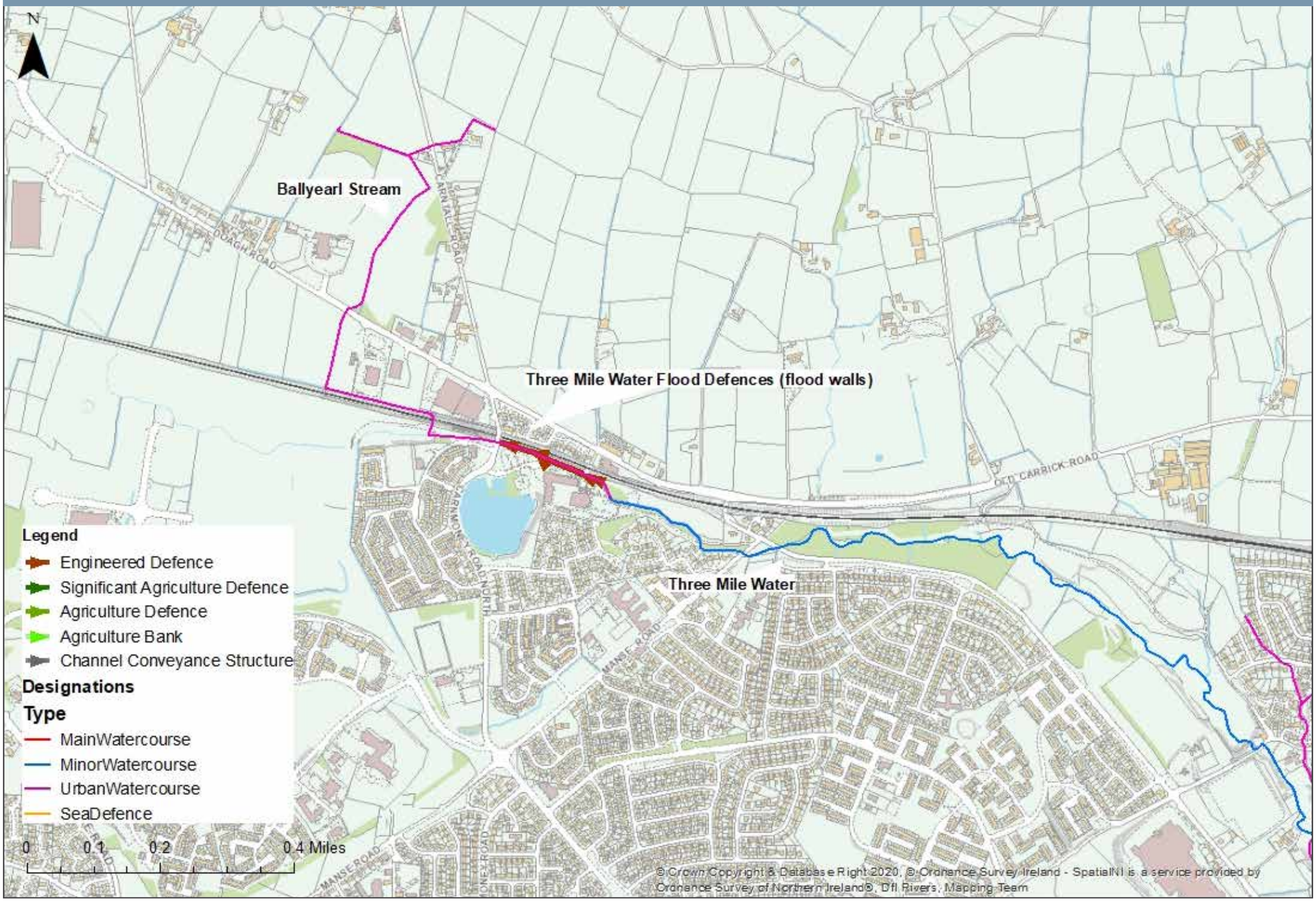
5.10.6.1 Planning

In addition to national planning policy and advice, DfI Rivers will advise against bringing forward sites or the zoning of any land in preparation for the new Antrim and Newtownabbey Borough Council LDP, particularly for built development, that has been identified from the flood maps as being within the 1 % AEP (1 in 100 year) fluvial floodplain, 0.5 % AEP (1 in 200 year) tidal floodplain/reservoir inundation area, or is susceptible to surface water flooding.

5.10.6.2 Flood defences

There is a short stretch of engineered defence, in the north west of the APSFR, this takes the form of cantilevered flood walls either side of the Three Mile Water, in the vicinity of Mossley Mill (see Figure 5.10-10).

Figure 5.10-10: Flood defences in Newtownabbey APSFR



5.10.7 ACTIONS IN THE FIRST CYCLE FLOOD RISK MANAGEMENT PLAN

In the first cycle FRMP, there were four measures set out specifically for the Newtownabbey APSFR.

Table 5.10-3 shows a summary of measures within the Newtownabbey APSFR and their progress.

5.10.7.1 Prevention

No particular Prevention measures specific to Newtownabbey were set out in the first cycle FRMP.

As outlined in Chapter 4, DfI Rivers advises on planning applications regarding the risk of flooding. The basis of this advice is to avoid inappropriate development in areas which are at risk of flooding and to ensure that any development does not increase flood risk elsewhere.

Table 5.10-3: Progress tracking for Flood Risk Management Plan measures 2015-2021

Category	Measure code from First Cycle FRMPs	Measure description	Progress
PROTECTION	UKNI_NE_APSFR_06_01	Concrete Row Stream - FAS	Complete.
	UKNI_NE_APSFR_06_02	Greenisland Stream - FAS	Included in long term works programme.
	UKNI_NE_APSFR_06_03	Three Mile Water - FAS	Included in long term works programme.
	UKNI_NE_APSFR_06_04	Jointure Bay Stream - FAS	Included in long term works programme.

5.10.7.1.1 Planning policy

Development planning proposals for Newtownabbey are currently set out in the BMAP, under the Newtownabbey District. The BMAP proposals identify the key considerations that will be taken into account in determining planning applications within the Plan Area.

A new LDP for the Antrim and Newtownabbey Borough Council area, for the period up to 2030, is being prepared and is due to be adopted by 2024, during the second FRMP cycle. It will comprise:

- a Plan Strategy to define strategic objectives for future development of the Borough, including strategic policies and a spatial strategy;
- a Local Policies Plan which will include site-specific proposals, designations and zoning to deliver the Strategy.

On adoption, the new LDP will replace the current Plans for the Borough and operational planning policies that were produced by the previous Department of the Environment.

5.10.7.2 Protection

Of the four flood alleviation schemes set out in the first cycle FRMP for the Newtownabbey APSFR, the Concrete Row Stream culvert works, consisting of a new box culvert and outlet channel, has been progressed to construction and completed.

The Three Mile Water and Jointure Bay Stream FAS both come under the Newtownabbey Significant Flood Risk Area Feasibility Study and have not yet been started, although they are listed on the DfI Rivers Prioritised Capital Works Programme.

The Greenisland Stream FAS has not been progressed so far due to scheme prioritisation constraints, however the scheme has been partially constructed downstream as part of the A2 road widening scheme.

5.10.7.3 Preparedness

There has been no specific flood risk management under the preparedness category for Newtownabbey. Regional measures for preparedness are outlined in Chapter 4 of this Plan.

5.10.8 UPDATED PROGRAMME FOR SECOND CYCLE FLOOD RISK MANAGEMENT PLAN

5.10.8.1 Key Messages

Although there are no specific measures set out under Prevention for the Newtownabbey APSFR in the first cycle FRMP, the Antrim and Newtownabbey Borough Council LDP is scheduled to be finalised early in the second cycle FRMP. The LDP, alongside current advice on Planning from DfI Rivers, will support mitigation of flood risk in the council area in relation to both new development and redevelopment proposals from the LDPs adoption and through the second FRMP cycle. This will be taken forwards as a measure for the second cycle FRMP for DfI Rivers to work with the council to update the flood risk policy within the new LDP.

Measures from the first cycle FRMP were all FAS, under the Protection category. Only one of these schemes has been completed, and the remaining three FAS will progress through to feasibility in the second cycle.

5.10.8.2 Living With Water Programme (LWWP)

The LWWP area covers the Greater Belfast Area and will promote an integrated approach to drainage and wastewater management across the catchment through the production of a Strategic Drainage Infrastructure Plan (SDIP). The aims of the SDIP are to help protect people and properties at risk from flooding, enhance the natural environment and help grow the local economy. The SDIP will include schemes and concepts to manage water in an integrated way across the catchment. These will include;

- Policy and Legislative changes;
- Improved WwTW;
- Sewerage network alterations;
- Upper Catchment management work including Natural Flood Management;
- Online and offline attenuation of watercourses using blue/green infrastructure, SuDS;
- Integrated concepts to improve public green space whilst incorporating blue/green infrastructure.

These are set out in the draft plan, Living With Water in Belfast, which was published for consultation in November 2020.

5.10.8.3 Enhanced Drainage Area Plan

NI Water is currently taking forward modelling in the form DAPs across NI for drainage areas with populations typically above 2000. The traditional approach is for all combined and foul sewers to be modelled. For the period April 2021 – March 2027 NI Water through the LWWP will be conducting Enhanced DAPs in each of the APSFR that fall within the scope of the Belfast SDIP. These Enhanced DAPs extend modelling to include the NI Water storm sewers. Through the LWWP, NI Water is also taking forward Integrated Drainage and Catchment Modelling within the Newtownabbey APSFR that will look at the interaction between watercourses and NI Water's sewerage and storm networks.

Table 5.10-4 below sets out the measures and timescales for the Newtownabbey APSFR in the second cycle FRMP.

Table 5.10-4: Proposed measures for Flood Risk Management Plan cycle 2021-2027				
Category	**Measure summary**	**Lead authority**	**Specific measure**	**Timescale**
PREVENTION	Enhanced Drainage Area Plan	NI Water	By 31st March 2027, NI Water will produce an Enhanced DAP for Newtownabbey that sets out actions to mitigate integrated flooding issues.	2027
	Influence local planning policy for development and flood risk	DfI Rivers	By 2024, DfI Rivers will work with the Borough of Antrim and Newtownabbey Council to update flood risk policy in the Local Development Plan	2024
	Living With Water Programme	DfI	By 2021, DfI will develop 'Living With Water in Belfast', an integrated Plan for Drainage and Wastewater Management in Greater Belfast. This Strategic Drainage Infrastructure Plan will set out an integrated approach to drainage and wastewater management.	2021
PROTECTION	Flood alleviation works (will form part of LWWP)	DfI Rivers	By 2026, DfI Rivers will undertake further feasibility work with regards to a flood alleviation scheme for the Three Mile Water. Should this identify a viable scheme this will be followed by detailed design and construction.	2026
	Flood alleviation works (will form part of LWWP)	DfI Rivers	By 2026, DfI Rivers will undertake further feasibility work with regards to a flood alleviation scheme for the Jointure Bay Steam. Should this identify a viable scheme this will be followed by detailed design and construction.	2026
	Flood alleviation works (will form part of LWWP)	DfI Rivers	By 2026, DfI Rivers will undertake further feasibility work with regards to a flood alleviation scheme for the Greenisland Stream. Should this identify a viable scheme this will be followed by detailed design and construction.	2026

5.11

CARRICKFERGUS

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5.11.1 SUMMARY

5.11.1.1 Flood risk area overview

Carrickfergus is in the North Eastern RBD and while it is a coastal town, the main risk of flooding arises from surface water and fluvial sources. The town has a population of 27,998 according to the 2011 census, and is situated adjacent to the north shore of Belfast Lough and just to the north-east of Newtownabbey APSFR. The most recent flooding occurred in early 2020 when several storms across eastern NI battered the coastline, causing wave overtopping and consequently flooding to both properties and roads. Prior to this, the most significant flooding in Carrickfergus occurred in 2002, emanating from the lower Sullatober Water, a significantly urbanised watercourse, flowing through the central area of the town.

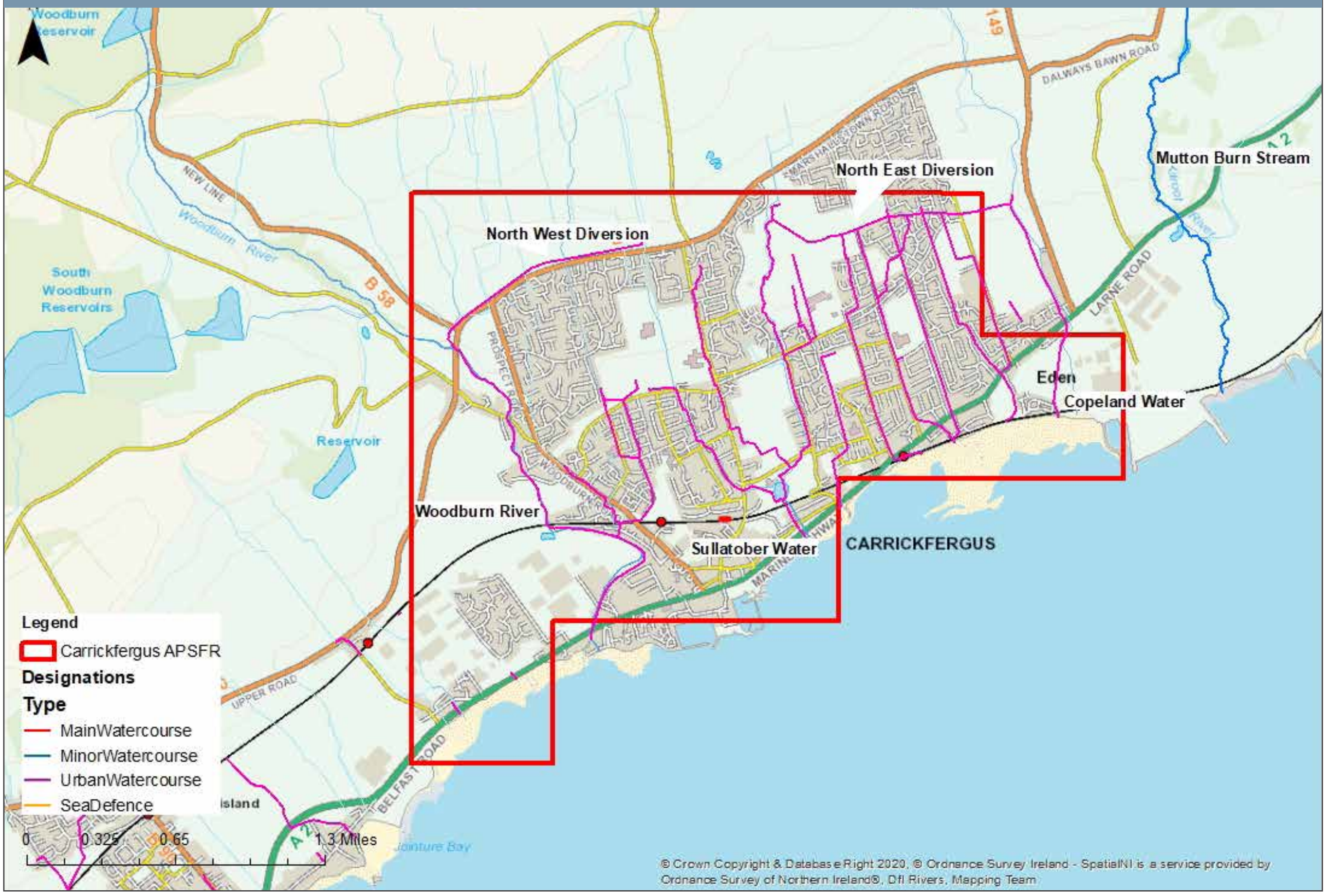
Figure 5.11-1 below shows the location and boundary of the Carrickfergus APSFR. The Carrickfergus APSFR is situated in the Belfast Lough and Tidal Lagan Local Flood Management Area, and is adjacent to the Sixmilewater and Larne Local Flood Management Area.

5.11.1.2 Northern Ireland Flood Risk Assessment (NIFRA) 2018

According to the NIFRA 2018, the majority of the risk is from fluvial and surface water flooding. However, there is an additional risk to infrastructure along the coast where storms and adverse weather conditions can breach or overtop the sea walls.

The APSFR boundary has not significantly changed since Carrickfergus was identified as a Significant Flood Risk Area in the PFRA 2011, although it now extends to include the upper reaches of the Sullatober Water and Woodburn River urbanised watercourses.

Figure 5.11-1: Location and boundary of Carrickfergus APSFR and key watercourses



5.11.2 HISTORY

5.11.2.1 Summary of flooding history

Recent records of localised flooding in Carrickfergus date back to the 1980s, however, two major flood alleviation schemes known as the North West Diversion and North East Diversion reduced the number and frequency of events being reported since their completion in the mid-1990s. Further information on the diversion schemes is included in Sections 5.11.3.1 and 5.11.5.3 below.

More recently, flooding occurred in September 1999 and June 2002 when at least 20 residential properties and one commercial property flooded within the town. Many of these properties were in the Joymount area, in the vicinity of the lower Sullatober Water. The Met Office consider the June 2002 event to have a return period of 0.33 % AEP (1 in 300 years), which exceeded the design standard for the drainage infrastructure and therefore the sewer and watercourse networks reached capacity and were overwhelmed. A joint sewerage upgrading and flood alleviation scheme for the Joymount area was subsequently completed in 2015 (see Section 5.11.6.2).

5.11.2.2 Flooding since 2015

In January 2020, Storm Brendan caused a sea wall in Carrickfergus to partially collapse which led to flooding along the Belfast Road and a closure between the junctions of Sloefield Road and Albert Road. The strong winds from Storm Brendan and high tide also caused 3 m high waves to overtop the sea wall, trapping the sea water inland, overwhelming drainage systems and consequently flooding properties and roads.

In February 2020 adverse weather conditions including severe wind and heavy rainfall from Storm Ciara and Storm Dennis caused further flooding in the Carrickfergus area from wave overtopping and overwhelmed drainage systems. Damage caused to the Carrickfergus Museum, during these events resulted in its closure for several days for assessment of the damage. The A2 between Carrickfergus and Belfast was also flooded at some locations. Repairs to the A2 Belfast Road at Carrickfergus and other affected infrastructure were undertaken over summer 2020.

Storms in May 2020 also caused damage to the sea wall opposite Troopers Lane and nearby footpaths, which have since been repaired.

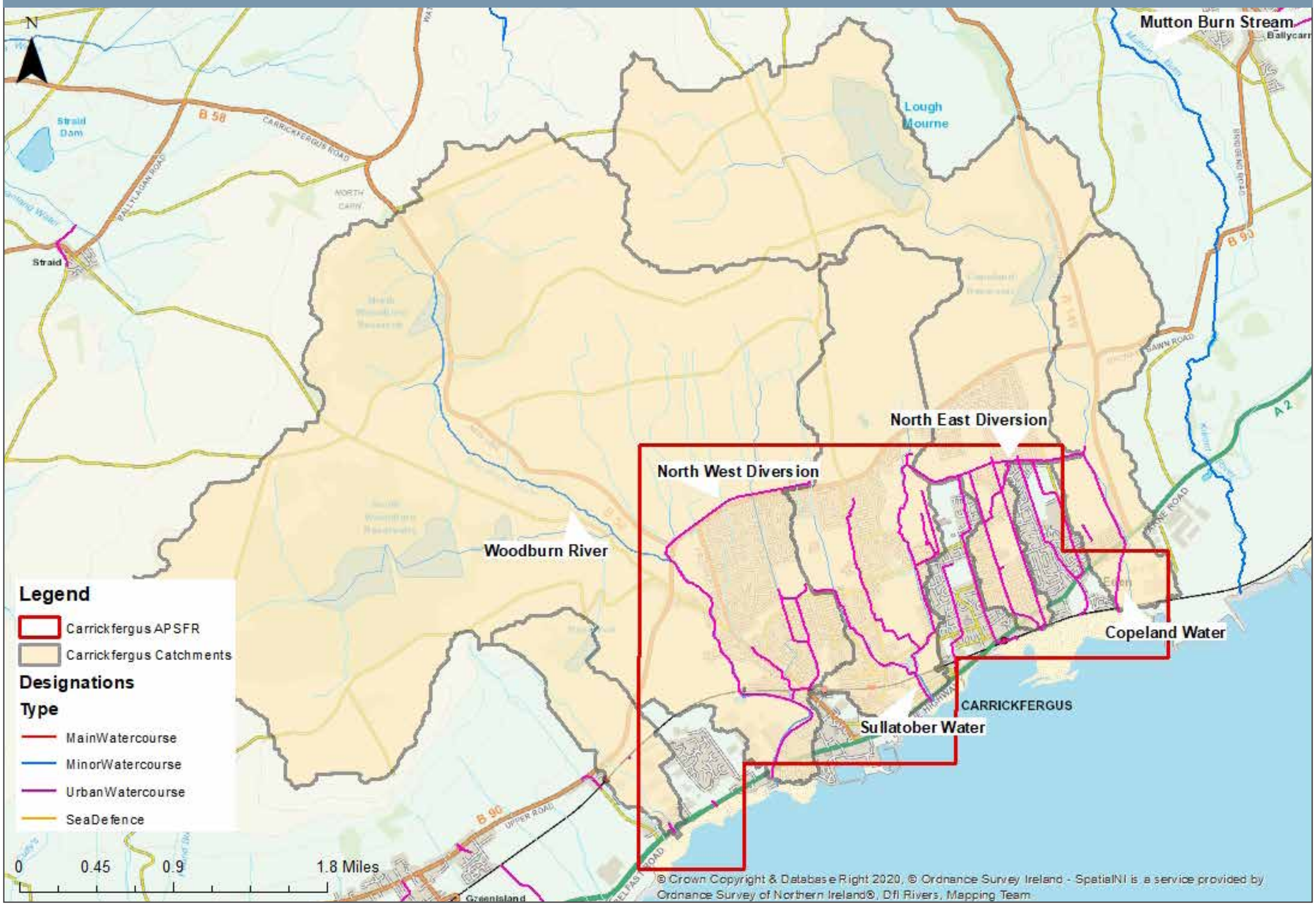
5.11.3 CATCHMENT

5.11.3.1 Catchment characteristics and tributaries

The town of Carrickfergus is situated on the north western shore of Belfast Lough approximately 15 km from Belfast. The area is drained by a series of small, parallel urban watercourses that start in the hills north west of the town and outfall to the coast.

Historically, some of these watercourses provided a water source for mill industries and there is still evidence of this history with mill ponds and channels in the town. Significant modifications have been made to the catchments of these urban watercourses because of the diversionary works undertaken in the 1990s. There are two 'umbrella' watercourse systems, called the North West and North East Diversions. These systems effectively intercept the headwaters of watercourses coming from the high ground and they divert fluvial flows around the town in two directions. The North West Diversion flows westwards and connects to the Woodburn River, while the North East Diversion takes flows eastwards to discharge into the Copeland Water flowing to the east through the neighbouring hamlet of Eden, outfalling at the coast near Kilroot Power Station. Consequently, watercourses which then run through Carrickfergus, are the remaining small catchments which lie below the Diversions and they are considerably urbanised and culverted. These watercourses and their catchments are shown in Figure 5.11-2 below.

Figure 5.11-2: Catchments in relation to the Carrickfergus APSFR



5.11.3.2 Urban drainage and wastewater network

NI Water is responsible for the clean drinking water supply, foul and storm water sewerage networks throughout NI.

The majority of the NI Water drainage network within the APSFR is separated, with approximately 103 km of storm sewer and 93 km of foul sewer, and just 40 km of combined sewer.

The WwTW for the Carrickfergus area is situated to the east between the town and Kilroot Power Station. There are also seven pumping stations within the Carrickfergus APSFR. DfI Roads has pumping equipment at the subways which cross under the A2 road.

There is a second WwTW on the western boundary of the APSFR, at Greenisland, which services the Newtownabbey area.

NI Water has a programme of work to remove properties on the DG5 register that are subject to internal flooding. Within PC15 the regulatory target is to remove 62 properties from the risk register by company action across NI. Milebush Park within Carrickfergus has been considered for solutions during PC15 and where a solution has been determined as economically viable it has been implemented.

5.11.3.3 Environment

The APSFR encompasses the following WFD waterbodies:

Table 5.11-1: Waterbody classifications in and around the Carrickfergus APSFR

Waterbody name	2015 Classification	2018 Classification	2021 Objective	Reason for failure
UKGBNI1NE050501118: Three Mile Water	Moderate	Moderate	Moderate	Benthic Invertebrates Phytobenthos Soluble Reactive Phosphorus
UKGBNI1NE050501120: Woodburn River	Moderate Ecological Potential	Moderate Ecological Potential	Moderate Ecological Potential	Soluble Reactive Phosphorus
UKGBNI1NE050501004: Copeland Water	Moderate Ecological Potential	Moderate Ecological Potential	Moderate Ecological Potential	Unmeasured Classified using proxy river
UKGBNI1NE040405046: Glynn River		Moderate		
UKGBNI1NE050501082: Kilroot River	Good	Good	Good	
UKGBNI6NE090: Belfast Lough Inner	Moderate		Moderate	Alien Species Priority Hazardous Substances
UKGBNI6NE080: Belfast Lough Outer	Good		Good	Alien Species

More information about status and individual objectives can be viewed at the NIEA Information Request Viewer.

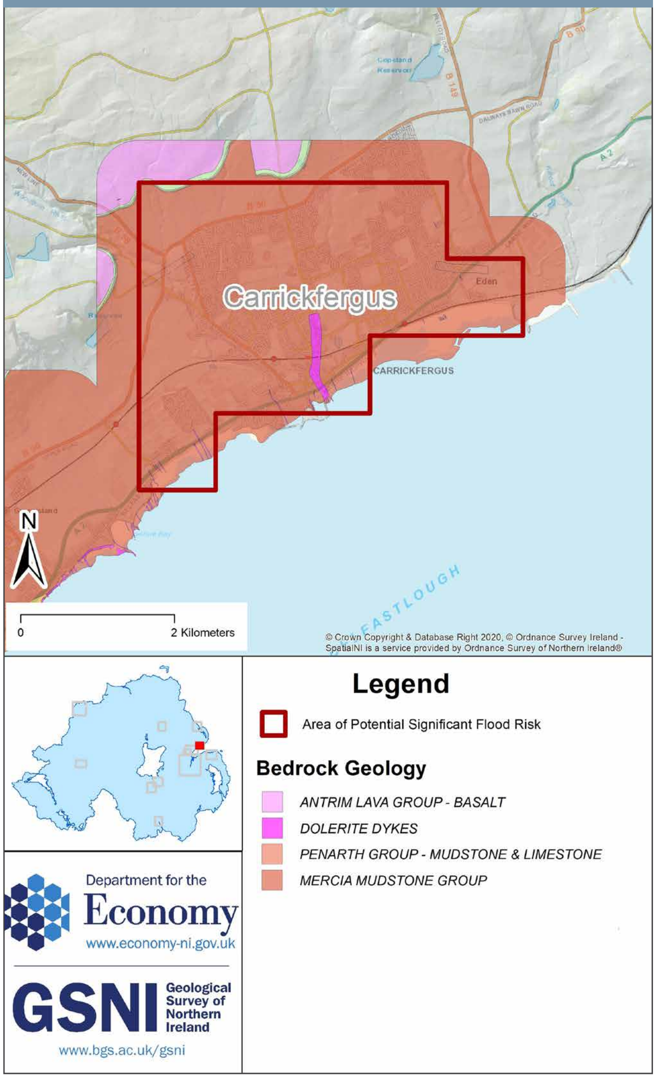
Belfast Lough and its peripheral waterbodies suffer from acute and chronic pollution that is impacting upon their ecological status.

Flood alleviation works such as reducing run off within the catchment, improving the sewage network by separating the foul and surface drainage and the establishment of blue / green infrastructure such as SuDS could all play a positive role in achieving WFD objectives within these waterbodies.

5.11.4 GEOLOGY

5.11.4.1 Bedrock Geology

Figure 5.11-3: Bedrock geology of Carrickfergus



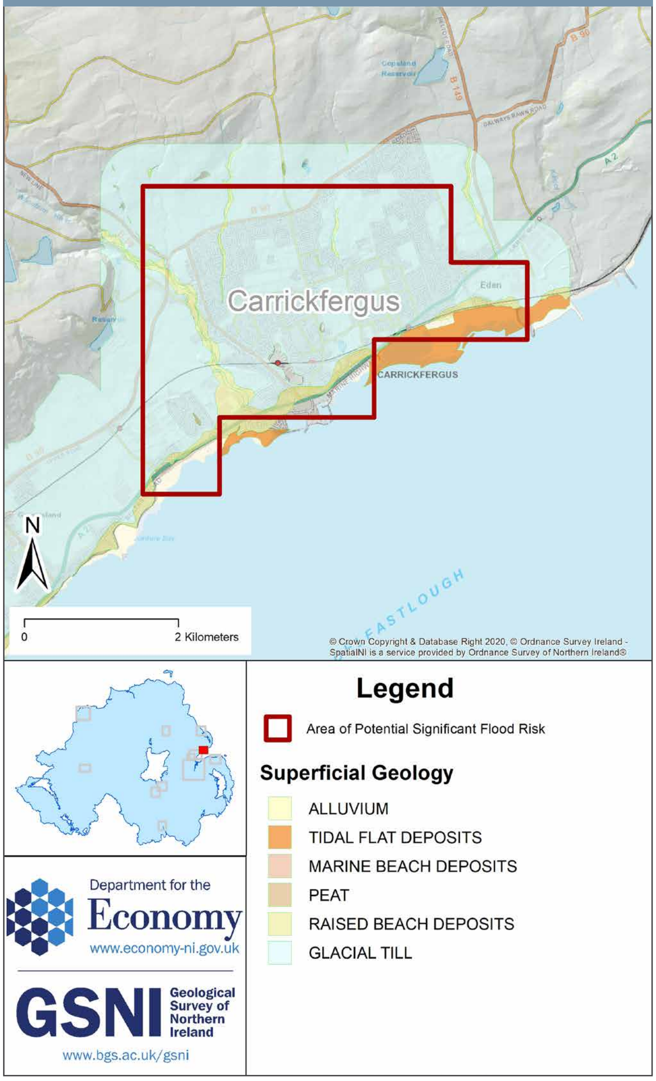
Bedrock beneath the Carrickfergus APSFR is composed mostly of impermeable mudstone of the Mercia Mudstone Group. Cutting the mudstone are numerous dykes composed of dolerite that can host limited groundwater in joints and small cavities. The bedrock in this area offers no alleviation of surface water flooding.

5.11.4.2 Superficial Geology

Glacial till derived from the Mercia Mudstone Group is the main superficial deposit covering bedrock across the area. It is clay dominated and has very low permeability, and as such will do almost nothing to alleviate surface flooding by allowing water to infiltrate into it or the underlying geology.

Raised beach deposits of sand and gravel occur in strips along the coast. Such deposits can readily absorb rain and surface water, and so where uncovered by impermeable man-made surfaces, will have a mitigating effect on surface water flooding. However, because this strip occurs along the coast, on the periphery of the urban area, its effects on surface water are likely to be minimal. There is the possibility that once the storage within them reaches capacity, they could be susceptible to localised small-scale groundwater flooding, especially in topographic hollow areas.

Figure 5.11-4: Superficial geology of Carrickfergus



5.11.5 SOURCES OF FLOODING

5.11.5.1 Risk to buildings and infrastructure by source

According to the NIFRA 2018 the town of Carrickfergus, in terms of the potential adverse consequences of flooding, is ranked 11th of the 45 FRAs. Surface water and fluvial sources generate the greatest risk to Carrickfergus because of the extensive nature of small parallel urban watercourses in the town and its position on the lower slopes of an escarpment. Although the damage figures below do not indicate a risk from tidal flooding, storm events in early 2020 saw waves overtopping sea walls, causing some property and roads to be flooded. Past history and media information indicates this as a potentially recurring issue and Climate Change bringing more storms like Storm Brendan could increase occurrences of wave overtopping.

DfI has undertaken detailed predictive computer mapping and modelling of flooding from rivers and sea, and further strategic mapping for surface water flooding. The results of this mapping can be found on Flood Maps (NI). However, although there is indication of tidal hazard in a confined coastal area, outside the APSFR and to the west of Carrickfergus marina, tidal modelling for this area of Carrickfergus is strategic and not detailed enough to enable tidal damages and detailed tidal risk mapping to be generated for this localised area. Consequently, tidal risk is not fully reflected in the potential damage statistics below which are dominated by surface water and fluvial sources. This localised issue will be considered in any future review of tidal mapping for NI.

Figure 5.11-5 shows the predicted annual average damages (AAD) by fluvial and surface water flood sources. Predicted surface water AAD were just over £1.5 million whereas the fluvial flooding damages reached approximately £262,000, although it should be noted that the surface water modelling does pick up the fluvial floodplains of urban watercourses.

Figure 5.11-5: Annual Average Damages (£m) by flood source

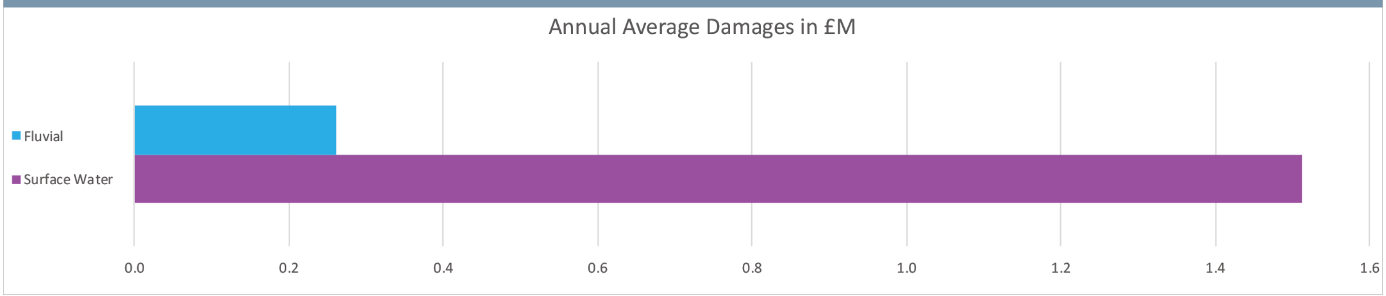
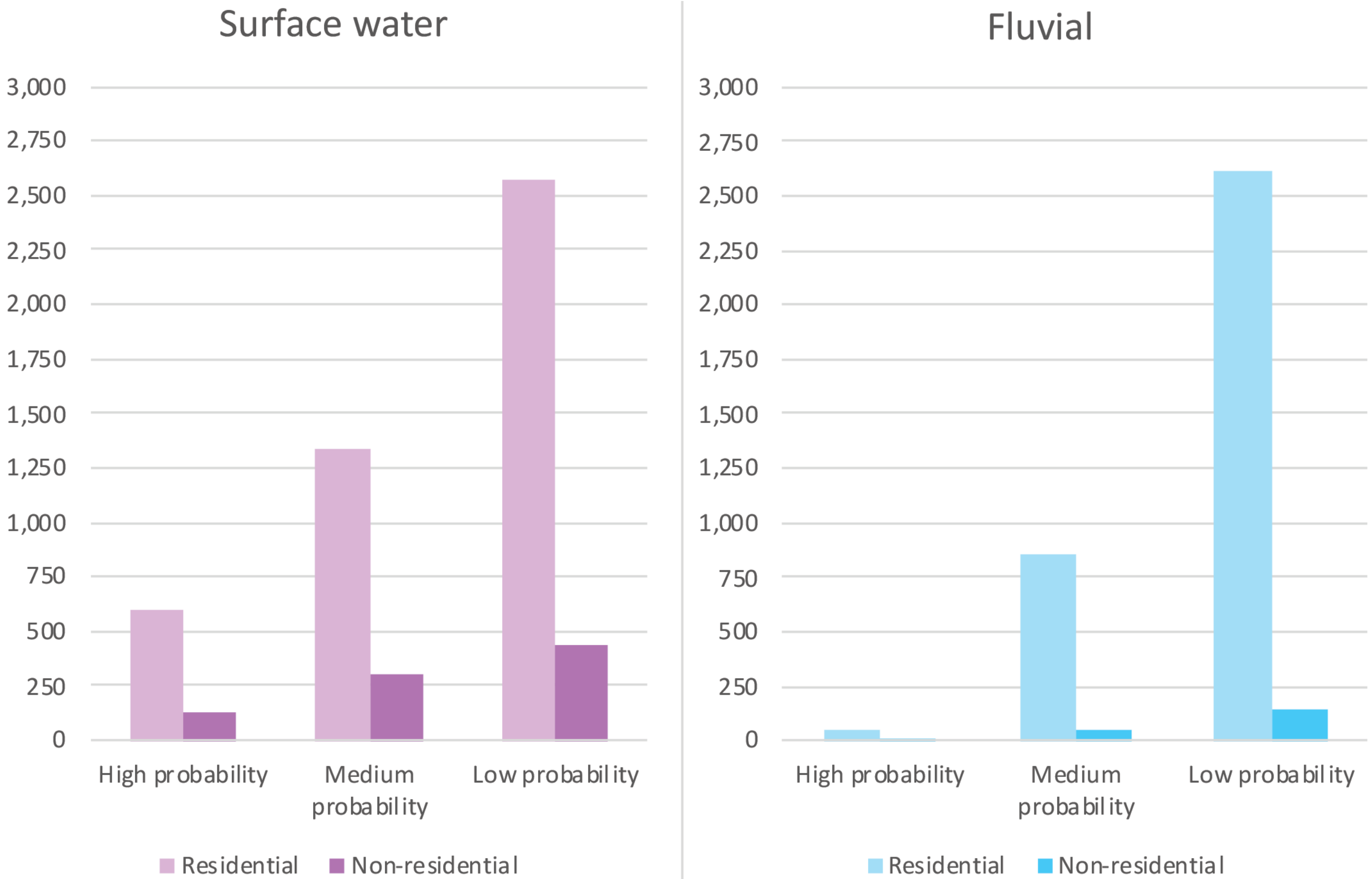


Figure 5.11-6 below shows a similar trend to Figure 5.11-5 in that surface water is predicted to affect a higher number of buildings compared to fluvial sources. Table 5.11-2 shows the return periods which have been assessed as high, medium and low probability events for surface water and fluvial flooding.

Table 5.11-2: Return periods for high, medium and low probability

Probability	Surface water	Fluvial
High	3.33 % AEP (1 in 30 year)	10 % AEP (1 in 10 year)
Medium	0.5 % AEP (1 in 200 year)	1 % AEP (1 in 100 year)
Low	0.1 % AEP (1 in 1000 year)	0.1 % AEP (1 in 1000 year)

Figure 5.11-6: Number of buildings located within the modelled flood extent

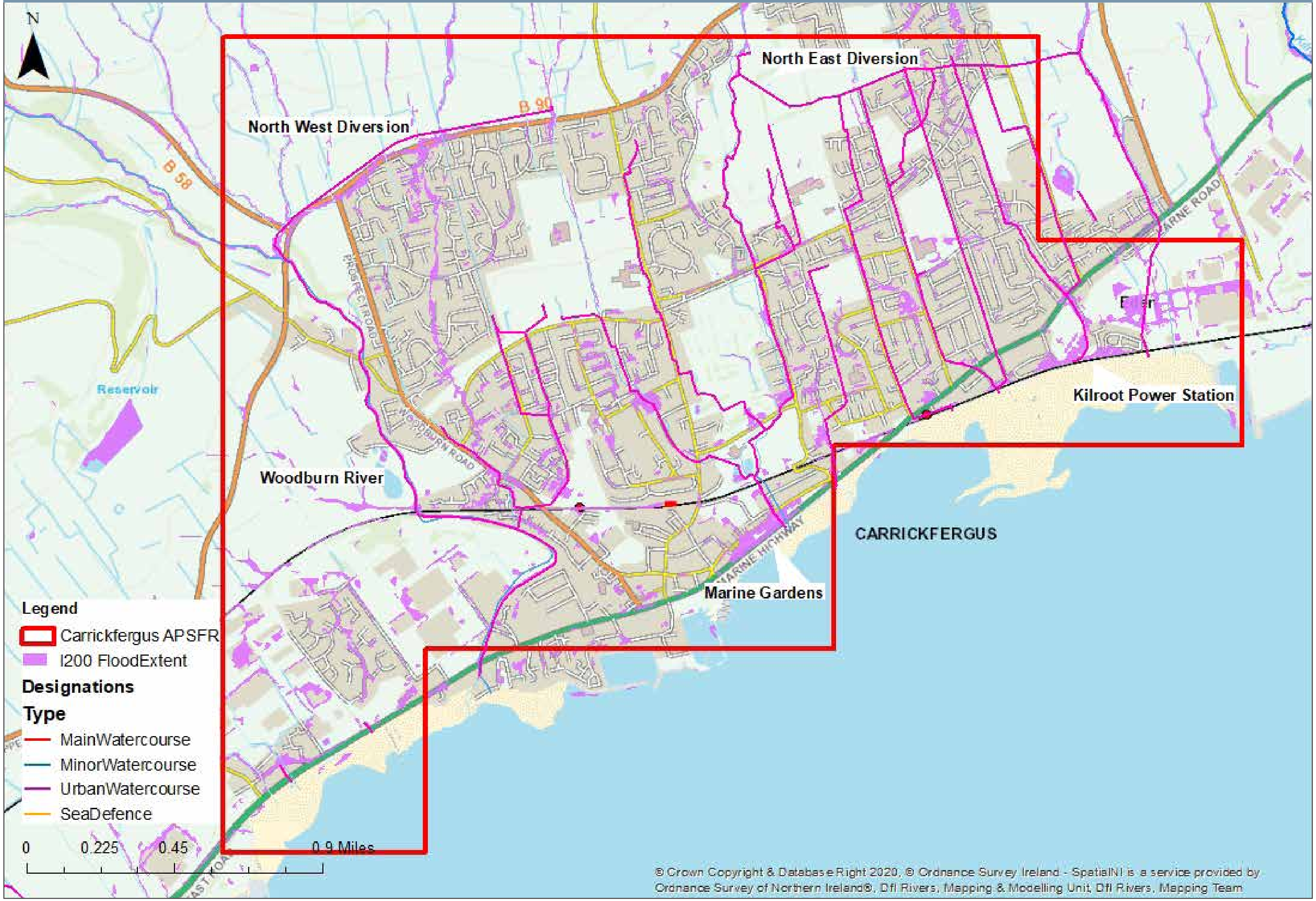


5.11.5.2 Surface water (Pluvial)

Surface water flood risk across the APSFR is shown in Figure 5.11-7 below. The flow routes are clear and, in comparison to the fluvial flood maps, seem to follow the urban watercourses suggesting that surface water flooding occurs when the urban watercourses and drainage systems are overwhelmed. It is important to note that the surface water modelling does pick up floodplains from these smaller, urbanised watercourses which are a high source of risk. The surface water flood risk shows a distribution across the APSFR, with significant areas of risk highlighted at the Kilroot Power Station to the eastern extent of the APSFR and the Marine Gardens area to the east of the castle. Whilst these are not residential areas, they are key to infrastructure and the local economy.

Infrastructure at risk from surface water flood events up to 0.1 % AEP (1 in 1000 year) in the Carrickfergus APSFR are IPPC sites, electricity substations, environmental designated sites and built heritage sites. A detailed breakdown of this is included in Appendix D.

Figure 5.11-7: Overview of surface water hazard mapping for a 0.5 % AEP (1 in 200 year) flood event.



5.11.5.3 Fluvial

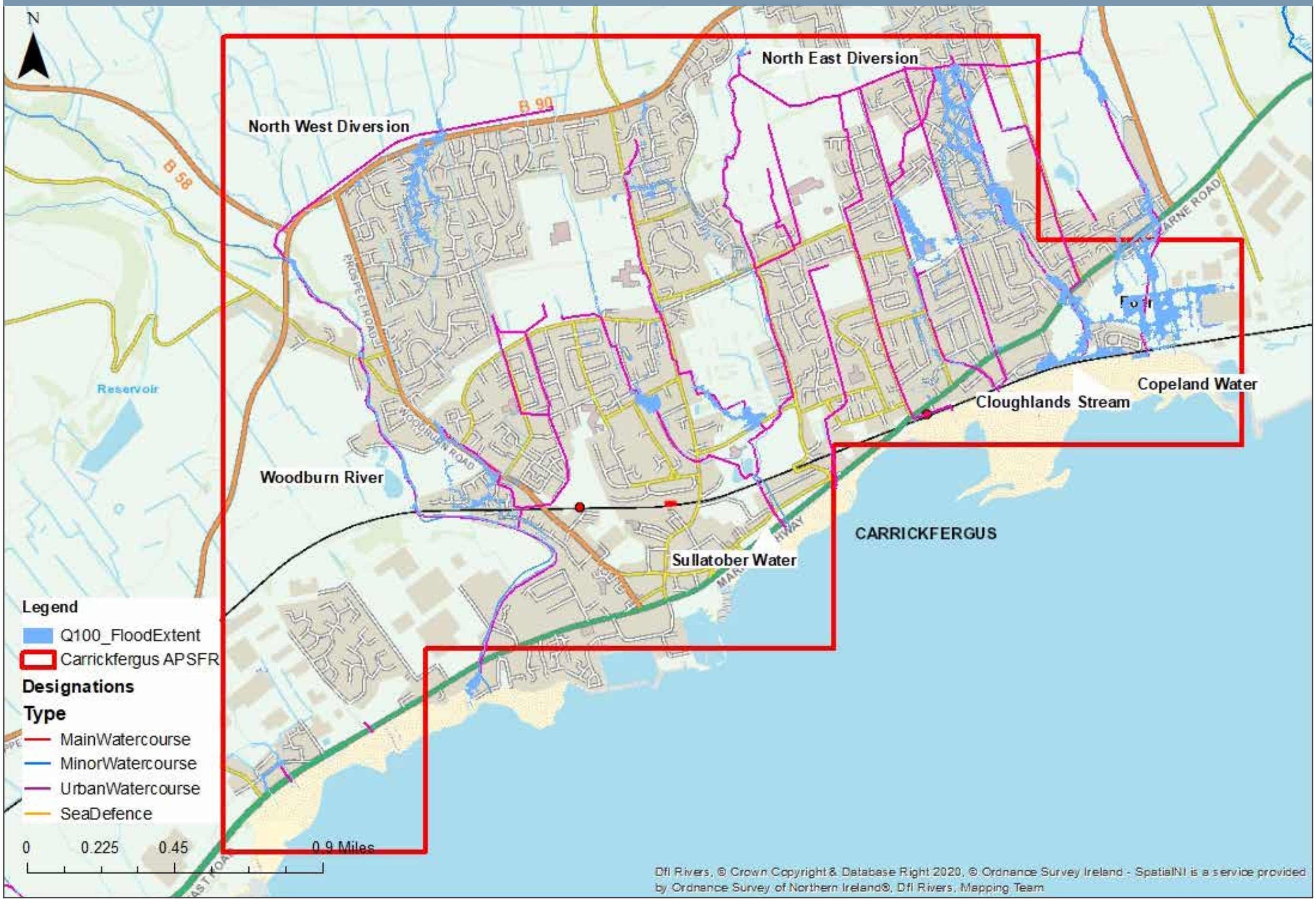
Key areas of fluvial risk as shown on the overview map, Figure 5.11-8 below, are around the floodplains of the urban watercourses. Whilst the fluvial modelling takes into account the North West and North East Diversions which intercept flows and divert them to the Woodburn River and Copeland Water, there is still a residual risk of fluvial flooding in the vicinity of the north-eastern residential areas, Cloughlands Stream and the Kilroot Power Station.

Infrastructure at risk from fluvial flood events up to 0.1 % AEP (1 in 1000 year) in the Carrickfergus APSFR are IPPC sites, electricity substations, environmental designated sites and listed buildings. A detailed breakdown of this is included in Appendix D.

5.11.5.4 Tidal

Although the modelling used for NIFRA 2018 did not indicate any significant tidal flood damages for Carrickfergus, there is historic evidence of localised tidal flooding at the A2 Marine Highway and of coastal property to the west of Carrickfergus marina, but outside the APSFR. A small number of residential properties and roads have suffered flood damage (e.g. in January 2014 and January 2020), when wave overtopping of the sea walls occurred due to tidal surge and spring tide conditions combining with southerly winds. Tidal hazard mapping at a 0.5 % AEP (1 in 200 year) extent shows this localized area of Carrickfergus to be at risk but as mentioned in 5.11.5.1 above, detailed risk mapping has not been done for this localised area but may be considered in any future review of tidal mapping for NI.

Figure 5.11-8: Overview of fluvial hazard mapping for a 1 % AEP (1 in 100 year) flood event.



5.11.6 CURRENT FLOOD RISK MITIGATION

5.11.6.1 Planning

In addition to national planning policy and advice, DfI Rivers will advise against bringing forward sites or the zoning of any land in preparation for the new Mid and East Antrim Local Development Plan, particularly for built development, that has been identified from the flood maps as being within the 1 % AEP (1 in 100 year) fluvial floodplain, 0.5 % AEP (1 in 200 year) tidal floodplain/reservoir inundation area, or is susceptible to surface water flooding.

5.11.6.2 Flood defences

The North East and North West Diversion flood alleviation schemes, to Copeland Water and Woodburn Stream were completed in the mid-1990s to intercept flows and manage the capacity of the urban watercourses. Around the same time, there was also a series of minor works schemes undertaken on the small urban watercourses following a blanket designation of watercourses in the town for maintenance by DfI Rivers.

Since then, a flood alleviation scheme on the Sullatober Water, designed to protect around 38 properties from floods up to the 1 % AEP (1 in 100 year) event, was completed in 2015. This major project, which cost in excess of £2 million, was completed in three phases between 2011 and 2015 and included NI Water sewerage upgrading as well as river flood alleviation works. Part of the completed scheme is shown in Figure 5.11-9 below.

Between 2011 and 2016 extensive maintenance work was undertaken by Transport NI (now DfI Roads) to prevent landslides and rockfalls and to improve roadway defences along the A2 Antrim Coast Road. In the spring of 2016 following the severe storms and heavy rainfall that winter, a further detailed inspection of the sea defences and slopes was undertaken to identify further work and funding required along this stretch of road. Maintenance of the outfalls at the sea wall puts less pressure on drainage systems and therefore reduces the surface water flood risk.

Figure 5.11-9: Sullatober Water Flood Alleviation Scheme storage pond in Shaftesbury Park

5.11.7 ACTIONS IN THE FIRST CYCLE FLOOD RISK MANAGEMENT PLAN

In the first cycle FRMP, there was one measure set out specifically for the Carrickfergus APSFR. Table 5.11-3 shows a summary of measures within the Carrickfergus APSFR and their progress.

Table 5.11-3: Progress tracking for Flood Risk Management Plan measures 2015-2021

Category	Measure code from First Cycle FRMPs	Measure description	Progress
PROTECTION	UKNI_NE_APSFR_03_01	Carrickfergus & Kilroot Power Station North West/ North East Diversions and associated watercourses - FAS	Included in long term works programme.

5.11.7.1 Prevention

No particular Prevention measures specific to Carrickfergus were set out in the first cycle FRMPs.

As outlined in Chapter 4, DfI Rivers advises on planning applications regarding the risk of flooding. The basis of this advice is to avoid inappropriate development in areas which are at risk of flooding and to ensure that any development does not increase flood risk elsewhere.

5.11.7.1.1 Planning policy

Development planning guidance and policy for Carrickfergus is currently set out in the BMAP, under the Carrickfergus District. This sets out policy for designated floodplain sites and where flood risk assessments are required.

A new LDP for Mid and East Antrim Borough Council for the period up to 2030 is being prepared and the plan strategy is due to be adopted in early 2021, and the Local Policies Plan is due to be adopted in late 2022, during the second FRMP cycle. It will comprise:

- a Plan Strategy to define strategic objectives for future development of the Borough, including strategic policies and a spatial strategy;
- a Local Policies Plan which will include site-specific proposals, designations and zoning to deliver the Strategy.

On adoption, the new LDP will replace the current Plans for the Borough and operational planning policies that were produced by the previous Department of the Environment.

5.11.7.2 Protection

A measure was set out through the first cycle FRMP to reduce flood risk to Carrickfergus and Kilroot Power Station and properties around Meadowhill, Hillview, Lennox, Cloughlands and Higgins housing developments. The study associated with this proposal has been reprogrammed on the DfI Rivers Capital Works Programme to a revised target of 2022-23.

5.11.7.3 Preparedness

There have been no specific flood risk management activities under the preparedness category for Carrickfergus in terms of resilience, engagement and emergency planning.

Regional measures for preparedness are outlined in Chapter 4 of this report.

5.11.8 UPDATED PROGRAMME FOR SECOND CYCLE FLOOD RISK MANAGEMENT PLAN

5.11.8.1 Key Messages

Although no specific measures around the Prevention of flooding were proposed for the Carrickfergus APSFR in the first cycle FRMPs, the Mid and East Antrim Borough Council LDP is scheduled to be finalised early in the second cycle FRMP. The LDP, alongside current advice on Planning from DfI Rivers, will support mitigation of flood risk in the council area in relation to both new development and redevelopment proposals from the LDPs adoption and through the second FRMP cycle. This will be taken forwards as a measure for the second cycle FRMP for DfI Rivers to work with the council to update the flood risk policy within the new LDP.

The measure for Protection for Carrickfergus as set out in the first cycle FRMPs has not yet been started due to reprioritisation of capital schemes, therefore this will be progressed through the second cycle.

5.11.8.2 Living With Water Programme (LWWP)

The LWWP area covers the Greater Belfast Area and will promote an integrated approach to drainage and wastewater management across the catchment through the production of a Strategic Drainage Infrastructure Plan (SDIP). The aims of the SDIP are to help protect people and properties at risk from flooding, enhance the natural environment and help grow the local economy. The SDIP will include schemes and concepts to manage water in an integrated way across the catchment. These will include;

- Policy and Legislative changes;
- Improved WwTW;
- Sewerage network alterations;
- Upper Catchment management work including Natural Flood Management;
- Online and offline attenuation of watercourses using blue/green infrastructure, SuDS;
- Integrated concepts to improve public green space whilst incorporating blue/green infrastructure.

These are set out in the draft plan, Living With Water in Belfast, which was published for consultation in November 2020.

5.11.8.3 Enhanced Drainage Area Plan

NI Water is currently taking forward modelling in the form of DAPs across NI for drainage areas with populations typically above 2000. The traditional approach is for all combined and foul sewers to be modelled. For the period April 2021 – March 2027 NI Water, through the LWWP will be conducting Enhanced DAPs in each of the APSFR that fall within the scope of the Belfast SDIP. These Enhanced DAPs extend modelling to include the NI Water storm sewers. Through the LWWP, NI Water is also taking forward Integrated Drainage and Catchment Modelling within the Carrickfergus APSFR that will look at the interaction between watercourses and NI Water's sewerage and storm networks.

Table 5.11-4 below sets out the measures and timescales for the Carrickfergus APSFR in the second cycle FRMP.

Table 5.11-4: Proposed measures for Flood Risk Management Plan cycle 2021-2027

Category	Measure summary	Lead authority	Specific measure	Timescale
PREVENTION	Enhanced Drainage Area Plan	NI Water	By 31st March 2027, NI Water will produce an Enhanced DAP for Carrickfergus that sets out actions to mitigate integrated flooding issues.	2027
	Influence local planning policy for development and flood risk	DfI Rivers	By 2022, DfI Rivers will work with Mid and East Antrim Borough Council to update flood risk policy in the Local Development Plan	2022
	Living With Water Programme	DfI	By 2021, DfI will develop 'Living With Water in Belfast', an integrated Plan for Drainage and Wastewater Management in Greater Belfast. This Strategic Drainage Infrastructure Plan will set out an integrated approach to drainage and wastewater management.	2021
PROTECTION	Flood alleviation works (will form part of LWWP)	DfI Rivers	By 2025, DfI Rivers will undertake feasibility work with regards to a flood alleviation scheme for the Carrickfergus & Kilroot Power Station, North West and North East Diversions and associated watercourses. Should this identify a viable scheme this will be followed by detailed design and construction.	2025

5.12

BALLYMENA

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5.12.1 SUMMARY

5.12.1.1 Flood risk area overview

Ballymena is an urbanised commercial town in County Antrim, part of the Borough of Mid and East Antrim. The population recorded in the 2011 Census was 29,551. The town is at risk of flooding from both surface water and fluvial sources.

Ballymena has a history of recorded flood events particularly in areas such as Toome Road and Queen Street which were flooded to a depth of 600 mm in 2008.

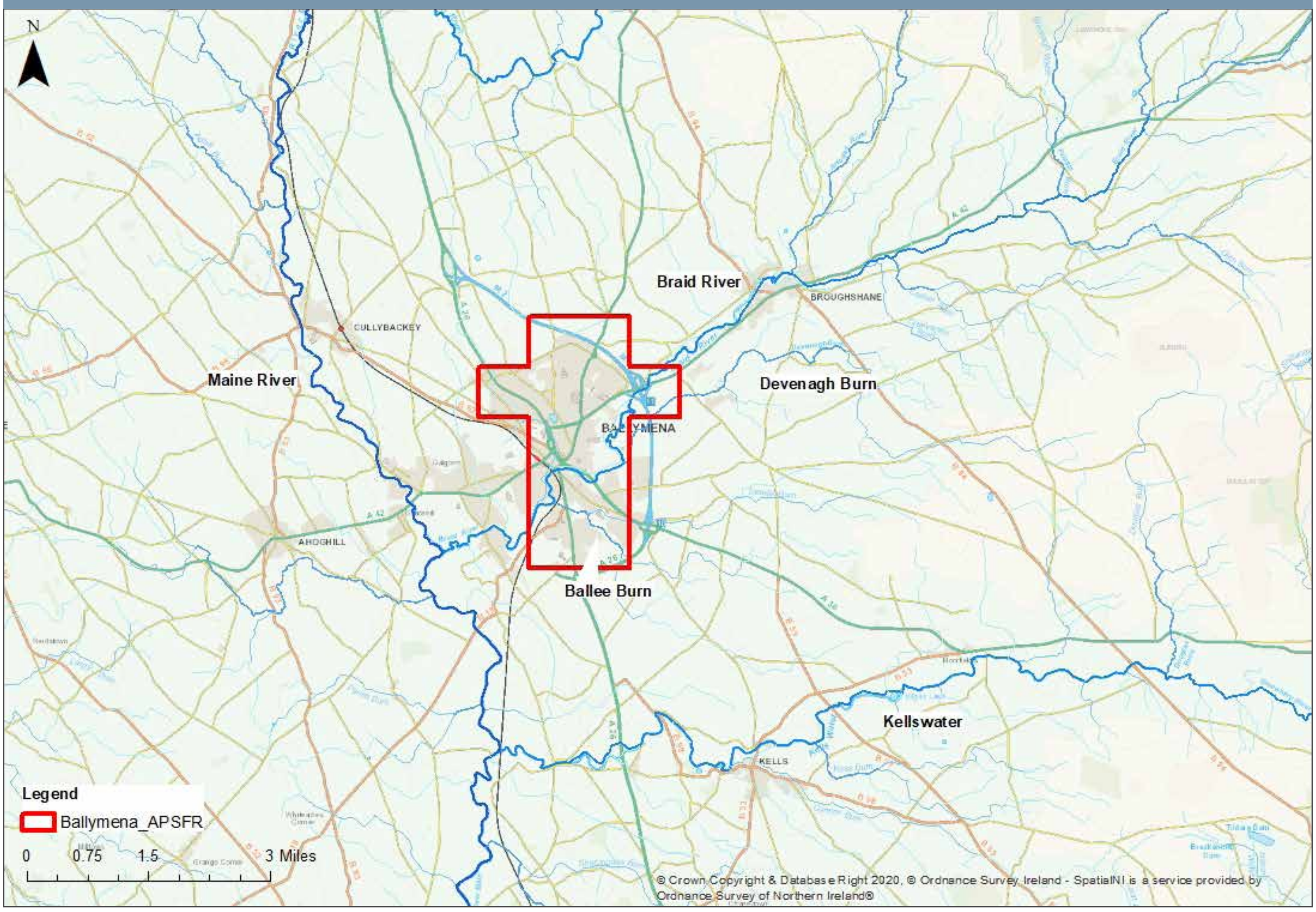
Figure 5.12-1 below shows the location of Ballymena APSFR and its boundary. Ballymena is located within its Local Flood Management Area; the Maine and Braid, named after the main watercourses in the catchment. It is situated within the Neagh Bann IRBD.

5.12.1.2 Northern Ireland Flood Risk Assessment (NIFRA) 2018

The NIFRA 2018 identified that Ballymena is at risk of flooding from fluvial and surface water sources which could adversely impact on people and property in the area.

The area identified as being at risk has increased in size from the PFRA 2011, and the extended boundary now covers Toome Road in the south-west and along the M2 in the north-east of the APSFR.

Figure 5.12-1: Location and boundary of Ballymena APSFR and key watercourses



5.12.2 HISTORY

5.12.2.1 Summary of flooding history

Below is an overview of historical flooding in Ballymena between 1948 and 1987. All the recorded flooding occurred following periods of heavy rainfall which increased river levels and saturated catchments and was predominantly caused by river flows from the Ballee Burn and Braid River, although in August 1952 surface water runoff also affected the town centre.

December 1948 - Severe flooding from the Ballee Burn to Galgorm Street area, Ballymoney Road, Toome Road area.

October 1949 - Factories and 50 properties flooded in Ballymena, Ballee Burn flooded Toome Road area.

August 1952 - Bank breach at Ballymena Road, Toome Road/Queen Street flooded from Ballee Burn, surface water in town centre.

November 1968 - Factory flooding and flooding to gas plant.

October 1987 - Road flooding but no homes affected.

On 16th - 18th August 2008 between 55-65 mm of rain fell widely across many central and eastern parts of NI. Up to 74.8 mm in 12 hours was recorded at Portglenone which is 12 km from Ballymena. This equated to a 1.1 % AEP (1 in 90 year) flood event and caused the Ballee Burn, on the Antrim Road side of Ballymena, to exceed its capacity and overtop its banks as shown in Figure 5.12-2 below. The A26 Larne Road Link at Pennybridge, was closed due to the flooding. Flood water was greater than 600 mm deep inside properties along Queen Street and Toome Road.

Figure 5.12-2: Aerial view of Ballee Burn in flood August 2008 at Harryville playing fields, Queen Street in foreground

In June 2014, heavy rainfall caused some residential properties on the Toome Road to flood for the fifth time in six years. Over 20 properties in Toome Road, Queen Street and Wakehurst Park areas of Ballymena were flooded as a result of overwhelmed local drainage systems (surface water) being unable to cope with high rainfall intensity over a 2-hour period.

5.12.2.2 Flood events since 2015

In July 2018, the first substantial rainfall in the town for a number of weeks caused flooding from surface water runoff in urban areas of Ballymena, including the Cushendall Road and Dan's Road. Figure 5.12-3 below shows flooding at the Cushendall Road. The rainfall caused the drainage system to become overwhelmed, which affected traffic in the area.

In November 2019, heavy rainfall caused flooding to roads throughout the Pennybridge Industrial Estate. This is a hub for local businesses and the flooding caused both social and economic impacts to the area.

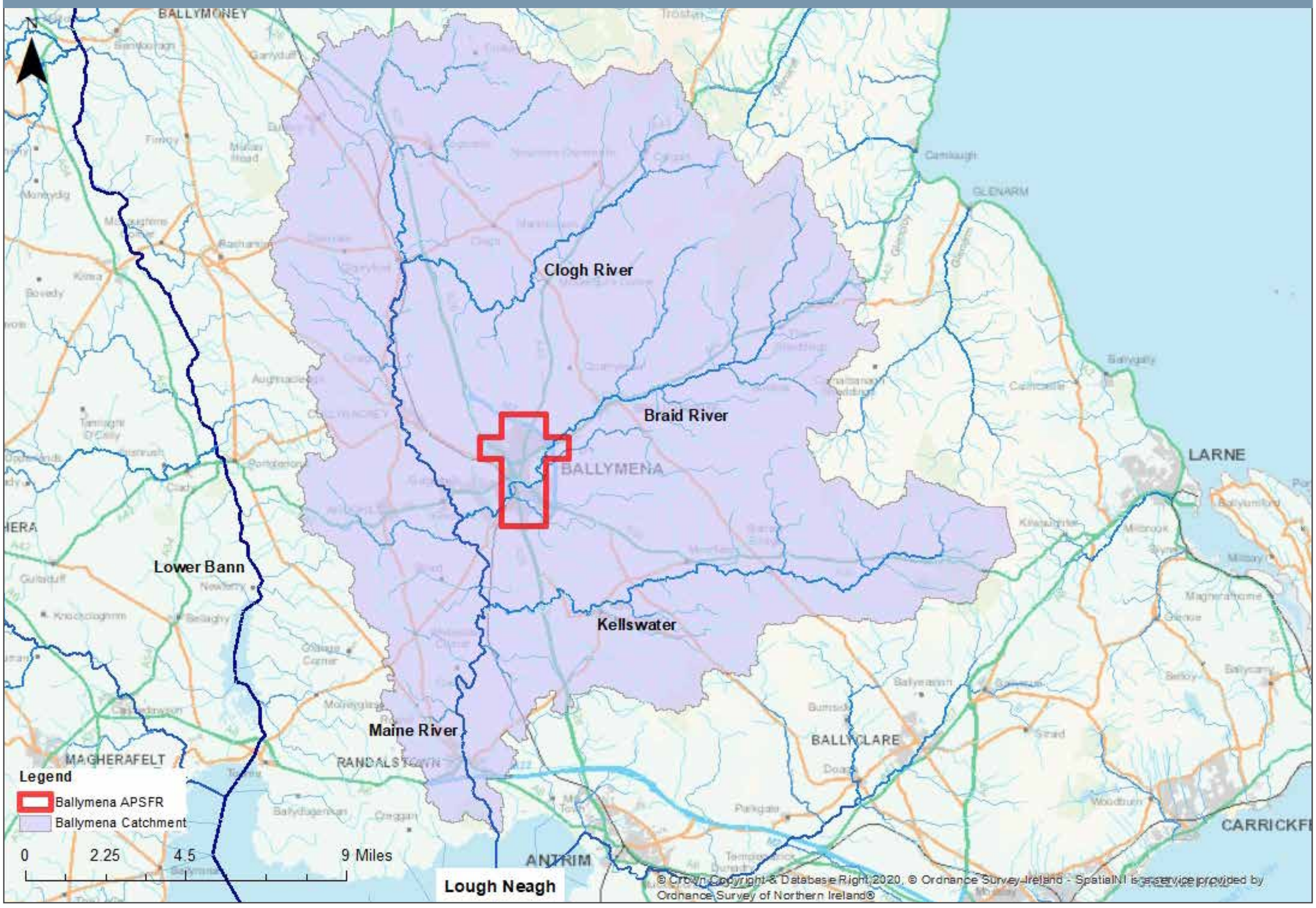
Figure 5.12-3: Surface water flooding at Cushendall Road, Ballymena, July 2018

5.12.3 CATCHMENT

5.12.3.1 Catchment characteristics and tributaries

The two main rivers in the area are the Braid River and the River Maine which are part of the Neagh Bann IRBD. The River Maine which has a mainly rural catchment, with the exception of the urban areas of Ballymena and Randalstown, flows in a southerly direction to the west of Ballymena and outfalls into Lough Neagh at Randalstown Forest. The River Maine historically was the subject of a substantial arterial drainage scheme in the mid-1970s. The Braid River is a tributary of the River Maine, of which the sub-catchment covers the Ballymena area. Schemes have been undertaken on the Braid to alleviate flooding, the latest being around 1994 / 1995 when floodwalls were constructed in the vicinity of Toome Road. The wider network of the River Maine is shown in Figure 5.12-4 below, with Clogh River to the north of Ballymena and Kellswater to the south. The rivers and their tributaries also support a wide range of recreational activities including walking, canoeing and angling.

Figure 5.12-4: Catchments in relation to the Ballymena APSFR



Tributaries of the Braid River in the Ballymena area include the Ballee Burn and Devenagh Burn to the south, and Carniny Burn to the north. Other smaller urban watercourses include the complex Mill Layde network and Broughshane Road Storm Drain to the north. These tributaries are shown on Figure 5.12-5 below.

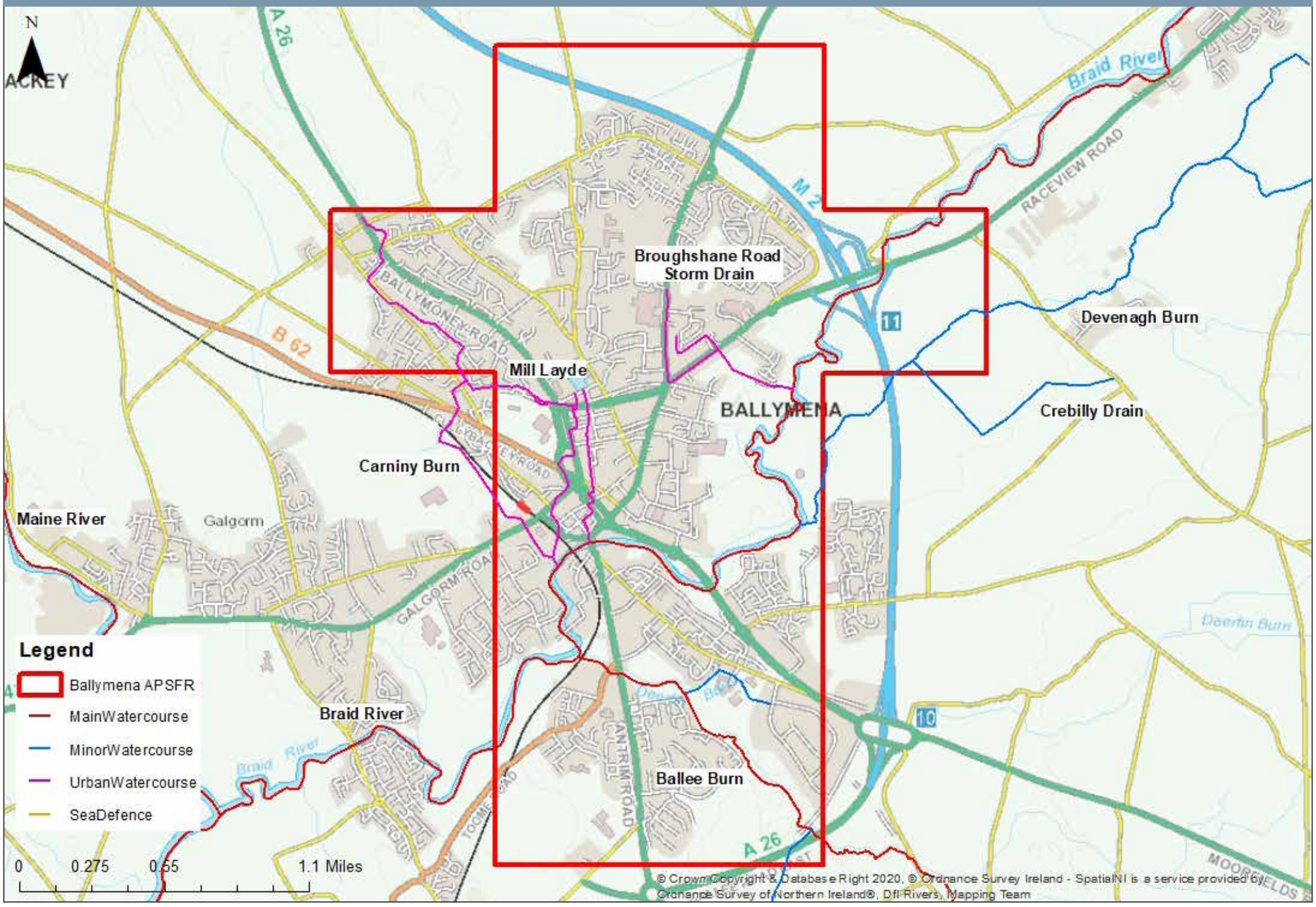
5.12.3.2 Urban drainage and wastewater network

NI Water is responsible for the clean drinking water supply, as well as the foul and storm water sewerage networks throughout NI.

The majority of the NI Water drainage network within the APSFR is separated with approximately 95 km of storm sewers and 120 km of foul sewers. The total length of combined sewer network is approximately 45 km.

Ballymena is served by the nearby Ballymena WwTW situated on the River Maine downstream of the confluence with the Braid River, just outside the APSFR boundary. There are also four NI Water wastewater pumping stations in the ASPFR.

Figure 5.12-5: Tributaries of the Braid River within the Ballymena area



5.12.3.3 Environment

The APSFR encompasses the following WFD waterbodies in the table below:

Table 5.12-1: Waterbody classifications in and around the Ballymena APSFR

Water body name	2015 Classification	2018 Classification	2021 Objective	Reason for Failure (2018)
UKGBNI1NB030302010: Braid River (Rabbit Hill)	Good	Good	Good	N/A
UKGBNI1NB030302017: Deerfin Burn	Moderate	Moderate	Good	Invertebrates Diatoms Soluble Reactive Phosphorus
UKGBNI1NB030302018: Braid River (Ballymena)	Moderate Ecological Potential	Moderate Ecological Potential	Good Ecological Potential	Morphology
UKGBNI1NB030302021: Devenagh Burn	Good	Moderate	Good	Soluble Reactive Phosphorus

NB Morphology can only downgrade an overall classification from High to Good. The status of Braid River (Ballymena) GBNI1NB030302018 is classed in terms of 'Ecological Potential' as it is a Heavily Modified Water Body (HMWB).

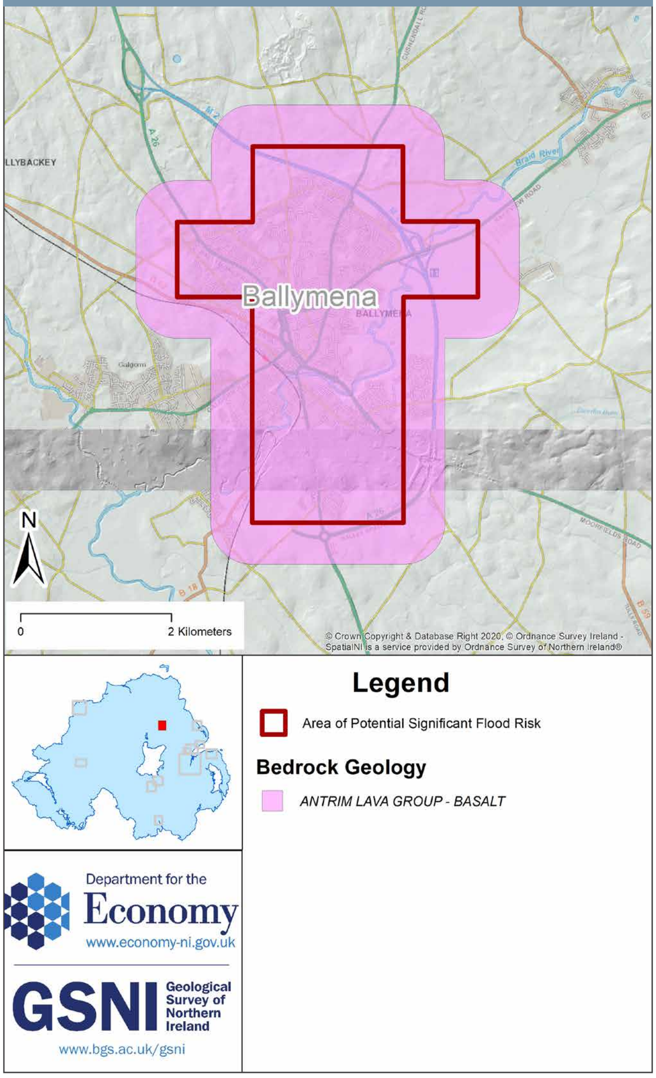
More information about status and individual objectives can be viewed at the NIEA Information Request Viewer.

Waterbodies within the APSFR boundary suffer from acute and chronic pollution that is impacting upon their ecological status. Flood alleviation works such as reducing run off within the catchment, improving the sewerage network by separating the foul and surface drainage and the establishment of blue / green infrastructure such as SuDS could all play a positive role in achieving WFD objectives within these waterbodies.

5.12.4 GEOLOGY

5.12.4.1 Bedrock Geology

Figure 5.12-6: Bedrock geology of Ballymena



Bedrock under the Ballymena APSFR is composed of basalt belonging to the Antrim Lava Group. Basalts can contain significant volumes of groundwater in joints, fractures and small cavities, but in this area, the bedrock is kept separate from surface water by a layer of glacial till.

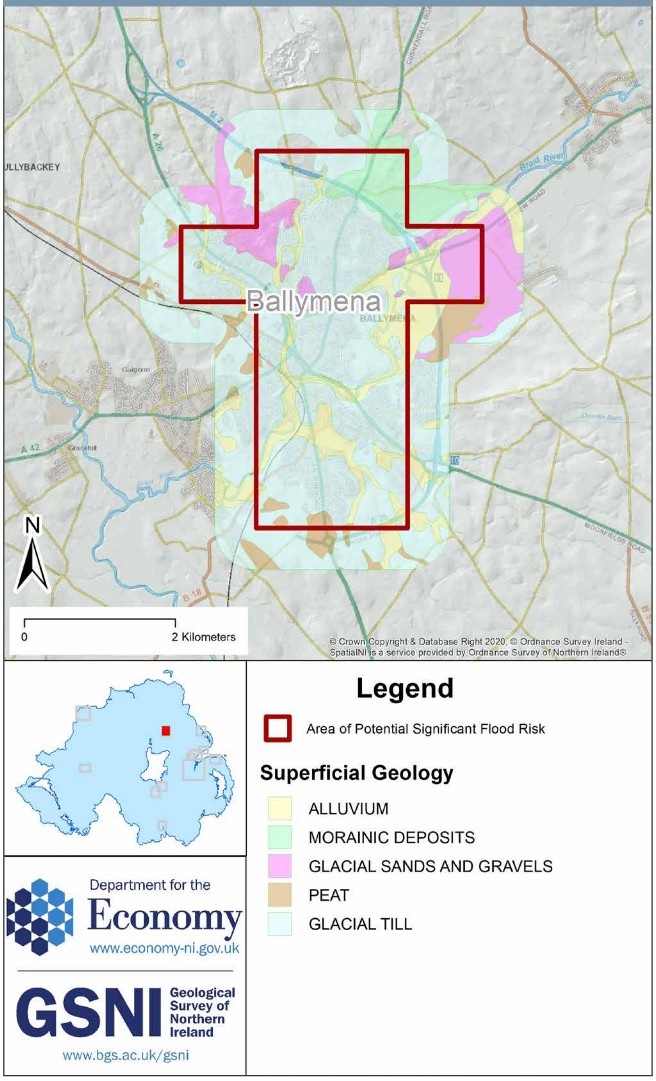
5.12.4.2 Superficial Geology

Till derived from basalt tends to be silt dominated and has very low permeability, and therefore does not alleviate surface flooding by allowing water to infiltrate into it or the underlying geology.

In the north-western and north-eastern parts of the APSFR there are large areas of glacial sand and gravel (Pink) that can host significant volumes of groundwater. They tend to have high intergranular porosity and permeability and can readily absorb surface water, and so where the superficial geology is unaltered, it will have a mitigating effect on surface water flooding. However, once the storage within these deposits approaches capacity, it is possible that they could start to be a source of longer duration groundwater flooding especially in low lying valley floor areas.

When not fully saturated, river alluvium (Yellow) can take in rainwater and help alleviate flooding. However, areas of alluvium tend to be quite thin and low lying, and are the first to flood in response to rising river water levels.

Figure 5.12-7: Superficial geology of Ballymena



5.12.5 SOURCES OF FLOODING

5.12.5.1 Risk to buildings and infrastructure by source

According to the NIFRA 2018, the town of Ballymena in terms of potential adverse consequences of flooding, is ranked 12th of the 45 FRAs. DfI has undertaken detailed predictive computer mapping and modelling of flooding from rivers and sea, and further strategic mapping for surface water flooding. The results of this mapping can be found on Flood Maps (NI). An analysis of the potential consequences from flooding shows the predominant flood risk is from surface water sources. It should be noted, however, that the surface water mapping picks up the floodplains of some of the smaller urban watercourses.

Figure 5.12-8 shows the predicted annual average damages (AAD) by flood source. The graph shows that the highest AAD cost is from surface water sources by a considerable margin. Predicted surface water AAD were just under £1.3 million whereas the fluvial flooding damages reached just over £400,000.

Figure 5.12-8: Annual Average Damages (£m) by flood source

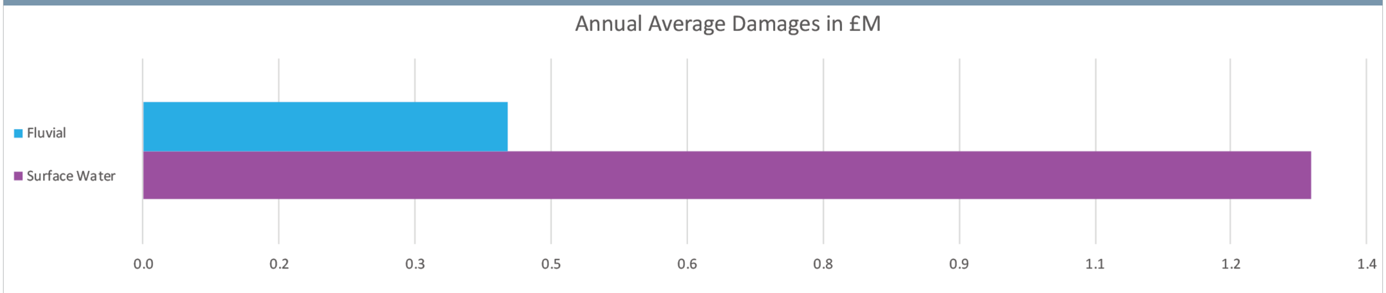
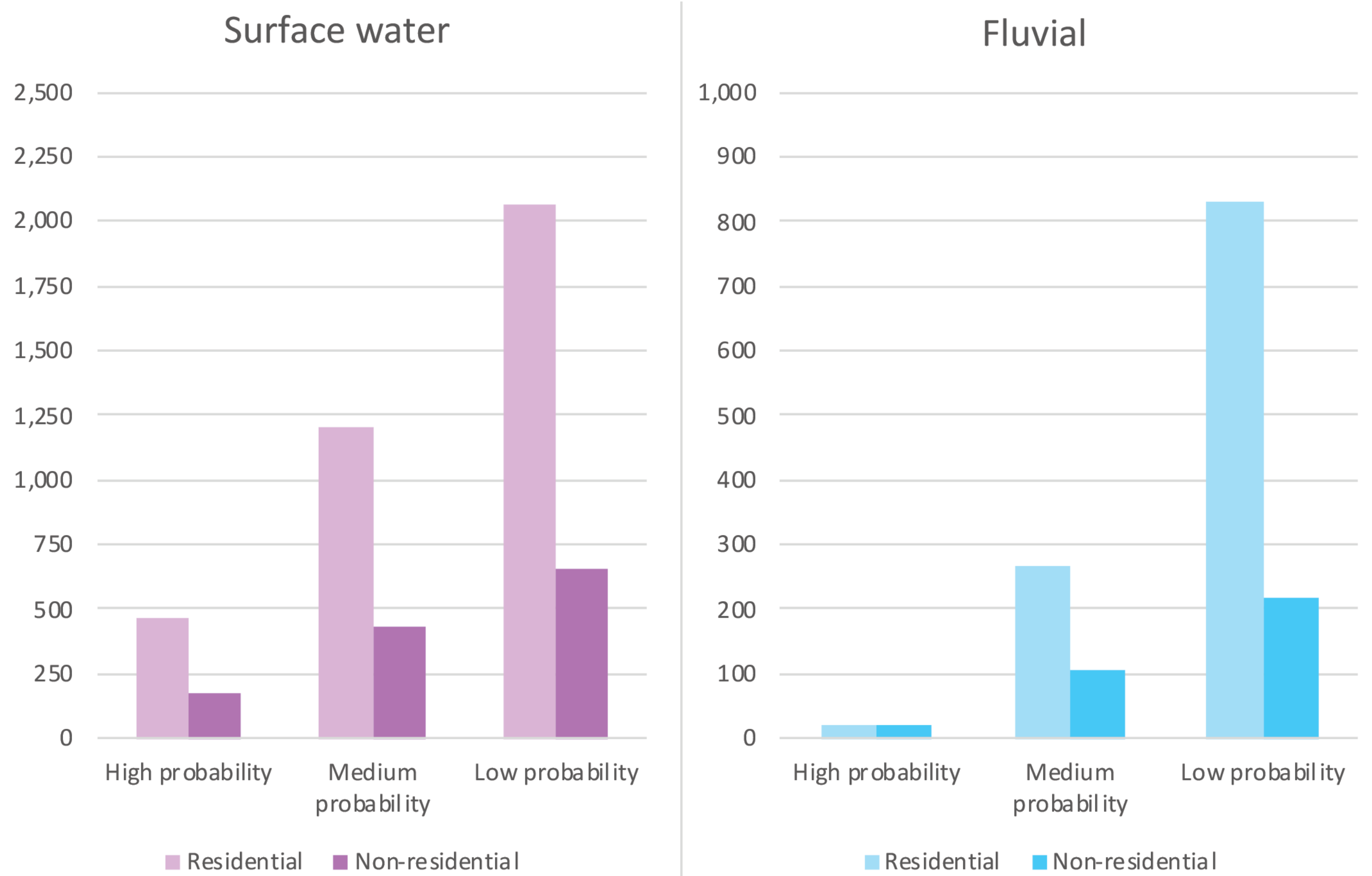


Figure 5.12-9 below shows a similar trend to Figure 5.12-8; surface water mapping shows a predicted higher number of buildings at risk compared to those at fluvial risk for the high, medium and low probability events. Table 5.12-2 shows the return periods which have been assessed as high, medium and low probability events for surface water and fluvial flooding.

Table 5.12-2: Return periods for high, medium and low probability

Probability	Surface water	Fluvial
High	3.33 % AEP (1 in 30 year)	10 % AEP (1 in 10 year)
Medium	0.5 % AEP (1 in 200 year)	1 % AEP (1 in 100 year)
Low	0.1 % AEP (1 in 1000 year)	0.1 % AEP (1 in 1000 year)

Figure 5.12-9: Number of buildings located within the modelled flood extent



Note that the scale for surface water on Figure 5.12-9 above is different to account for significantly higher values than those for fluvial.

5.12.5.2 Surface water (Pluvial)

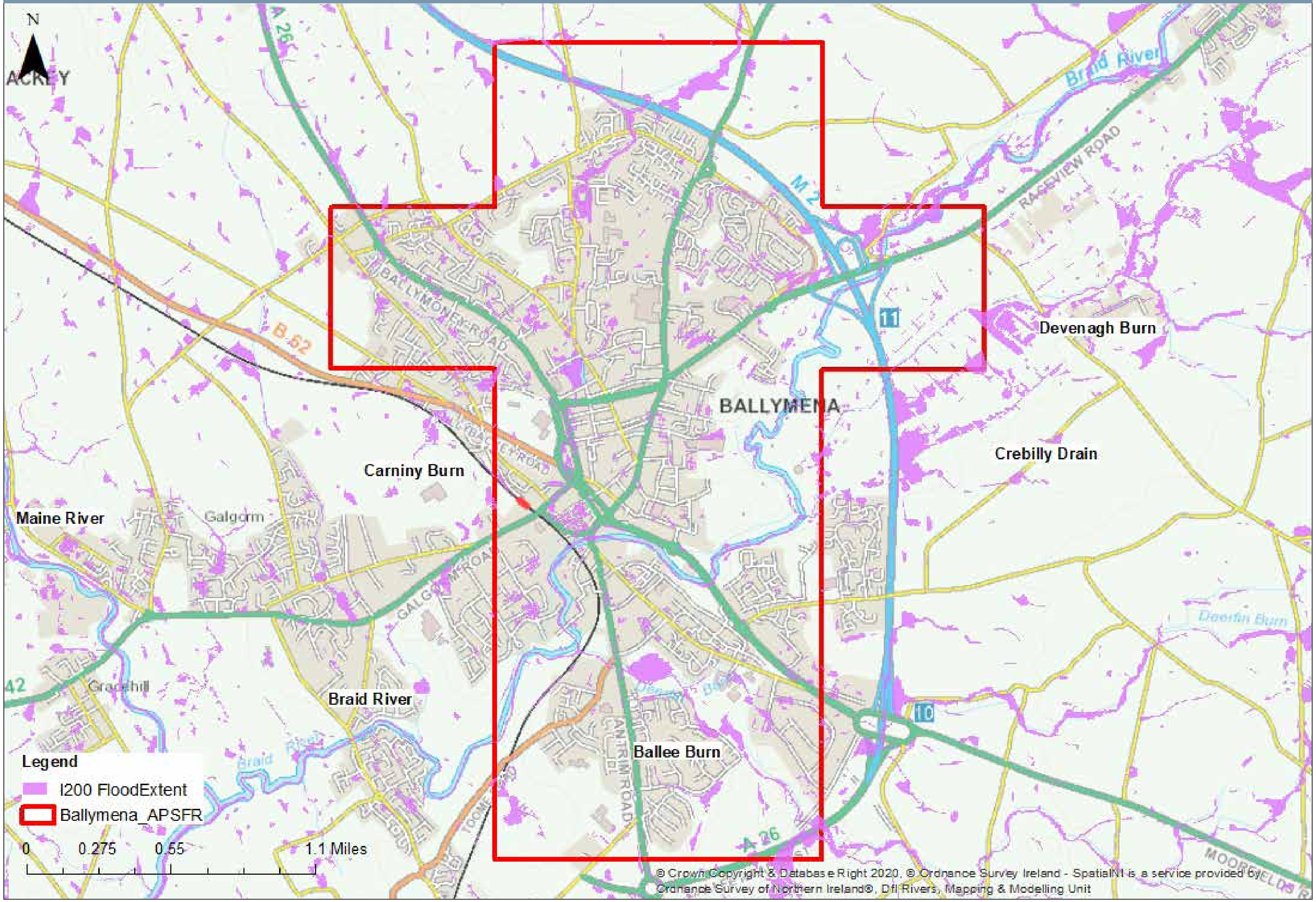
Due to the urbanised nature of the Ballymena APSFR, the town is at risk of surface water flooding. Recorded dates of surface water flooding range from August 1952 to July 2018. Because these events occurred mainly over the summer months and due to intense rainfall, this suggests that the urban areas are prone to flash flooding. Surrounding farmland could also have contributed to run-off during these events because of reduced permeability in hot, dry summer conditions.

Figure 5.12-10 below shows an overview of surface water flooding across the Ballymena APSFR at a 0.5 % AEP (1 in 200 year) flood event. Key areas at risk according to the surface water modelling are surface water flow routes across the residential areas of Grove Road and Frys Road to the north of Ballymena, the town centre and pooling around the playing fields at Harryville to the south of Ballymena adjacent to the Ballee Burn open channel.

Areas affected by surface water flooding historically are the town centre and Cushendall Road which are urbanised areas and key routes in and around the town.

Infrastructure at risk from surface water flood events up to 0.1 % AEP (1 in 1000 year) in the Ballymena APSFR are IPPC sites, a fire station, hospital, police station, school, electricity substations, and built heritage sites. A detailed breakdown of this is included in Appendix D.

Figure 5.12-10: Overview of surface water hazard mapping for a 0.5% AEP (1 in 200 year) flood event.



5.12.5.3 Fluvial

Due to the fluvial network of the Braid River and its tributaries running through the centre of Ballymena, fluvial flood risk is considerable across the Ballymena APSFR, as shown in Figure 5.12-11 below.

Although the main river through the area, the Braid River itself does not pose the majority of risk to the APSFR, the hazard mapping shows that the fluvial flood risk mostly emanates from the tributaries of the Braid River.

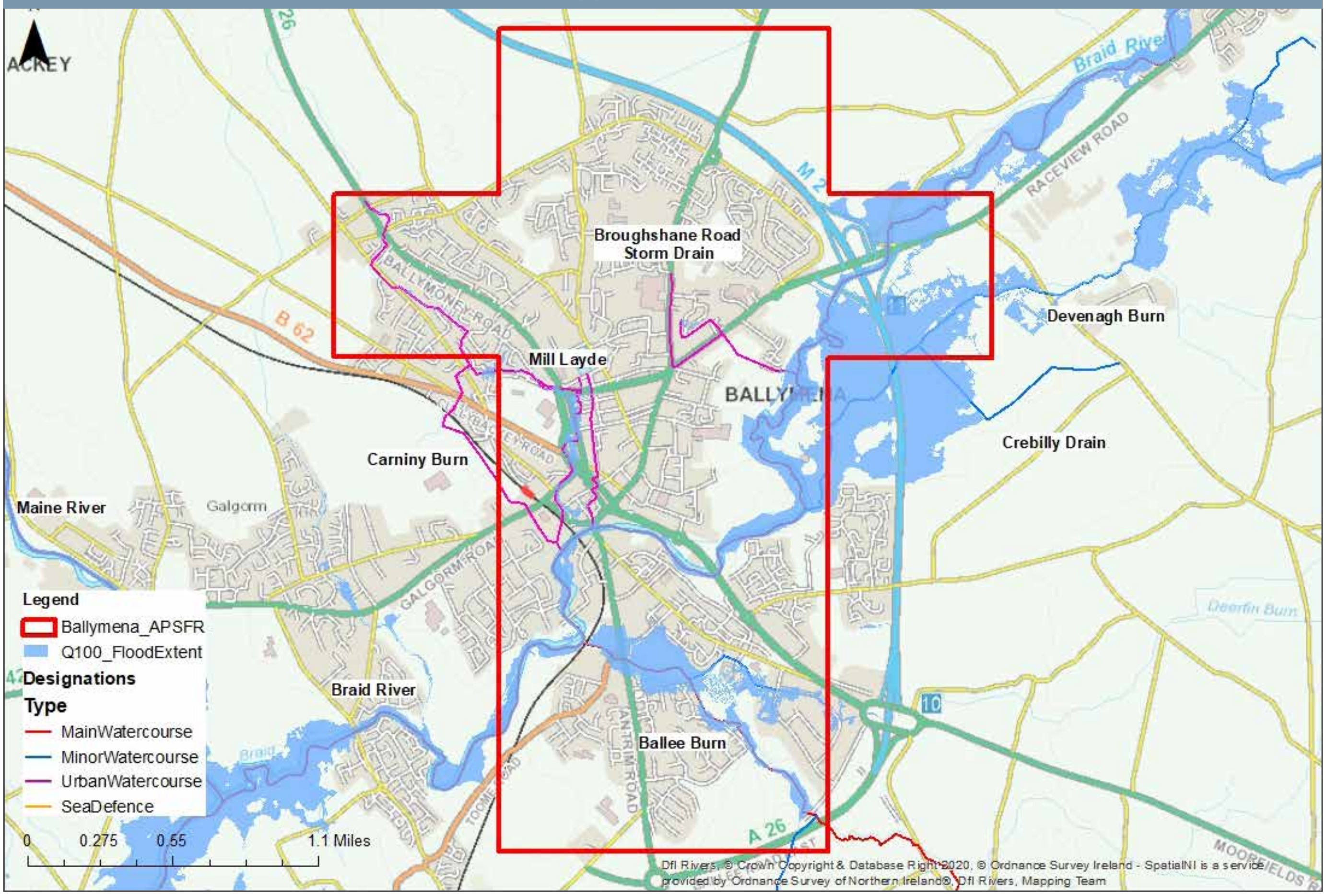
The Mill Layde watercourse is a culverted urban watercourse through the centre of Ballymena with several diversions and branches. Fluvial risk from this watercourse is shown to be from the western branch, where it weaves through a mixture of residential and commercial areas in the centre of the town.

Flooding upstream of the Braid River and from the Devenagh Burn is predominantly of open space and agricultural land, which are areas of established floodplain. The fluvial extent does not affect the M2 due to its slight elevation above the surrounding agricultural land.

Synonymous with historical flood records, there is an area of fluvial flooding from the Ballee Burn to the Toome Road and Queen Street areas. Fluvial flooding from the Ballee Burn watercourse and its tributary further upstream also poses a risk to the Pennybridge Industrial Estate.

Infrastructure at risk from fluvial flood events up to 0.1 % AEP (1 in 1000 year) in the Ballymena APSFR are IPPC sites, GP surgeries, a fire station, a police station, a school, an NI Water sewage pumping station, electricity substations, and built heritage sites. A detailed breakdown of this is included in Appendix D.

Figure 5.12-11: Overview of fluvial hazard mapping for a 1% AEP (1 in 100 year) flood event.



5.12.6 CURRENT FLOOD RISK MITIGATION

5.12.6.1 Planning

In addition to national planning policy and advice, DfI Rivers will advise against bringing forward sites or the zoning of any land in preparation for the new Mid and East Antrim Borough Council Local Development Plan, particularly for built development, that has been identified from the flood maps as being within the 1 % AEP (1 in 100 year) fluvial floodplain, 0.5 % AEP (1 in 200 year) reservoir inundation area, or is susceptible to surface water flooding.

5.12.6.2 Flood defences

The earliest work on the River Braid was completed between 1952 and 1968. A further scheme, to construct new flood walls and length of flood bank to alleviate the flooding problem at Toome Road, was carried out on the Braid in 1994/95.

The River Maine arterial drainage scheme was proposed in 1969 and after Public Inquiry, started in the mid-1970s. The main channelisation occurred upstream from Dunminning (10 km north-west of Ballymena) in April 1984 and the scheme was completed in 1987. It involved channel widening, deepening and straightening over 26 km of river between Dunloy and the confluence with the River Braid. This drainage scheme included the construction of a water level activated barrier at Dunminning, which is designed to raise under certain river conditions to increase upstream storage in the catchment. Channelisation occurred along the River Maine downstream from Dunminning as far as the confluence with the River Braid but no information is available on changes to the Lower Maine. Given the fact that a significant area of overbank storage was withdrawn, and channel conveyance and velocity was increased, a significant impact on flood peaks downstream from the affected reach is to be expected. The impact of upstream channelisation is likely to persist to the mouth of the Maine at Lough Neagh.

A flood storage area is present on the Deerfin Burn which attenuates flood water from the Burn in park land adjacent to the watercourse. The park land has been lowered to provide additional storage capacity. There have been several schemes put in place along the watercourses in the River Maine catchment. These range from river channelisation and realignment with raised defences, to formal storage areas.

5.12.6.3 Northern Ireland Water improvements

NI Water is undertaking a scheme to alleviate historical internal and external ‘out of sewer’ flooding issues for the Toome Road/Wakehurst Road area. The scheme costing £2 million, commenced in September 2019 and is currently nearing completion. The scheme is to increase the drainage capacity in this area, which will substantially reduce the risk of flooding.

The project involves the upgrade of the existing sewers, as well as the installation of new sewers on Wakehurst Park, and Wakehurst Road to increase capacity. A large storage tank has also been constructed on land adjacent to the council playing fields at Wakehurst Road.

In addition, NI Water has carried out works to alleviate flooding at Old Antrim Road; the scheme was completed in August 2017.

5.12.7 ACTIONS IN THE FIRST CYCLE FLOOD RISK MANAGEMENT PLAN

In the first cycle FRMP, there were four measures set out specifically for the Ballymena APSFR. Table 5.12-3 shows a summary of measures within the Ballymena APSFR and their progress.

Table 5.12-3: Progress tracking for Flood Risk Management Plan objectives 2015-2021

Category	Measure code from First Cycle FRMPs	Measure description	Progress
PROTECTION	UKNI_NB_APSFR_03_01	Ballee Burn Flood Alleviation Scheme	Included in long term works programme.
	UKNI_NB_APSFR_03_02	Lower Mill Layde Flood Alleviation Scheme	Included in long term works programme.
	UKNI_NB_APSFR_03_03	Braid River Flood Alleviation Scheme	Included in long term works programme.
PREPAREDNESS	UKNI_NB_APSFR_03_04	Ballykeel - Establishment of local community resilience groups	Ongoing.

5.12.7.1 Prevention

No particular Prevention measures specific to Ballymena were set out in the first cycle FRMPs.

As outlined in Chapter 4, DfI Rivers advises on planning applications regarding the risk of flooding. The basis of this advice is to avoid inappropriate development in areas which are at risk of flooding and to ensure that any development does not increase flood risk elsewhere.

5.12.7.1.1 Planning policy

A new LDP for the Mid and East Antrim Borough Council for the period up to 2030 is being prepared with the adoption of the Plan Strategy in early 2021 and Local Policies Plan in late 2022, during the second FRMP cycle. It will comprise:

- a Plan Strategy to define strategic objectives for future development of the District including strategic policies and a spatial strategy;
- a Local Policies Plan which will include site-specific proposals, designations and zoning to deliver the Strategy.

On adoption, the new LDP will replace the current Plans for Ballymena and operational planning policies that were produced by the previous Department of the Environment.

5.12.7.2 Protection

Three FAS were proposed for Ballymena in the first cycle FRMP; for the Ballee Burn, Lower Mill Layde and Braid River. These have been grouped as the Ballymena Significant Flood Risk Area Feasibility Study on the DfI Rivers Prioritised Capital Works Programme and has not yet been started due to prioritisation. They are included in the DfI Rivers long term works programme.

5.12.7.3 Preparedness

The measure to establish a community resilience group in the area of Ballykeel has been partially achieved; two local areas were identified, and one has been established. The Leighinmohr Avenue/ Phoenix Fields area group was established in 2015/16 and is ongoing, and the Ballymoney Road area group is yet to be established and is programmed for 2020/21.

Other community engagement under the RCRG programme in the vicinity of Ballymena has been undertaken in the Toome Road area, and in the villages of Ahoghill, and Broughshane.

5.12.8 UPDATED PROGRAMME FOR SECOND CYCLE FLOOD RISK MANAGEMENT PLAN

5.12.8.1 Key Messages

Although no specific measures around Prevention of flooding were proposed for the Ballymena APSFR in the first cycle FRMPs, the Mid and East Antrim Borough Council LDP is scheduled to be finalised early in the second cycle FRMP. The LDP, alongside current advice on Planning from DfI Rivers, will support mitigation of flood risk in the council area in relation to both new development and redevelopment proposals from the LDPs adoption and through the second FRMP cycle. This will be taken forwards as a measure for the second cycle FRMP for DfI Rivers to work with the council to update the flood risk policy within the new LDP.

The measures set out through the first cycle FRMP for Ballymena are mostly not started; these are the three FASs which are grouped as the Ballymena Significant Flood Risk Area Feasibility Study which is included in the DfI Rivers' works programme. These measures will be carried over to the second cycle.

The fourth measure for Preparedness to establish community groups has been completed in the area of Leighinmohr Avenue/Phoenix Fields, however the group in the area of Ballymoney Road remains to be established.

5.12.8.2 Enhanced Drainage Area Plan

NI Water is currently taking forward modelling in the form of DAPs across NI for drainage areas with populations typically above 2000. The traditional approach is for all combined and foul sewers to be modelled. For the period April 2021 – March 2027 NI Water, will be conducting Enhanced DAPs in each of the APSFR. These Enhanced DAPs extend modelling to include the NI Water storm sewers, which may identify drainage improvement schemes.

Table 5.12-4 below sets out the measures and timescales for the Ballymena APSFR in the second cycle FRMP.

Table 5.12-4: Proposed measures for Flood Risk Management Plan cycle 2021-2027

Category	Measure summary	Lead authority	Specific measure	Timescale
PREVENTION	Enhanced Drainage Area Plan	NI Water	By 31st March 2027, NI Water will produce an Enhanced DAP for Ballymena that sets out actions to mitigate integrated flooding issues.	2027
	Influence local planning policy for development and flood risk	DfI Rivers	By 2022, DfI Rivers will work with Mid-East Antrim Borough Council to update flood risk mapping and policy in the Local Development Plan	2022
PROTECTION	Flood alleviation works	DfI Rivers	By 2023, DfI Rivers will undertake feasibility work with regards to a flood alleviation scheme for the Ballee Burn. Should this identify a viable scheme this will be followed by detailed design and construction.	2023
	Flood alleviation works	DfI Rivers	By 2023, DfI Rivers will undertake feasibility work with regards to a flood alleviation scheme for the Lower Mill Layde. Should this identify a viable scheme this will be followed by detailed design and construction.	2023
	Flood alleviation works	DfI Rivers	By 2023, DfI Rivers will undertake feasibility work with regards to a flood alleviation scheme for the Braid River. Should this identify a viable scheme this will be followed by detailed design and construction.	2023
PREPAREDNESS	Community engagement	RCRG	The RCRG will establish the Ballymoney Road area community group and progress engagement in further local community groups, as appropriate, to increase community resilience to flooding.	2027

Chapter **6**

COSTS OF IMPLEMENTING THE FLOOD RISK MANAGEMENT PLAN

6. COSTS OF IMPLEMENTING THE FLOOD RISK MANAGEMENT PLAN

This section gives an overview of the costs of implementing the measures to manage flood risk identified in the 12 APSFR along with costs of Regional Measures which will be undertaken throughout NI.

The costs included in this section are high level and strategic in nature and represent an overall order of costs to manage flood risk. The costs have been compiled under the broad headings of Prevention, Protection and Preparedness.

More detailed estimates will be produced over the lifetime of the Plan as more information, particularly in relation to flood 'protection' activities, is known and works programmes are updated.

6.1 Impacts of Resourcing Pressures

It should however be noted that the resourcing pressures on all Departments, particularly in terms of resource funding, will impact directly on the ability to maintain critical drainage infrastructure.

The delivery of flood alleviation schemes is linked directly to the availability of capital investment. Budgetary constraints will be kept under review throughout the life of this Plan and delivery programmes will be reviewed and reprioritised as necessary.

The advances made in relation to flood emergency response with co-responders outside of the flood risk management organisations, particularly Local Councils, PSNI and NIFRS could regress if they also are faced with significant resourcing pressures. The effect of any stalling or regression in progressing this measure would be magnified by the fact that public expectation will not reduce.

6.2 Costs of Regional Measures

Budget cost estimates have been developed by the Department and other organisational partners in relation to measures to address flooding. These cover both costs of measures within the 12 APSFR and costs associated with the Regional Measures.

The related text also provides information as to which organisation will be responsible for the expenditure.

Where possible, costs have been estimated for the measures to be undertaken to address flood risks within the 12 APSFR during the second cycle FRMP 2021-27. Where it has not been possible to allocate costs of measures directly against the 12 APSFR, costs have been compiled on 'regional' basis.

6.2.1 Prevention

Costs of DfI Rivers liaison with planning authorities regarding new development

These are estimated running costs under the heading of 'Prevention' associated with DfI Rivers provision of flood risk management advice to DfI Planning and Local Planning Authorities. This advice, regarding developments and flood risk, is provided strategically during the preparation of Local Development Plans and, in relation to individual planning applications.

Table 6-1: Costs of DfI Rivers liaison with planning authorities regarding new development

Expenditure (£k)	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	TOTAL (£k)
Prevention	£750	£750	£750	£750	£750	£750	£4,500

6.2.2 Protection

Costs of measures in DfI Rivers Capital Works Programme within the 12 APSFR

This table is a summary of costs associated with DfI Rivers Capital Works Programme in relation to measures identified within the APSFR during the second cycle Plan.

Table 6-2: Costs of measures in DfI Rivers Capital Works Programme within the 12 APSFR

Expenditure (£k)	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	TOTAL (£k)
Protection Flood Alleviation Schemes in the APSFR	£15,750	£14,000	£11,000	£10,000	£10,000	£10,000	£70,750

Costs of measures in DfI Rivers Capital Works Programme outside the APSFR

This table is a summary of costs associated with DfI Rivers Capital Works Programme in relation to measures in other areas outside the APSFR in the second cycle Plan.

Table 6-3: Costs of measures in DfI Rivers Capital Works Programme outside the APSFR

Expenditure (£k)	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	TOTAL (£k)
Protection Flood Alleviation Schemes outside the APSFR	£6,000	£6,000	£6,500	£7,750	£8,500	£9,500	£44,250

Costs associated with DfI Rivers proposed operation of the Homeowner Flood Protection Grant Scheme

The Department currently operates a Grant Scheme for Property Level Flood Protection in Northern Ireland. An evaluation of the scheme is now complete and has demonstrated both a need for, and benefit from, a property level protection grant scheme. Funding for the Scheme is estimated to be of the order of £250k per year.

Table 6-4: Costs associated with DfI Rivers proposed operation of the Homeowner Flood Protection Grant Scheme

Expenditure (£k)	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	TOTAL (£k)
Protection	£250	£250	£250	£250	£250	£250	£1,500

Costs associated with Stakeholder Groups formed to address the requirements of the Floods Directive Regulations

In order to implement the requirements of the Floods Directive Regulations in Northern Ireland, a number of groups exist to provide opportunities for public bodies and the general public to participate in discussion and exchange views and information relating to the preparation of the FRMP and related documents e.g. FDTSG, FSSG. These groups will continue to meet regarding, implementation of measures in the FRMP, development of new measures for future Plan cycles and to be informed and give views on flood-related matters. Costs associated with these groups have mainly been allocated under the 'Protection' heading since they deal predominantly with flood mitigation. However, RCRG is a 'Resilience' group which has close contact with communities at risk and costs are included below under 'Preparedness' in Community Resilience Costs.

Table 6-5: Costs associated with Stakeholder Groups formed to address the requirements of the Floods Directive Regulations

Expenditure (£k)	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	TOTAL (£k)
Protection	£30	£30	£30	£30	£30	£30	£180

Costs associated with drainage maintenance

These are costs associated with the routine maintenance by DfI Rivers of designated open and culverted watercourses, and by DfI Roads and NI Water of their respective road drainage and storm drainage systems throughout NI. While these costs would include routine maintenance within the 12 APSFR, much of this work is undertaken outside these areas. It is difficult to specifically attribute costs to each APSFR and therefore this has not been done.

Table 6-6: Costs associated with drainage maintenance

Expenditure (£k) PROTECTION	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	TOTAL (£k)
Watercourse Maintenance	£12,000	£12,000	£12,000	£12,000	£12,000	£12,000	£72,000
Road Drainage Maintenance	£8,000	£8,000	£8,000	£8,000	£8,000	£8,000	£48,000
Planned Sewerage Maintenance	£6,300	£6,280	£5,380	£5,180	£5,840	£7,340	£36,320
TOTAL	£26,300	£26,280	£25,380	£25,180	£25,840	£27,340	£156,320

Costs associated with drainage and flood risk management activities by DfI Roads

DfI Roads has capital expenditure on upgrading of road drainage systems to reduce susceptibility to surface-water flooding, throughout NI and not just within the 12 APSFR.

Table 6-7: Costs associated with drainage and flood risk management activities by DfI Roads

Expenditure (£k) PROTECTION	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	TOTAL (£k)
Structural Drainage Upgrading	£3,500	£3,500	£3,500	£3,500	£3,500	£3,500	£21,000

Costs associated with drainage and flood risk management activities by Northern Ireland Water

The following costs have been included in NI Water's PC21 business plan, during the second cycle of the FRMP associated with works to address Planned Sewerage Maintenance, DG5 (Internal Flooding) and Storm-water Separation.

Table 6-8: Costs associated with drainage and flood risk management activities by Northern Ireland Water

Expenditure (£k) PROTECTION	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	TOTAL (£k)
DG5 (Internal Flooding)	£8,480	£10,660	£5,780	£3,580	£4,720	£4,400	£37,620
Storm-water Separation	£3,120	£3,430	£3,420	£3,040	£4,110	£4,450	£21,570
SCaMP (3% for flood risk management)	£30	£30	£30	£30	£30	£30	£180
Drainage Area Plan modelling	£1,420	£1,440	£1,460	£1,480	£1,500	£1,520	£8,820
TOTAL	£13,050	£15,560	£10,690	£8,130	£10,360	£10,400	£68,190

Costs associated with drainage and flood risk management activities in the 'Living With Water' Programme (LWWP)

The LWWP was developed to deliver a Strategic Drainage Infrastructure Plan for the Greater Belfast area that will help Protect from flooding, Enhance the environment and Grow the local economy. The LWWP geographical scope covers 4 of the APSFRs and 1 TAPSFR and is estimated to cost approx. £1.4bn over the 12 year period of the life of the plan. Much of the Flood protection costs included within this £1.4bn are already included in the NI Water costs in the table above. The estimated costs to deliver potential Blue / Green infrastructure works to help alleviate flood risk and provide capacity within the sewerage and drainage network are included in the table below. These estimated costs have been calculated to show whole life operating and maintenance costs over a 100 year lifespan and include 60% optimism bias.

Table 6-9: Costs associated with drainage and flood risk management activities in the 'Living With Water' Programme (LWWP)

Expenditure (£k) PROTECTION	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	TOTAL (£k)
Plan/Guidance Development	£350	£350	£350	£350	£350	£350	£2,100
Blue/Green Infrastructure	£4,000	£13,000	£19,000	£21,000	£22,000	£25,000	£104,000
TOTAL	£4,350	£13,350	£19,350	£21,350	£22,350	£25,350	£106,100

6.2.3 Preparedness

Costs associated with DfI Rivers provision of Emergency Planning Expertise, Weather Warning, Informing and Awareness activities

These are estimated costs incurred under the heading of 'Preparedness' for provision of Emergency Planning and Hydrometric services. Costs include the following:

Table 6-10: Costs associated with DfI Rivers provision of Emergency Planning Expertise, Weather Warning, Informing and Awareness activities

Expenditure (£k)	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	TOTAL (£k)
Preparedness (Flood Data Acquisition, Warning & Informing)	£20	£20	£20	£20	£20	£20	£120
New Alert Stations	£25	£25	£25	£25	£25	£25	£150
Preparedness (Emergency Planning)	£10	£10	£10	£10	£10	£10	£60
TOTAL	£55	£55	£55	£55	£55	£55	£330

Community Resilience costs

The following are estimated costs incurred by both the Department and other organisations under the heading of 'Preparedness' associated with Community Resilience. Costs include the following:

Table 6-11: Community Resilience costs

Expenditure (£k)	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	TOTAL (£k)
Preparedness (Regional Community Resilience Group)	£50	£50	£50	£50	£50	£50	£300
Preparedness (Community Resilience Programme – currently working with more than 30 communities)	£25	£25	£25	£25	£25	£25	£150
TOTAL	£75	£75	£75	£75	£75	£75	£450

Table 6-12: Proposed Regional Measures for the Second Cycle Flood Risk Management Plan – Cost Summary

Regional Measures Cost Summary	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	Total (k)
PREVENTION							
DfI Rivers - PAMU	£750	£750	£750	£750	£750	£750	**£4,500**
PROTECTION							
DfI Rivers - Flood Alleviation Schemes within APSFR	£15,750	£14,000	£11,000	£10,000	£10,000	£10,000	**£468,290**
DfI Rivers - Flood Alleviation Schemes without APSFR	£6,000	£6,000	£6,500	£7,750	£8,500	£9,500	
DfI Rivers - Homeowner Flood Protection Grant Scheme	£250	£250	£250	£250	£250	£250	
DfI Rivers - Stakeholder Groups	£30	£30	£30	£30	£30	£30	
DfI Rivers - Maintenance	£12,000	£12,000	£12,000	£12,000	£12,000	£12,000	
DfI Roads - Maintenance	£8,000	£8,000	£8,000	£8,000	£8,000	£8,000	
NI Water - Planned Sewerage Maintenance	£6,300	£6,280	£5,380	£5,180	£5,840	£7,340	
DfI Roads - Structural Drainage Upgrading	£3,500	£3,500	£3,500	£3,500	£3,500	£3,500	
NI Water - DG5 (Internal Flooding)	£8,480	£10,660	£5,780	£3,580	£4,720	£4,400	
NI Water - Storm-water Separation	£3,120	£3,430	£3,420	£3,040	£4,110	£4,450	
NI Water - SCaMP	£30	£30	£30	£30	£30	£30	
NI Water - Drainage Area Plan modelling	£1,420	£1,440	£1,460	£1,480	£1,500	£1,520	
LWWP - Plan/Guidance Development	£350	£350	£350	£350	£350	£350	
LWWP - Blue/Green Infrastructure	£4,000	£13,000	£19,000	£21,000	£22,000	£25,000	
PREPAREDNESS							
DfI Rivers - Warning & Informing	£55	£55	£55	£55	£55	£55	**£780**
DfI Rivers - Community Resilience	£75	£75	£75	£75	£75	£75	
Total Per Year (k)	£70,110	£79,850	£77,580	£77,070	£81,710	£87,250	**£473,570**

Chapter **7**

ENVIRONMENTAL ASSESSMENT

7. ENVIRONMENTAL ASSESSMENT

7.1 Strategic Environmental Assessment (SEA)

The SEA Directive (2001/42/EC) has been implemented in order to integrate environmental considerations into the preparation of Plans and Programmes and is a means of ensuring a high level of protection for the environment, while also promoting sustainable development. The SEA Directive requires that certain Plans and Programmes, prepared by statutory bodies, which are likely to have a significant impact on the environment, be subject to the SEA process.

The first cycle FRMPs were subject to full SEA in order to satisfy the requirements of the SEA Directive and the Environmental Assessment of Plans and Programmes Regulations (Northern Ireland) 2004, and to ensure that any likely significant effects of the Plans were addressed as far as possible. The Environmental Report from the SEA process was published alongside the draft Plans in December 2015.

A SEA Monitoring Report was completed in May 2020. This report was a review of the environmental monitoring recommended in the Environmental Report for the first cycle FRMPs. Article 10 of the SEA Directive requires that monitoring be carried out in order to identify, at an early stage, any unforeseen adverse effects due to implementation of a Plan or Programme, and to enable remedial action to be taken. Monitoring is carried out by reporting on a set of Indicators established in the SEA Objectives, which allow impacts on the environment to be measured.

Monitoring of the implementation of the first cycle FRMPs did not find any significant negative impacts on the wider environment, based on the SEA topics and indicators. This monitoring however found localised, significant positive impacts on population, human health and material assets, from the protection of people and property from flood risk in the Newtownabbey and Belfast SFRAs.

A SEA Screening Report for the second cycle FRMP was completed in May 2020 and was sent to DAERA, as the environmental consultee for SEA in Northern Ireland, and to the transboundary environmental consultees for SEA in the Republic of Ireland. It was agreed that, as the second cycle FRMP is considered to be a modification of the first cycle FRMPs, with no additional physical actions or measures being proposed, the SEA for the first cycle FRMPs remains valid, with no need to undertake a full new SEA. It was however recommended that an updated HRA is completed and that the second cycle FRMP will need to consider the outcomes and recommendations of the Environmental Report for the first cycle FRMPs, as these remain valid.

The Environmental Report from the first cycle FRMPs, the SEA Monitoring Report, the SEA Screening Report and the HRA Report will accompany the draft FRMP (2021-2027) for public consultation.

7.2 Habitats Regulations Assessment (HRA)

The Habitats Directive (Council Directive 92/43/EEC) on the conservation of natural habitats and of wild fauna and flora obliges member states to designate, protect and conserve habitats and species of importance in a European Union context. Article 6(3) of the Habitats Directive requires that:

"Any plan or project not directly connected with or necessary to the conservation of a site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives."

Any proposed plan or project that has potential to result in a significant effect on a designated European site will require an Appropriate Assessment (AA).

As recommended by DAERA, a HRA was carried out to assess the implications for Natura 2000 sites from implementation of the 2nd cycle FRMP.

Stage I Screening for Appropriate Assessment assessed the three measures under which approaches are proposed to manage flood risk in the FRMP; 'Prevention', 'Preparedness' and 'Protection'. Approaches proposed under 'Prevention' and 'Preparedness' were not considered to have potential to result in likely significant effects on the Conservation Objectives of Natura 2000 sites.

Approaches proposed under the 'Protection' measure include the possibility of structural measure types and activities. Stage I screening for Appropriate Assessment identified the potential for adverse effects on any Natura 2000 site that could be affected by structural approaches, based on geographic location, qualifying criteria and catchment connectivity with the 12 APSFR.

The HRA considered three broad impact themes and focused on the following possible Likely Significant Effects from implementation of the 'Protection' measure types. Stage I of the process concluded that:

- The possibility of likely significant Habitat Loss effects could not be discounted for three European sites without further evaluation and analysis, or the application of measures intended to avoid or reduce the harmful effects of the potential projects on European sites;
- The possibility of likely significant Water Quality and Habitat Deterioration effects could not be discounted for ten European sites without further evaluation and analysis, or the application of measures intended to avoid or reduce the harmful effects of the potential projects on European sites; and
- The possibility of likely significant Disturbance and Displacement effects could not be discounted for three European sites without further evaluation and analysis, or the application of measures intended to avoid or reduce the harmful effects of the potential projects on European sites.

Further investigation and analysis was undertaken as part of the Stage 2 appraisal for Appropriate Assessment. Following the application of measures considered appropriate at this strategic Plan level intended to avoid or reduce the harmful effects of the implementation of the Plan on Natura 2000 sites; and taking into consideration the safeguarding regime of lower level screening for Appropriate Assessment or Appropriate Assessment as the case may be at a project level for each of the projects brought forward from the Plan prior to those projects being consented under the planning code; it was concluded in the HRA that implementation of the Plan will not adversely affect the integrity of any Natura 2000 site.

7.3 Mitigation

SEA mitigation measures were recommended and provided in Section 8 of the Environmental Report of the first cycle FRMPs, where there was considered to be a risk of potential negative impacts from implementing the Plans. Two forms of mitigation were identified as being required to prevent, reduce and as fully as possible offset any significant adverse effects on the environment due to the implementation of the measures within the Plans; suggested Plan-level actions, and EIA guidance and project-level mitigation (including HRA requirements). The second cycle FRMP should take on board these recommendations, as they remain valid.

The updated HRA undertaken for the second cycle FRMP also provides Plan-level avoidance and mitigation measures, as well as mitigation measures that should be incorporated into HRAs and/or EIAs at the project stage, as appropriate, in order to mitigate against the potential for adverse effects on the integrity of Natura 2000 sites from implementation of the measures within the Plan.

This mitigation will be fully taken into consideration and utilised, where appropriate, at the next stages of planning for the proposed schemes and projects that are progressed from the Plan.

7.4 Monitoring

The second cycle FRMP will cover the period from 2021-2027. Monitoring of the SEA topics will be required from implementation of FASs during the second cycle FRMP in the identified APSFR. The Environmental Report (Table 12) for the first cycle FRMPs proposed a set of generic measures to be used for monitoring of SEA topics. The SEA Monitoring assessment provided an insight into how appropriate the generic measures and indicators that were proposed in the Environmental Report are for monitoring purposes. The recommended strategy (measures, indicators and data sources) for monitoring effects from implementation of the second cycle FRMPs is outlined in Table 7-1. For some SEA topics, the proposed measures and data sources remain the same as those that were proposed for the first cycle FRMPs, where this assessment has found them to be suitable; these have been refined, where possible, with the addition of proposed indicator(s). For other SEA topics, alternative measures, associated indicators, and data sources have been proposed that are considered to be more appropriate.

The wider environmental monitoring recommended in Table 7-1 will be undertaken before the development stage of the next FRMP cycle. This should identify at an early stage any unforeseen adverse effects, as well as any positive outcomes that are due to implementation of the Plan.

Table 7-1: Proposed Monitoring Measures, Indicators and Data Sources for SEA Topics for the Second Cycle Flood Risk Management Plan

SEA Topic	Proposed Measures	Proposed Indicator(s)	Proposed Data Source(s)
Biodiversity, Flora and Fauna	Protected sites and species are monitored with regards to their conservation objectives. Any increase in unfavourable/favourable conditions will be monitored in conjunction with the implementation of flood risk management projects as well as any habitat loss/ increase.	• Change in condition of designated national or European designated sites; and • Significant changes in existing habitats or species.	• Article 17 Habitats Directive reporting for SACs relevant to completed/in progress FASs; • Article 12 Bird's Directive reporting for SPAs relevant to completed/in progress FASs; • Consultation with DAERA regarding any significant changes in the condition of habitats/species within ASSIs relevant to completed/in progress FASs; • DfI data on completed FASs; and • State of the Seas Reporting.
Cultural Heritage	Historical sites (monuments, listed buildings, industrial heritage, maritime heritage, archaeological sites, etc.) should be appropriately monitored where they are lost, damaged, relocated or discovered as a result of FASs.	• Number of cultural heritage (including marine) sites or features that have been afforded protection by completed FASs; • Number of historical sites (including marine) that have been lost, damaged, relocated, or discovered during FASs; and • Number and state of heritage assets used as part of the means to address flood risk – i.e. through historic coastal works, or man-made waterways and historic canals.	• Project-specific information on the sites or features at risk from flooding that will be protected by completed FASs; and • Project-specific information from DfI or via consultation with DfC regarding the loss, damage, relocation or discovery of any historical sites during completed/in progress FASs.

Table 7-1: Proposed Monitoring Measures, Indicators and Data Sources for SEA Topics for the Second Cycle Flood Risk Management Plan

SEA Topic	Proposed Measures	Proposed Indicator(s)	Proposed Data Source(s)
Water	Water quality is monitored by DAERA under the requirements of the WFD. Any changes in status of water bodies will be monitored in conjunction with the implementation of flood risk management projects.	• Change in WFD status of water bodies.	• WFD reporting of water body status by DAERA.
Geology and Soil	The condition and quality of designated sites of geological importance (ASSIs) is subject to ongoing monitoring. This should be reviewed in conjunction with the implementation of flood risk management projects.	• Change in condition of ASSI sites designated for geological features.	• Consultation with DAERA regarding any significant changes in the condition of ASSIs designated for geological features relevant to completed/in progress FASs.
Population and Human Health	The implementation of Flood Risk Management measures directly protects the population of these areas against flooding, and the number of individuals directly protected can be monitored, as well as the cost benefit attributable to the FASs.	• Number of people protected by completed FASs; and • Significant impacts on the health or living environment of communities (only feasible to monitor for large collaborative schemes where this information is collected).	• DfI data on completed FASs, providing information on the no. of properties protected; • NI Census population statistics on average household size in the scheme areas; and • Publicly available data on community benefits of completed FASs (only feasible to monitor for large collaborative schemes where this information is collected).

Table 7-1: Proposed Monitoring Measures, Indicators and Data Sources for SEA Topics for the Second Cycle Flood Risk Management Plan

SEA Topic	Proposed Measures	Proposed Indicator(s)	Proposed Data Source(s)
Material Assets	Benefits from implemented flood risk management measures should be monitored, including cost benefits, no. of properties protected and any infrastructure protected by schemes.	• Cost benefit attributable to completed FASs; • Number of properties protected by completed FASs; • Infrastructure protected by completed FASs; and • Monitor the number of properties protected from future flood events by the Homeowner Flood Protection Grant Scheme, and the cost benefit attributable to this scheme.	• DfI data on completed FASs.
Climate Factors	The effects of climate change should be effectively managed through the implementation of Flood relief management measures. The capacity of implemented schemes to manage climate change effects can be monitored.	• Number of completed FASs that have been designed to be adaptable to climate change projections; and • Number of people protected against the effects of climate change by completed FASs.	• DfI data on completed FASs.
Landscape	Flood management measures should be designed to protect, maintain and, where possible enhance local landscapes. Monitoring can assess the amount of blue/green infrastructure created during the implementation of completed schemes, and any changes in landscape character following implementation of FASs.	• Area of blue/green infrastructure (including SuDS) created during implementation of completed FASs (only feasible to monitor for large collaborative schemes where this information is collected, or in cases where FASs create new upstream water storage areas); and • Any changes to the landscape and / or seascape character from implementation of FASs.	• Publicly available data on new blue-green infrastructure associated with completed FASs (only feasible to monitor for large collaborative schemes where this information is collected); • Landscape and seascape character assessments for NI; and • DfI data on completed FASs.

Chapter **8**

MONITORING AND REVIEW

8. MONITORING AND REVIEW

This Section details the monitoring and review arrangements for the implementation of this FRMP.

8.1 Plan Monitoring

Progress on the implementation of this FRMP will be reported on an annual basis through the normal Departmental reporting processes. (Further detail on new Floods Directive reporting processes will be included in the final FRMP.)

8.2 Environmental Monitoring

As detailed in Chapter 7 of this Plan, the wider environmental monitoring recommended in the SEA Environmental Monitoring Report will be undertaken before the development stage of the next FRMP cycle. This should identify at an early stage any unforeseen adverse effects, as well as any positive outcomes that are due to implementation of the Plan.

8.3 Review

The Floods Directive Regulations require that the FRMPs are reviewed on a six year cycle. The timeline of the next, third cycle is:

- Further Flood Risk Assessment- 22 December 2024;
- Flood Hazard and Risk Maps update - 22 December 2025; and
- The Flood Risk Management Plan update - 22 December 2027.

The APSFR identified during the second planning cycle were based on the NIFRA 2018 analysis and Flood Mapping information at that time. Further reviews of the APSFR will be ongoing as new and updated information and updated flood mapping becomes available, and changes in levels of protection due to the completion of new flood alleviation schemes is taken into account.

Regular reviewing and updating of the flood maps is an ongoing process. This will include the validation of existing mapping information and updating the maps based on new hydrometric information, tide level data, historical flood events and Climate Change factors. Based on new information, the effectiveness of existing defences and the likelihood of overtopping for predicted design events will also be reviewed.

8.4 Conclusion

This FRMP seeks to build on past successes and provide a more coordinated approach to managing flood risk in Northern Ireland.

Using the Flood Hazard and Risk Maps it is now possible to identify, not only historical flooding, but also potential future flooding which can be predicted with more accuracy. This has facilitated the development of a range of measures to mitigate and manage flooding in the APSFR.

This FRMP will be a key source of information in taking forward the business of flood risk management in NI and driving the activities necessary to manage the risk. It will also help provide focus in bidding for resources and setting targets.

During the six year life of this Plan our knowledge and understanding of flood risk will continue to change and improve as new information emerges and new technologies are embraced. This will inform the development and delivery of the associated measures and objectives of this FRMP and help us to start the process of delivering the third six-year cycle of Flood Risk Management Plans by 2027.

Appendices A-F

APPENDIX A	TAPSFR MEASURES FROM THE FIRST CYCLE FLOOD RISK MANAGEMENT PLAN AND THEIR PROGRESS
APPENDIX B	REGIONAL MEASURES FROM THE FIRST CYCLE FLOOD RISK MANAGEMENT PLAN AND THEIR PROGRESS
APPENDIX C	OBJECTIVES AND MEASURES TABLE
APPENDIX D	POTENTIAL ADVERSE CONSEQUENCE TABLES
APPENDIX E	EQUALITY OF OPPORTUNITY SCREENING ANALYSIS FORM AND RURAL NEEDS IMPACT ASSESSMENT (RNIA)
APPENDIX F	FRMP 2021-2027 CONSULTATION FORM

Appendix **A**

TAPSFR MEASURES FROM THE FIRST CYCLE FLOOD RISK MANAGEMENT PLAN AND THEIR PROGRESS

APPENDIX A

7.5 TAPSFR measures from the First Cycle Flood Risk Management Plan and their progress

RBD	TAPSFR	Measure code from first cycle FRMPs	Measure description	Lead	Current progress on implementation
NE RBD	Newtownards	UKNI_NE_APSFR_02_01	Ballycullen Stream - FAS	DfI Rivers	Included in long term works programme.
NE RBD	Newcastle	UKNI_NE_APSFR_05_01	Shimna River - FAS	DfI Rivers	Construction commencement programmed for summer 2021.
NE RBD	Newcastle	UKNI_NE_APSFR_05_02	Mourneview Urban Drainage Improvements	NI Water	Investigation ongoing.
NE RBD	Newcastle	UKNI_NE_APSFR_05_03	Establishment of Local Community Resilience Group	DfI Rivers	DfI will liaise with RCRG partners following flooding of August 2020.
NE RBD	Downpatrick	UKNI_NE_APSFR_07_01	Integrated Urban Drainage Study	DfI Rivers	Included in long term works programme.
NE RBD	Dundonald	UKNI_NE_APSFR_08_01	River Enler & tributaries - FAS	DfI Rivers	Included in long term works programme.
NB RBD	Warrenpoint	UKNI_NB_APSFR_04_01	Clonallan Stream Extension - FAS	DfI Rivers	Included in long term works programme.
NB RBD	Warrenpoint	UKNI_NB_APSFR_04_02	Milltown Stream - FAS	DfI Rivers	Included in long term works programme.
NB RBD	Warrenpoint	UKNI_NB_APSFR_04_03	Coastal - FAS	DfI Rivers	Included in long term works programme.
NB RBD	Antrim	UKNI_NB_APSFR_05_01	Sixmilewater 1 - FAS	DfI Rivers	Included in long term works programme.
NB RBD	Antrim	UKNI_NB_APSFR_05_02	Muckamore - Establishment of local community resilience group	DfI Rivers	Completed
NB RBD	Antrim	UKNI_NB_APSFR_05_03	Hollywell Burn - FAS	DfI Rivers	Construction commencement programmed for Autumn 2020.
NB RBD	Antrim	UKNI_NB_APSFR_05_04	Sixmilewater 2 - FAS	DfI Rivers	Included in long term works programme.

RBD	TAPSFR	Measure code from first cycle FRMPs	Measure description	Lead	Current progress on implementation
NB RBD	Antrim	UKNI_NB_APSFR_05_05	Riverside & Masserene - Establishment of local community resilience group	DfI Rivers	Completed
NB RBD	Banbridge	UKNI_NB_APSFR_06_01	Showgrounds Stream - FAS	DfI Rivers	Included in long term works programme.
NB RBD	Banbridge	UKNI_NB_APSFR_06_02	Banbridge Town Culvert - FAS	DfI Rivers	Included in long term works programme.
NB RBD	Banbridge	UKNI_NB_APSFR_06_03	Continue with established local community resilience group	DfI Rivers	Completed
NB RBD	Banbridge	UKNI_NB_APSFR_06_04	Rifle Park Stream - FAS	DfI Rivers	Included in long term works programme.
NB RBD	Banbridge	UKNI_NB_APSFR_06_05	Brookefield Stream - FAS	DfI Rivers	Included in long term works programme.
NB RBD	Coleraine	UKNI_NB_APSFR_07_01	Lower Bann River - No specific mitigation measures proposed	DfI Rivers	No viable measures identified.
NW RBD	Strabane	UKNI_NW_APSFR_03_01	Urney Road Drain & Extension, Designated Watercourses - FAS	DfI Rivers	Feasibility study commenced in November 2019
NW RBD	Strabane	UKNI_NW_APSFR_03_02	Urney Road Undesignated Watercourses - FAS	DfI Rivers	Feasibility study commenced in November 2019
NW RBD	Strabane	UKNI_NW_APSFR_03_03	River Mourne - FAS	DfI Rivers	Feasibility study commenced in November 2019
NW RBD	Strabane	UKNI_NW_APSFR_03_04	Park Road Drain - FAS	DfI Rivers	Feasibility study commenced in November 2019
NW RBD	Strabane	UKNI_NW_APSFR_03_05	Roundhill Drain - FAS	DfI Rivers	Feasibility study commenced in November 2019

Appendix **B**

REGIONAL MEASURES FROM THE FIRST CYCLE FLOOD RISK MANAGEMENT PLAN AND THEIR PROGRESS

7.6 Regional measures from the First Cycle Flood Risk Management Plan and their progress

Measure code	Measure description	Lead	Current progress on implementation
UKNI_NE_01	DfI Rivers Drainage & Flood Defence Infrastructure Management	DfI Rivers	Ongoing – DfI Rivers continues to inspect and maintain flood defence assets and infrastructure as resources permit.
UKNI_NE_02	DfI Rivers Watercourse Inspection and Maintenance Programmes	DfI Rivers	Ongoing – DfI Rivers continues to inspect and maintain designated urban open watercourses and designated culvert inlet grilles.
UKNI_NE_03	DfI Rivers Planning Advice	DfI Rivers	Ongoing - DfI Rivers provides advice to Planning Authorities, in relation to flood risk to enable them to decide if development is sustainable from a flood risk perspective.
UKNI_NE_04	DfI Rivers Capital Works Programme in all areas including the 20 SFRAs	DfI Rivers	Ongoing – See Chapter 5 for further detail.
UKNI_NE_05	DfI Roads - Road Drainage Maintenance Programme	DfI Roads	Ongoing – This measure includes gully emptying and road channel sweeping.
UKNI_NE_06	DfI - Living with Water Programme	LWWP	Ongoing - The draft plan entitled Living With Water in Belfast, An Integrated Plan for Drainage and Wastewater Management in the Greater Belfast Area, was published for consultation in November 2020.
UKNI_NE_07	Northern Ireland Water – Programme of proposed schemes to alleviate flooding	NI Water	Ongoing – The measure includes projects to alleviate internal flooding (DG5), stormwater management and base maintenance programmes to ensure the continued serviceability of NI Water assets.
UKNI_NE_08	DfI Rivers Homeowner Flood Protection Grant Scheme	DfI Rivers	Ongoing - This scheme is designed to encourage homeowners who meet the schemes eligibility criteria to make their property more resilient to flooding.
UKNI_NE_09	DfI Rivers Emergency Planning, Flood Warning, Informing and Awareness activities	DfI Rivers	Ongoing - This measure involves preparing for flooding emergencies and discharging LGD responsibilities in relation to: • Emergency communications • Co-ordination of defined emergencies • Providing expertise to co-responders • Reviewing emergencies it provides strategic co-ordination for.
UKNI_NE_10	Community Resilience	DfI Rivers	Ongoing – Since 2013 working multi-agency partners, the Regional Community Resilience Group (RCRG) has developed and refined approaches to enhance 31 individual communities' ability to reduce the impacts of flooding.

Appendix **C**

OBJECTIVES AND MEASURES TABLE

APPENDIX C

7.1 Objectives and Measures Table

Objectives	Objectives Activities	Measures	Measures Type	Measures Activities
ECONOMIC ACTIVITY	• Reduce economic damages to properties. • Reduce economic costs on business caused by the disruption to essential infrastructure and services. • Optimise economic return on Flood Risk Management investment.	**FLOOD PREVENTION**	Keep new development outside Flood Risk Areas	• Provide timely advice to planning authorities to inform decisions to ensure that new zonings are located outside flood risk areas. • Provide timely advice to planning authorities to inform decisions to ensure that individual applications are located outside flood risk areas. • Continue to update information on Climate Change to inform advice to planning authorities, for example, incorporating UKCP18 guidance into Flood mapping.
			Ensure new development within Flood Risk Areas is suitably constructed	• In accordance with Policy Advice aim to ensure that any development which is located "by exception" in flood risk areas is appropriately built with flood resistance/resilience measures. • In accordance with Planning Policy Advice proposed development applications will be accompanied by a Flood Risk Assessment or Drainage Assessment.
			Surface Water Management	• In accordance with the Long Term Water Strategy, promote the use of SuDS, as the preferred means of surface water management, for all new developments, where feasible. • Advance and identify SuDS pilot schemes. • Continue to utilise SuDS, where appropriate, in the construction of Roads' projects. • Develop enhanced Drainage Area Plans for all APSFR. • Take forward a study to consider if predictive surface water flood models can be improved, and used to develop more accurate flood mapping and are cost effective.

Objectives	Objectives Activities	Measures	Measures Type	Measures Activities
ECONOMIC ACTIVITY	• Reduce economic damages to properties. • Reduce economic costs on business caused by the disruption to essential infrastructure and services. • Optimise economic return on Flood Risk Management investment.	**FLOOD PROTECTION**	Maintenance of the Existing Drainage and Flood Defence Networks	• Continue to Inspect and maintain designated watercourse grilles, road gullies as appropriate and as funding allows. • Continue to regularly inspect the condition of all Drainage and Flood Defence Assets. • Continue to implement a prioritised programme of works for the maintenance of all Drainage Assets and Flood Defence Assets. • Continue to implement a prioritised programme of works for the maintenance of public sewers and storm drainage systems. • Complete a Rivers' Asset Management Plan to identify the amount of funding required for future maintenance. • Continue to work collaboratively through the Flood Investment and Planning Group to provide a co-ordinated approach to address difficult flooding issues on a multi-agency basis.
HUMAN HEALTH AND SOCIAL	• Reduce the risk to life. • Raise awareness of the consequences of flood risk. • Reduce risk to health and wellbeing. • Reduce the impact on people caused by the disruption to essential Infrastructure and services. • Improve recreation and public amenities.		New Flood Alleviation and Drainage Schemes	• Continue to carry out feasibility studies to identify viable solutions. • Continue to implement a prioritised programme of works of flood defence and flood alleviation schemes. • Continue to implement a prioritised programme of works of integrated surface water drainage schemes. • Continue to implement a prioritised programme of works to separate surface water systems from combined sewer systems.

Objectives	Objectives Activities	Measures	Measures Type	Measures Activities
HUMAN HEALTH AND SOCIAL	• Reduce the risk to life. • Raise awareness of the consequences of flood risk. • Reduce risk to health and wellbeing. • Reduce the impact on people caused by the disruption to essential Infrastructure and services. • Improve recreation and public amenities.	**FLOOD PROTECTION**	Catchment Based Management	• Continue to work collaboratively through the LWWP to develop plans to facilitate an integrated approach to drainage and wastewater management through the production and implementation of a Strategic Drainage Infrastructure Plan for the greater Belfast area and an Integrated Drainage Investment Planning Guide for NI. • Work with others collaboratively to progress measures that deliver multiple benefits for flood risk, Climate Change adaptation, water quality and biodiversity. • Engage with DAERA on how future agricultural and land support measures may incorporate flood risk management options. • Develop policy / guidance on approaches to Natural Flood Management. • Undertake a study for to improve understanding of the potential for groundwater flooding in NI.
		FLOOD PREPAREDNESS	Flood Emergency Response	• Continue to engage with other responsible bodies on identifying local flooding hotspots and co-ordination of response procedures along with Blue Light responders. • Continue to engage with local communities in those areas of known flood risk where there is an interest in developing community resilience measures. • Continue to test emergency response plans through multi-agency 'Exercising'. • Continue to work with Co responders in line with Flood Emergency Response "Best Practice Guidelines".

Objectives	Objectives Activities	Measures	Measures Type	Measures Activities
HUMAN HEALTH AND SOCIAL	• Reduce the risk to life. • Raise awareness of the consequences of flood risk. • Reduce risk to health and wellbeing. • Reduce the impact on people caused by the disruption to essential Infrastructure and services. • Improve recreation and public amenities.	**FLOOD PREPAREDNESS**	Flood Warning and Forming suitable for NI	• Formal engagement with the Met Office in a 'partnering' approach to better inform the impact assessment of National Severe Weather Warnings for heavy rainfall. • Ensuring adequate 'Informing' in relation to flood risk through community engagement. • Public dissemination of water level information. This includes the use of River level text warnings, where these are likely to be beneficial. • Continue to explore the development of targeted flood forecasting/warning in areas with significant flood risk.
ENVIRON-MENTAL (including cultural heritage)	• Consider the impact of Climate Change • Under the Water Framework Directive, support the achievement of good ecological potential/status for water bodies. • Reduce the risk of pollution. • Avoid or mitigate impact on priority species and habitats. • Avoid or mitigate impact on designated environmental areas, including those of cultural heritage importance.		Community Engagement	• Continue to work with the local government, drainage agencies, the emergency services, NIHE, Red Cross, Consumer Council, Met Office, etc., to develop and establish a consistent approach to flood warning and informing activities across NI. • Continue to work with partners, through the RCRG, to further develop communication with communities at risk of flooding.

Objectives	Objectives Activities	Measures	Measures Type	Measures Activities
ENVIRON-MENTAL (including cultural heritage)	• Consider the impact of Climate Change • Under the Water Framework Directive, support the achievement of good ecological potential/ status for water bodies. • Reduce the risk of pollution. • Avoid or mitigate impact on priority species and habitats. • Avoid or mitigate impact on designated environmental areas, including those of cultural heritage importance.	**FLOOD PREPAREDNESS**	Communication of Flood Risk	• Continue to engage with communities to facilitate the informing aspect of 'Flood Warning and Information' proposals. • Continue to update and improve flood risk information on the Flood Maps (NI). • Continue to improve information on flooding on the NI Direct Website. • Continue to work with NI Direct in the development of the Flooding Incident Line (FIL). • Continue to consult with stakeholders to make them aware of their roles and responsibilities in assessing and managing flood risk. • Seek to issue timely media messages to inform the Public of significant flooding events.
			Individual Property Protection	• A Pilot scheme for grant aiding Individual Property Protection is currently operating. Eligibility is assessed on the likelihood of future flooding and the frequency of past flooding events.
			Flood Recovery, Welfare and Insurance Issues	• Continue to carry out and contribute to flood investigations to gather information and improve knowledge and action on future flood events. • Continue to work with Councils and local communities at flood risk in providing advice and information to aid recovery after a flood event. • Continue to engage and work with voluntary sector organisations such as the Red Cross in providing Welfare Support. • Continue to work with the insurance industry with respect to flood insurance issues, including "FloodRe" in NI, to help address long term flood insurance affordability issues.

Appendix **D**

POTENTIAL ADVERSE CONSEQUENCE TABLES

APPENDIX D

7.1 Potential Adverse Consequence Tables

Table 5.1-5: Potential Adverse Consequences - **Pluvial Flooding**

Belfast APSFR	Flood Event % AEP			Total Count within APSFR
	3.3% AEP	0.5% AEP	0.1% AEP	
Residential (Number)	6,684	16,829	31,776	139,645
Non-Residential (Number)	1,574	3,625	6,101	14,341
Economic Damage (£)	£154,972K	£379,714K	£721,838K	
Annual Average Damage (£)	£17,497K			
Present Value (£)	£521,652K			
IPPC sites (Number)	20	26	30	34
IPPC sites	20	26	30	34
Community Assets (Number)	17	27	47	416
Care Homes (Nursing + Residential)	1	4	10	85
GP Surgeries	2	2	6	84
Fire Stations	0	0	1	8
Hospitals	0	2	3	6
Police Stations	1	3	4	16
Schools	13	16	23	217
Key Infrastructure (Number)	86	213	367	1597
NIW Wastewater Treatment Works	4	4	4	4
Wastewater Treatment Works (other ownership)	0	0	0	0
NIW Sewage Pumping Stations	9	18	23	36
Sewage Pumping Stations (other ownership)	0	1	4	23
NIW Water Treatment Works	0	0	0	0
NIW Treated Water Pumping Stations	1	1	1	5
NIE Substation 6 to 11kV	67	180	317	1489
NIE Substation 33kV	4	7	12	32
NIE Substation 110kV	0	1	5	7
NIE Substation 275kV	1	1	1	1
*DfI Roads - Trunk Road length (Km)	5.1	9.6	15.8	83.9
Environmental Designated sites (Number)	56	59	60	65
AONB	1	1	1	1
ASSI	2	2	2	2
Environmentally Sensitive Areas	0	0	0	0
Maritime Nature Reserve	0	0	0	0
Nature Reserve	0	0	0	0
RAMSAR	0	0	0	1
SAC	0	0	0	0
Sites of Local Conservation Importance	49	52	53	55
SPA	0	0	0	2
RSPB Reserve	1	1	1	1
UWT Nature Reserve	3	3	3	3
Built Heritage Sites (Number)	31	58	94	1516
National Trust	0	0	0	3
Listed Buildings	11	27	55	1337
Sites and Monuments	1	10	17	148
Buildings of Special Architectural or Historical interest	1	1	1	6
Areas of Significant Archaeological Interest	0	0	0	0
Historic Parks & Gardens	18	20	21	22

Table 5.1-6: Potential Adverse Consequences - **Fluvial Flooding**

Belfast APSFR	Flood Event % AEP				Total Count within APSFR
	10% AEP	4% AEP	1% AEP	0.1% AEP	
Residential (Number)	1975	2543	4737	9098	139,645
Non-Residential (Number)	241	333	623	1681	14,341
Economic Damage (£)	£7,662K	£9,968K	£33,916K	£170,043K	
Annual Average Damage (£)	£4,693K				
Present Value (£)	£139,914K				
IPPC sites (Number)	11	8	14	16	34
IPPC sites	11	8	14	16	34
Community Assets (Number)	1	1	9	20	416
Care Homes (Nursing + Residential)	0	0	0	2	85
GP Surgeries	0	0	7	7	84
Fire Stations	0	0	0	0	8
Hospitals	0	0	0	0	6
Police Stations	0	0	0	2	16
Schools	1	1	2	9	217
Key Infrastructure (Number)	31	42	71	176	1597
NIW Wastewater Treatment Works	2	3	3	3	4
Wastewater Treatment Works (other ownership)	0	0	0	0	0
NIW Sewage Pumping Stations	3	3	6	12	36
Sewage Pumping Stations (other ownership)	1	1	1	1	23
NIW Water Treatment Works	0	0	0	0	0
NIW Treated Water Pumping Stations	0	0	0	0	5
NIE Substation 6 to 11kV	21	31	56	154	1489
NIE Substation 33kV	4	4	4	5	32
NIE Substation 110kV	0	0	1	1	7
NIE Substation 275kV	0	0	0	0	1
*DfI Roads - Trunk Road length (Km)	0.5	0.7	2.9	7.8	83.9
Environmental Designated sites (Number)	32	30	35	36	65
AONB	1	1	1	1	1
ASSI	2	2	2	2	2
Environmentally Sensitive Areas	0	0	0	0	0
Maritime Nature Reserve	0	0	0	0	0
Nature Reserve	0	0	0	0	0
RAMSAR	1	1	1	1	1
SAC	0	0	0	0	0
Sites of Local Conservation Importance	23	21	26	27	55
SPA	2	2	2	2	2
RSPB Reserve	1	1	1	1	1
UWT Nature Reserve	2	2	2	2	3
Built Heritage Sites (Number)	31	29	38	82	1516
National Trust	0	0	0	1	3
Listed Buildings	16	14	22	61	1337
Sites and Monuments	6	6	7	10	148
Buildings of Special Architectural or Historical interest	1	1	1	1	6
Areas of Significant Archaeological Interest	0	0	0	0	0
Historic Parks & Gardens	8	8	8	9	22

Table 5.1-7: Potential Adverse Consequences - **Tidal Flooding**

Belfast APSFR	Flood Event % AEP				Total Count within APSFR
	10% AEP	2% AEP	0.5% AEP	0.1% AEP	
Residential (Number)	208	307	955	1852	139,645
Non-Residential (Number)	71	215	931	1212	14,341
Economic Damage (£)	£12,303K	£19,435K	£148,668K	£270,263K	
Annual Average Damage (£)	£6,278K				
Present Value (£)	£187,166K				
IPPC sites (Number)	6	6	11	11	34
IPPC sites	6	6	11	11	34
Community Assets (Number)	0	1	3	4	416
Care Homes (Nursing + Residential)	0	0	0	1	85
GP Surgeries	0	0	0	0	84
Fire Stations	0	1	1	1	6
Hospitals	0	0	0	0	8
Police Stations	0	0	1	1	16
Schools	0	0	1	1	217
Key Infrastructure (Number)	8	28	113	155	1597
NIW Wastewater Treatment Works	0	1	1	1	4
Wastewater Treatment Works (other ownership)	0	0	0	0	0
NIW Sewage Pumping Stations	0	0	0	2	36
Sewage Pumping Stations (other ownership)	1	3	7	7	23
NIW Water Treatment Works	0	0	0	0	0
NIW Treated Water Pumping Stations	0	0	0	0	5
NIE Substation 6 to 11kV	6	22	99	139	1489
NIE Substation 33kV	1	1	4	4	32
NIE Substation 110kV	0	1	2	2	7
NIE Substation 275kV	0	0	0	0	1
*DfI Roads - Trunk Road length (Km)	0.4	0.4	3.3	4.5	83.9
Environmental Designated sites (Number)	5	5	5	5	65
AONB	1	1	1	1	1
ASSI	1	1	1	1	2
Environmentally Sensitive Areas	0	0	0	0	0
Maritime Nature Reserve	0	0	0	0	0
Nature Reserve	0	0	0	0	0
RAMSAR	1	1	1	1	1
SAC	0	0	0	0	0
Sites of Local Conservation Importance	0	0	0	0	55
SPA	2	2	2	2	2
RSPB Reserve	0	0	0	0	1
UWT Nature Reserve	0	0	0	0	3
Built Heritage Sites (Number)	9	11	88	113	1516
National Trust	0	0	0	0	3
Listed Buildings	4	5	76	99	1337
Sites and Monuments	5	5	11	12	148
Buildings of Special Architectural or Historical interest	0	0	0	0	6
Areas of Significant Archaeological Interest	0	0	0	0	0
Historic Parks & Gardens	0	1	1	2	22

Table 5.2-5: Potential Adverse Consequences - **Pluvial Flooding**

Londonderry APSFR	Flood Event % AEP			Total Count within APSFR
	3.3% AEP	0.5% AEP	0.1% AEP	
Residential (Number)	2,176	4,905	8,259	30,848
Non-Residential (Number)	636	1,348	1,864	3,353
Economic Damage (£)	£76,901K	£173,769K	£299,612K	
Annual Average Damage (£)	£7,959K			
Present Value (£)	£237,287K			
IPPC sites (Number)	0	0	0	0
IPPC sites	0	0	0	0
Community Assets (Number)	3	4	6	88
Care Homes (Nursing + Residential)	1	1	1	12
GP Surgeries	0	1	1	16
Fire Stations	0	0	0	2
Hospitals	0	0	0	3
Police Stations	1	1	2	2
Schools	1	1	2	53
Key Infrastructure (Number)	27	76	113	370
NIW Wastewater Treatment Works	0	0	0	2
Wastewater Treatment Works (other ownership)	0	0	0	0
NIW Sewage Pumping Stations	7	14	18	22
Sewage Pumping Stations (other ownership)	1	1	1	1
NIW Water Treatment Works	0	0	0	0
NIW Treated Water Pumping Stations	0	0	0	4
NIE Substation 6 to 11kV	19	57	90	333
NIE Substation 33kV	0	2	2	6
NIE Substation 110kV	0	2	2	2
NIE Substation 275kV	0	0	0	0
*DfI Roads - Trunk Road length (Km)	4.2	10.2	15.1	37.1
Environmental Designated sites (Number)	2	2	2	2
AONB	0	0	0	0
ASSI	1	1	1	1
Environmentally Sensitive Areas	0	0	0	0
Maritime Nature Reserve	0	0	0	0
Nature Reserve	0	0	0	0
RAMSAR	0	0	0	0
SAC	1	1	1	1
Sites of Local Conservation Importance	0	0	0	0
SPA	0	0	0	0
RSPB Reserve	0	0	0	0
UWT Nature Reserve	0	0	0	0
Built Heritage Sites (Number)	16	27	34	611
National Trust	0	0	0	0
Listed Buildings	4	8	12	530
Sites and Monuments	7	12	13	68
Buildings of Special Architectural or Historical interest	0	0	0	3
Areas of Significant Archaeological Interest	0	0	0	0
Historic Parks & Gardens	5	7	9	10

Table 5.2-6: Potential Adverse Consequences - **Fluvial Flooding**

Londonderry APSFR	**Flood Event % AEP**				**Total Count within APSFR**
	10% AEP	**4% AEP**	**1% AEP**	**0.1% AEP**	
Residential (Number)	24	70	207	640	30,848
Non-Residential (Number)	40	69	116	292	3,353
Economic Damage (£)	£139K	£422K	£1,939K	£12,942K	
Annual Average Damage (£)	£172K				
Present Value (£)	£5,128K				
IPPC sites (Number)	0	0	0	0	0
IPPC sites	0	0	0	0	0
Community Assets (Number)	0	0	0	2	88
Care Homes (Nursing + Residential)	0	0	0	2	12
GP Surgeries	0	0	0	0	16
Fire Stations	0	0	0	0	2
Hospitals	0	0	0	0	3
Police Stations	0	0	0	0	2
Schools	0	0	0	0	53
Key Infrastructure (Number)	1	4	9	21	370
NIW Wastewater Treatment Works	0	0	0	0	2
Wastewater Treatment Works (other ownership)	0	0	0	0	0
NIW Sewage Pumping Stations	1	1	2	4	22
Sewage Pumping Stations (other ownership)	0	0	0	0	1
NIW Water Treatment Works	0	0	0	0	0
NIW Treated Water Pumping Stations	0	0	0	0	4
NIE Substation 6 to 11kV	0	3	6	16	333
NIE Substation 33kV	0	0	0	0	6
NIE Substation 110kV	0	0	1	1	2
NIE Substation 275kV	0	0	0	0	0
*DfI Roads - Trunk Road length (Km)	0.6	0.8	1.2	2.0	37.1
Environmental Designated sites (Number)	2	2	2	4	2
AONB	0	0	0	0	0
ASSI	1	1	1	1	1
Environmentally Sensitive Areas	0	0	0	0	0
Maritime Nature Reserve	0	0	0	0	0
Nature Reserve	0	0	0	1	0
RAMSAR	0	0	0	1	0
SAC	1	1	1	1	1
Sites of Local Conservation Importance	0	0	0	0	0
SPA	0	0	0	0	0
RSPB Reserve	0	0	0	0	0
UWT Nature Reserve	0	0	0	0	0
Built Heritage Sites (Number)	5	7	8	9	611
National Trust	0	0	0	0	0
Listed Buildings	3	5	5	6	530
Sites and Monuments	0	0	1	1	68
Buildings of Special Architectural or Historical interest	0	0	0	0	3
Areas of Significant Archaeological Interest	0	0	0	0	0
Historic Parks & Gardens	2	2	2	2	10

Table 5.2-7: Potential Adverse Consequences - **Tidal Flooding**

Londonderry APSFR	Flood Event % AEP				Total Count within APSFR
	10% AEP	2% AEP	0.5% AEP	0.1% AEP	
Residential (Number)	1	21	92	170	30,848
Non-Residential (Number)	20	177	323	374	3,353
Economic Damage (£)	£159K	£3,235K	£22,864K	£44,708K	
Annual Average Damage (£)	£452K				
Present Value (£)	£13,485K				
IPPC sites (Number)	0	0	0	0	0
IPPC sites	0	0	0	0	0
Community Assets (Number)	1	2	3	3	88
Care Homes (Nursing + Residential)	0	0	0	0	12
GP Surgeries	0	1	2	2	16
Fire Stations	0	0	0	0	2
Hospitals	0	0	0	0	3
Police Stations	1	1	1	1	2
Schools	0	0	0	0	53
Key Infrastructure (Number)	0	14	22	27	370
NIW Wastewater Treatment Works	0	0	0	0	2
Wastewater Treatment Works (other ownership)	0	0	0	0	0
NIW Sewage Pumping Stations	0	2	3	3	22
Sewage Pumping Stations (other ownership)	0	0	0	0	1
NIW Water Treatment Works	0	0	0	0	0
NIW Treated Water Pumping Stations	0	0	0	0	4
NIE Substation 6 to 11kV	0	12	19	22	333
NIE Substation 33kV	0	0	0	2	6
NIE Substation 110kV	0	0	0	0	2
NIE Substation 275kV	0	0	0	0	0
*DfI Roads - Trunk Road length (Km)	1.1	2.0	3.6	4.5	37.1
Environmental Designated sites (Number)	0	0	0	0	2
AONB	0	0	0	0	0
ASSI	0	0	0	0	1
Environmentally Sensitive Areas	0	0	0	0	0
Maritime Nature Reserve	0	0	0	0	0
Nature Reserve	0	0	0	0	0
RAMSAR	0	0	0	0	0
SAC	0	0	0	0	1
Sites of Local Conservation Importance	0	0	0	0	0
SPA	0	0	0	0	0
RSPB Reserve	0	0	0	0	0
UWT Nature Reserve	0	0	0	0	0
Built Heritage Sites (Number)	1	6	15	31	611
National Trust	0	0	0	0	0
Listed Buildings	1	6	14	25	530
Sites and Monuments	0	0	0	4	68
Buildings of Special Architectural or Historical interest	0	0	0	0	3
Areas of Significant Archaeological Interest	0	0	0	0	0
Historic Parks & Gardens	0	0	1	2	10

Table 5.3-5: Potential Adverse Consequences - **Pluvial Flooding**

Newry APSFR	Flood Event % AEP			Total Count within APSFR
	3.3% AEP	0.5% AEP	0.1% AEP	
Residential (Number)	487	1,305	2,316	9,343
Non-Residential (Number)	344	715	1,067	1,817
Economic Damage (£)	£11,246K	£42,474K	£96,528K	
Annual Average Damage (£)		£1,655K		
Present Value (£)		£49,333K		
IPPC sites (Number)	4	6	6	8
IPPC sites	4	6	6	8
Community Assets (Number)	0	4	12	39
Care Homes (Nursing + Residential)	0	0	0	6
GP Surgeries	0	0	7	8
Fire Stations	0	0	1	1
Hospitals	0	0	0	1
Police Stations	0	1	1	1
Schools	0	3	3	22
Key Infrastructure (Number)	19	40	54	153
NIW Wastewater Treatment Works	0	1	1	1
Wastewater Treatment Works (other ownership)	0	0	0	1
NIW Sewage Pumping Stations	6	7	11	12
Sewage Pumping Stations (other ownership)	0	1	1	3
NIW Water Treatment Works	0	0	0	0
NIW Treated Water Pumping Stations	0	1	1	4
NIE Substation 6 to 11kV	12	28	37	128
NIE Substation 33kV	1	2	3	3
NIE Substation 110kV	0	0	0	1
NIE Substation 275kV	0	0	0	0
*DfI Roads - Trunk Road length (Km)	0.8	2.5	4.9	23.7
Environmental Designated sites (Number)	2	2	2	3
AONB	1	1	1	1
ASSI	0	0	0	1
Environmentally Sensitive Areas	1	1	1	1
Maritime Nature Reserve	0	0	0	0
Nature Reserve	0	0	0	0
RAMSAR	0	0	0	0
SAC	0	0	0	0
Sites of Local Conservation Importance	0	0	0	0
SPA	0	0	0	0
RSPB Reserve	0	0	0	0
UWT Nature Reserve	0	0	0	0
Built Heritage Sites (Number)	12	51	100	211
National Trust	0	0	0	0
Listed Buildings	10	47	96	177
Sites and Monuments	2	3	3	31
Buildings of Special Architectural or Historical interest	0	1	1	3
Areas of Significant Archaeological Interest	0	0	0	0
Historic Parks & Gardens	0	0	0	0

Table 5.3-6: Potential Adverse Consequences - **Fluvial Flooding**					
Newry APSFR	**Flood Event % AEP**				**Total Count within APSFR**
	10% AEP	**4% AEP**	**1% AEP**	**0.1% AEP**	
Residential (Number)	29	52	429	911	9,343
Non-Residential (Number)	165	362	975	1129	1,817
Economic Damage (£)	£3,242K	£10,721K	£100,798K	£293,193K	
Annual Average Damage (£)	£4,292K				
Present Value (£)	£127,959K				
IPPC sites (Number)	0	0	3	3	8
IPPC sites	0	0	3	3	8
Community Assets (Number)	1	1	10	10	39
Care Homes (Nursing + Residential)	0	0	0	0	6
GP Surgeries	0	0	7	7	8
Fire Stations	0	0	1	1	1
Hospitals	0	0	0	0	1
Police Stations	0	0	0	0	1
Schools	1	1	2	2	22
Key Infrastructure (Number)	4	12	47	64	153
NIW Wastewater Treatment Works	0	0	1	1	1
Wastewater Treatment Works (other ownership)	0	0	0	0	1
NIW Sewage Pumping Stations	1	2	6	10	12
Sewage Pumping Stations (other ownership)	0	0	1	1	3
NIW Water Treatment Works	0	0	0	0	0
NIW Treated Water Pumping Stations	0	0	0	0	4
NIE Substation 6 to 11kV	3	10	38	51	128
NIE Substation 33kV	0	0	1	1	3
NIE Substation 110kV	0	0	0	0	1
NIE Substation 275kV	0	0	0	0	0
*DfI Roads - Trunk Road length (Km)	0.4	0.4	2.7	5.4	23.7
Environmental Designated sites (Number)	2	2	2	2	3
AONB	1	1	1	1	1
ASSI	0	0	0	0	1
Environmentally Sensitive Areas	1	1	1	1	1
Maritime Nature Reserve	0	0	0	0	0
Nature Reserve	0	0	0	0	0
RAMSAR	0	0	0	0	0
SAC	0	0	0	0	0
Sites of Local Conservation Importance	0	0	0	0	0
SPA	0	0	0	0	0
RSPB Reserve	0	0	0	0	0
UWT Nature Reserve	0	0	0	0	0
Built Heritage Sites (Number)	14	23	80	121	211
National Trust	0	0	0	0	0
Listed Buildings	13	22	78	119	177
Sites and Monuments	1	1	2	2	31
Buildings of Special Architectural or Historical interest	0	0	0	0	3
Areas of Significant Archaeological Interest	0	0	0	0	0
Historic Parks & Gardens	0	0	0	0	0

Table 5.3-7: Potential Adverse Consequences - **Tidal Flooding**

Newry APSFR	Flood Event % AEP				Total Count within APSFR
	10% AEP	2% AEP	0.5% AEP	0.1% AEP	
Residential (Number)	2	2	31	56	9,343
Non-Residential (Number)	16	23	147	261	1,817
Economic Damage (£)	£321K	£442K	£853K	£4,766K	
Annual Average Damage (£)	£186K				
Present Value (£)	£5,545K				
IPPC sites (Number)	0	0	0	0	8
IPPC sites	0	0	0	0	8
Community Assets (Number)	0	0	0	0	39
Care Homes (Nursing + Residential)	0	0	0	0	6
GP Surgeries	0	0	0	0	8
Fire Stations	0	0	0	0	1
Hospitals	0	0	0	0	1
Police Stations	0	0	0	0	1
Schools	0	0	0	0	22
Key Infrastructure (Number)	4	6	9	17	153
NIW Wastewater Treatment Works	0	0	0	0	1
Wastewater Treatment Works (other ownership)	0	0	0	0	1
NIW Sewage Pumping Stations	1	2	3	4	12
Sewage Pumping Stations (other ownership)	0	0	0	0	3
NIW Water Treatment Works	0	0	0	0	0
NIW Treated Water Pumping Stations	0	0	0	0	4
NIE Substation 6 to 11kV	3	4	6	12	128
NIE Substation 33kV	0	0	0	1	3
NIE Substation 110kV	0	0	0	0	1
NIE Substation 275kV	0	0	0	0	0
*DfI Roads - Trunk Road length (Km)	0.0	0.0	0.0	0.0	23.7
Environmental Designated sites (Number)	2	2	2	2	3
AONB	1	1	1	1	1
ASSI	0	0	0	0	1
Environmentally Sensitive Areas	1	1	1	1	1
Maritime Nature Reserve	0	0	0	0	0
Nature Reserve	0	0	0	0	0
RAMSAR	0	0	0	0	0
SAC	0	0	0	0	0
Sites of Local Conservation Importance	0	0	0	0	0
SPA	0	0	0	0	0
RSPB Reserve	0	0	0	0	0
UWT Nature Reserve	0	0	0	0	0
Built Heritage Sites (Number)	1	1	1	4	211
National Trust	0	0	0	0	0
Listed Buildings	1	1	1	4	177
Sites and Monuments	0	0	0	0	31
Buildings of Special Architectural or Historical interest	0	0	0	0	3
Areas of Significant Archaeological Interest	0	0	0	0	0
Historic Parks & Gardens	0	0	0	0	0

Table 5.4-5: Potential Adverse Consequences - **Pluvial Flooding**

Lurgan APSFR	Flood Event % AEP			Total Count within APSFR
	3.3% AEP	0.5% AEP	0.1% AEP	
Residential (Number)	674	1,451	2,343	10,053
Non-Residential (Number)	174	338	507	1,311
Economic Damage (£)	£41,650K	£59,935K	£87,425K	
Annual Average Damage (£)	£3,391K			
Present Value (£)	£101,090K			
IPPC sites (Number)	1	1	1	2
IPPC sites	1	1	1	2
Community Assets (Number)	1	2	6	23
Care Homes (Nursing + Residential)	1	1	1	2
GP Surgeries	0	0	1	6
Fire Stations	0	0	1	1
Hospitals	0	0	0	0
Police Stations	0	1	1	1
Schools	0	0	2	13
Key Infrastructure (Number)	11	15	19	125
NIW Wastewater Treatment Works	0	0	0	0
Wastewater Treatment Works (other ownership)	0	0	0	0
NIW Sewage Pumping Stations	1	1	2	5
Sewage Pumping Stations (other ownership)	1	1	2	2
NIW Water Treatment Works	0	0	0	0
NIW Treated Water Pumping Stations	0	0	0	0
NIE Substation 6 to 11kV	8	12	14	113
NIE Substation 33kV	0	0	0	4
NIE Substation 110kV	1	1	1	1
NIE Substation 275kV	0	0	0	0
*DfI Roads - Trunk Road length (Km)	0.0	0.0	0.0	0.0
Environmental Designated sites (Number)	2	2	3	3
AONB	0	0	0	0
ASSI	0	0	0	0
Environmentally Sensitive Areas	0	0	0	0
Maritime Nature Reserve	0	0	0	0
Nature Reserve	0	0	0	0
RAMSAR	1	1	1	1
SAC	0	0	0	0
Sites of Local Conservation Importance	1	1	2	2
SPA	0	0	0	0
RSPB Reserve	0	0	0	0
UWT Nature Reserve	0	0	0	0
Built Heritage Sites (Number)	6	15	21	98
National Trust	0	0	0	0
Listed Buildings	5	13	18	83
Sites and Monuments	0	1	2	14
Buildings of Special Architectural or Historical interest	0	0	0	0
Areas of Significant Archaeological Interest	0	0	0	0
Historic Parks & Gardens	1	1	1	1

Table 5.4-6: Potential Adverse Consequences - **Fluvial Flooding**

Lurgan APSFR	**Flood Event % AEP**				**Total Count within APSFR**
	10% AEP	**4% AEP**	**1% AEP**	**0.1% AEP**	
Residential (Number)	0	109	214	409	10,053
Non-Residential (Number)	0	3	3	17	1,311
Economic Damage (£)	£0K	£467K	£1,251K	£3,927K	
Annual Average Damage (£)	£97K				
Present Value (£)	£2,877K				
IPPC sites (Number)	0	0	0	0	2
IPPC sites	0	0	0	0	2
Community Assets (Number)	0	0	0	0	23
Care Homes (Nursing + Residential)	0	0	0	0	2
GP Surgeries	0	0	0	0	6
Fire Stations	0	0	0	0	1
Hospitals	0	0	0	0	0
Police Stations	0	0	0	0	1
Schools	0	0	0	0	13
Key Infrastructure (Number)	0	2	3	9	125
NIW Wastewater Treatment Works	0	0	0	0	0
Wastewater Treatment Works (other ownership)	0	0	0	0	0
NIW Sewage Pumping Stations	0	1	1	3	5
Sewage Pumping Stations (other ownership)	0	0	0	0	2
NIW Water Treatment Works	0	0	0	0	0
NIW Treated Water Pumping Stations	0	0	0	0	0
NIE Substation 6 to 11kV	0	1	2	6	113
NIE Substation 33kV	0	0	0	0	4
NIE Substation 110kV	0	0	0	0	1
NIE Substation 275kV	0	0	0	0	0
*DfI Roads - Trunk Road length (Km)	0.0	0.0	0.0	0.0	0.0
Environmental Designated sites (Number)	2	2	2	2	3
AONB	0	0	0	0	0
ASSI	0	0	0	0	0
Environmentally Sensitive Areas	0	0	0	0	0
Maritime Nature Reserve	0	0	0	0	0
Nature Reserve	0	0	0	0	0
RAMSAR	1	1	1	1	1
SAC	0	0	0	0	0
Sites of Local Conservation Importance	1	1	1	1	2
SPA	0	0	0	0	0
RSPB Reserve	0	0	0	0	0
UWT Nature Reserve	0	0	0	0	0
Built Heritage Sites (Number)	1	1	1	1	98
National Trust	0	0	0	0	0
Listed Buildings	0	0	0	0	83
Sites and Monuments	0	0	0	0	14
Buildings of Special Architectural or Historical interest	0	0	0	0	0
Areas of Significant Archaeological Interest	0	0	0	0	0
Historic Parks & Gardens	1	1	1	1	1

Table 5.5-5: Potential Adverse Consequences - **Pluvial Flooding**				
Glengormley & Mallusk APSFR	**Flood Event % AEP**			**Total Count within APSFR**
	3.3% AEP	**0.5% AEP**	**0.1% AEP**	
Residential (Number)	411	1,172	2,065	8,782
Non-Residential (Number)	173	333	451	947
Economic Damage (£)	£25,588K	£71,394K	£117,766K	
Annual Average Damage (£)	£2,840K			
Present Value (£)	£84,679K			
IPPC sites (Number)	3	3	3	3
IPPC sites	3	3	3	3
Community Assets (Number)	1	3	3	25
Care Homes (Nursing + Residential)	0	1	1	5
GP Surgeries	1	1	1	3
Fire Stations	0	0	0	1
Hospitals	0	0	0	0
Police Stations	0	0	0	0
Schools	0	1	1	16
Key Infrastructure (Number)	9	26	32	121
NIW Wastewater Treatment Works	0	0	0	0
Wastewater Treatment Works (other ownership)	0	0	0	0
NIW Sewage Pumping Stations	1	2	2	4
Sewage Pumping Stations (other ownership)	0	0	0	0
NIW Water Treatment Works	0	0	0	0
NIW Treated Water Pumping Stations	0	1	1	2
NIE Substation 6 to 11kV	8	23	29	112
NIE Substation 33kV	0	0	0	1
NIE Substation 110kV	0	0	0	2
NIE Substation 275kV	0	0	0	0
*DfI Roads - Trunk Road length (Km)	0.4	1.1	1.5	11.5
Environmental Designated sites (Number)	1	1	2	3
AONB	0	0	0	0
ASSI	0	0	0	0
Environmentally Sensitive Areas	0	0	0	0
Maritime Nature Reserve	0	0	0	0
Nature Reserve	0	0	0	0
RAMSAR	0	0	0	0
SAC	0	0	0	0
Sites of Local Conservation Importance	1	1	2	3
SPA	0	0	0	0
RSPB Reserve	0	0	0	0
UWT Nature Reserve	0	0	0	0
Built Heritage Sites (Number)	1	2	5	38
National Trust	0	0	0	0
Listed Buildings	0	0	0	12
Sites and Monuments	1	2	5	26
Buildings of Special Architectural or Historical interest	0	0	0	0
Areas of Significant Archaeological Interest	0	0	0	0
Historic Parks & Gardens	0	0	0	0

Table 5.5-6: Potential Adverse Consequences - **Fluvial Flooding**

Glengormley & Mallusk APSFR	Flood Event % AEP				Total Count within APSFR
	10% AEP	4% AEP	1% AEP	0.1% AEP	
Residential (Number)	40	53	143	387	8,782
Non-Residential (Number)	25	38	76	119	947
Economic Damage (£)	£99K	£266K	£2,101K	£7,232K	
Annual Average Damage (£)	£135K				
Present Value (£)	£4,029K				
IPPC sites (Number)	0	1	1	2	3
IPPC sites	0	1	1	2	3
Community Assets (Number)	0	0	0	0	25
Care Homes (Nursing + Residential)	0	0	0	0	5
GP Surgeries	0	0	0	0	3
Fire Stations	0	0	0	0	1
Hospitals	0	0	0	0	0
Police Stations	0	0	0	0	0
Schools	0	0	0	0	16
Key Infrastructure (Number)	3	4	7	13	121
NIW Wastewater Treatment Works	0	0	0	0	0
Wastewater Treatment Works (other ownership)	0	0	0	0	0
NIW Sewage Pumping Stations	0	1	1	2	4
Sewage Pumping Stations (other ownership)	0	0	0	0	0
NIW Water Treatment Works	0	0	0	0	0
NIW Treated Water Pumping Stations	0	0	0	0	2
NIE Substation 6 to 11kV	3	3	6	11	112
NIE Substation 33kV	0	0	0	0	1
NIE Substation 110kV	0	0	0	0	2
NIE Substation 275kV	0	0	0	0	0
*DfI Roads - Trunk Road length (Km)	0.0	0.0	0.0	0.0	11.5
Environmental Designated sites (Number)	0	0	0	1	3
AONB	0	0	0	0	0
ASSI	0	0	0	0	0
Environmentally Sensitive Areas	0	0	0	0	0
Maritime Nature Reserve	0	0	0	0	0
Nature Reserve	0	0	0	0	0
RAMSAR	0	0	0	0	0
SAC	0	0	0	0	0
Sites of Local Conservation Importance	0	0	0	1	3
SPA	0	0	0	0	0
RSPB Reserve	0	0	0	0	0
UWT Nature Reserve	0	0	0	0	0
Built Heritage Sites (Number)	0	1	2	2	38
National Trust	0	0	0	0	0
Listed Buildings	0	0	0	0	12
Sites and Monuments	0	1	2	2	26
Buildings of Special Architectural or Historical interest	0	0	0	0	0
Areas of Significant Archaeological Interest	0	0	0	0	0
Historic Parks & Gardens	0	0	0	0	0

Table 5.6-4: Potential Adverse Consequences - **Pluvial Flooding**

Larne APSFR	Flood Event % AEP			Total Count within APSFR
	3.3% AEP	0.5% AEP	0.1% AEP	
Residential (Number)	607	1,109	1,905	8,209
Non-Residential (Number)	295	450	544	903
Economic Damage (£)	£29,403K	£54,724K	£85,857K	
Annual Average Damage (£)	£2,703K			
Present Value (£)	£80,571K			
IPPC sites (Number)	1	1	2	2
IPPC sites	1	1	2	2
Community Assets (Number)	5	7	9	25
Care Homes (Nursing + Residential)	0	1	2	3
GP Surgeries	2	2	2	5
Fire Stations	0	0	0	1
Hospitals	0	0	0	1
Police Stations	1	1	1	1
Schools	2	3	4	14
Key Infrastructure (Number)	17	23	26	98
NIW Wastewater Treatment Works	0	0	0	1
Wastewater Treatment Works (other ownership)	0	0	0	0
NIW Sewage Pumping Stations	3	3	3	9
Sewage Pumping Stations (other ownership)	0	0	0	0
NIW Water Treatment Works	0	0	0	0
NIW Treated Water Pumping Stations	0	0	0	0
NIE Substation 6 to 11kV	14	20	23	87
NIE Substation 33kV	0	0	0	1
NIE Substation 110kV	0	0	0	0
NIE Substation 275kV	0	0	0	0
*DfI Roads - Trunk Road length (Km)	0.3	0.8	1.2	6.5
Environmental Designated sites (Number)	6	6	6	6
AONB	1	1	1	1
ASSI	2	2	2	2
Environmentally Sensitive Areas	1	1	1	1
Maritime Nature Reserve	0	0	0	0
Nature Reserve	0	0	0	0
RAMSAR	1	1	1	1
SAC	0	0	0	0
Sites of Local Conservation Importance	0	0	0	0
SPA	1	1	1	1
RSPB Reserve	0	0	0	0
UWT Nature Reserve	0	0	0	0
Built Heritage Sites (Number)	6	12	20	64
National Trust	0	0	0	0
Listed Buildings	1	6	11	34
Sites and Monuments	3	4	6	27
Buildings of Special Architectural or Historical interest	1	1	1	1
Areas of Significant Archaeological Interest	0	0	0	0
Historic Parks & Gardens	1	1	2	2

Table 5.6-5: Potential Adverse Consequences - **Fluvial Flooding**

Larne APSFR	Flood Event % AEP				Total Count within APSFR
	10% AEP	4% AEP	1% AEP	0.1% AEP	
Residential (Number)	31	35	50	77	8,209
Non-Residential (Number)	11	11	19	127	903
Economic Damage (£)	£187K	£233K	£428K	£5,826K	
Annual Average Damage (£)	£92K				
Present Value (£)	£2,746K				
IPPC sites (Number)	0	0	0	0	2
IPPC sites	0	0	0	0	2
Community Assets (Number)	0	0	0	0	25
Care Homes (Nursing + Residential)	0	0	0	0	3
GP Surgeries	0	0	0	0	5
Fire Stations	0	0	0	0	1
Hospitals	0	0	0	0	1
Police Stations	0	0	0	0	1
Schools	0	0	0	0	14
Key Infrastructure (Number)	0	0	0	8	98
NIW Wastewater Treatment Works	0	0	0	0	1
Wastewater Treatment Works (other ownership)	0	0	0	0	0
NIW Sewage Pumping Stations	0	0	0	1	9
Sewage Pumping Stations (other ownership)	0	0	0	0	0
NIW Water Treatment Works	0	0	0	0	0
NIW Treated Water Pumping Stations	0	0	0	0	0
NIE Substation 6 to 11kV	0	0	0	7	87
NIE Substation 33kV	0	0	0	0	1
NIE Substation 110kV	0	0	0	0	0
NIE Substation 275kV	0	0	0	0	0
*DfI Roads - Trunk Road length (Km)	0.1	0.1	0.1	0.2	6.5
Environmental Designated sites (Number)	0	0	0	0	6
AONB	0	0	0	0	1
ASSI	0	0	0	0	2
Environmentally Sensitive Areas	0	0	0	0	1
Maritime Nature Reserve	0	0	0	0	0
Nature Reserve	0	0	0	0	0
RAMSAR	0	0	0	0	1
SAC	0	0	0	0	0
Sites of Local Conservation Importance	0	0	0	0	0
SPA	0	0	0	0	1
RSPB Reserve	0	0	0	0	0
UWT Nature Reserve	0	0	0	0	0
Built Heritage Sites (Number)	0	0	0	0	64
National Trust	0	0	0	0	0
Listed Buildings	0	0	0	0	34
Sites and Monuments	0	0	0	0	27
Buildings of Special Architectural or Historical interest	0	0	0	0	1
Areas of Significant Archaeological Interest	0	0	0	0	0
Historic Parks & Gardens	0	0	0	0	2

Table 5.6-6: Potential Adverse Consequences - **Tidal Flooding**

Larne APSFR	Flood Event % AEP				Total Count within APSFR
	10% AEP	2% AEP	0.5% AEP	0.1% AEP	
Residential (Number)	5	N/A	29	50	8,209
Non-Residential (Number)	18	N/A	74	114	903
Economic Damage (£)	£48K	N/A	£4,543K	£9,838K	
Annual Average Damage (£)	£279K				
Present Value (£)	£8,323K				
IPPC sites (Number)	0	N/A	2	2	2
IPPC sites	0	N/A	2	2	2
Community Assets (Number)	0	N/A	1	1	25
Care Homes (Nursing + Residential)	0	N/A	0	0	3
GP Surgeries	0	N/A	0	0	5
Fire Stations	0	N/A	0	0	1
Hospitals	0	N/A	0	0	1
Police Stations	0	N/A	1	1	1
Schools	0	N/A	0	0	14
Key Infrastructure (Number)	1	N/A	8	13	98
NIW Wastewater Treatment Works	1	N/A	1	1	1
Wastewater Treatment Works (other ownership)	0	N/A	0	0	0
NIW Sewage Pumping Stations	0	N/A	0	0	9
Sewage Pumping Stations (other ownership)	0	N/A	0	0	0
NIW Water Treatment Works	0	N/A	0	0	0
NIW Treated Water Pumping Stations	0	N/A	0	0	0
NIE Substation 6 to 11kV	0	N/A	7	12	87
NIE Substation 33kV	0	N/A	0	0	1
NIE Substation 110kV	0	N/A	0	0	0
NIE Substation 275kV	0	N/A	0	0	0
*DfI Roads - Trunk Road length (Km)	0.0	N/A	0.0	0.1	6.5
Environmental Designated sites (Number)	4	N/A	4	4	6
AONB	0	N/A	0	0	1
ASSI	2	N/A	2	2	2
Environmentally Sensitive Areas	0	N/A	0	0	1
Maritime Nature Reserve	0	N/A	0	0	0
Nature Reserve	0	N/A	0	0	0
RAMSAR	1	N/A	1	1	1
SAC	0	N/A	0	0	0
Sites of Local Conservation Importance	0	N/A	0	0	0
SPA	1	N/A	1	1	1
RSPB Reserve	0	N/A	0	0	0
UWT Nature Reserve	0	N/A	0	0	0
Built Heritage Sites (Number)	0	N/A	1	1	64
National Trust	0	N/A	0	0	0
Listed Buildings	0	N/A	1	1	34
Sites and Monuments	0	N/A	0	0	27
Buildings of Special Architectural or Historical interest	0	N/A	0	0	1
Areas of Significant Archaeological Interest	0	N/A	0	0	0
Historic Parks & Gardens	0	N/A	0	0	2

Table 5.7-5: Potential Adverse Consequences - **Pluvial Flooding**

Bangor APSFR	**Flood Event % AEP**			**Total Count within APSFR**
	3.3% AEP	**0.5% AEP**	**0.1% AEP**	
Residential (Number)	999	2,441	4,010	23,214
Non-Residential (Number)	257	455	653	1,649
Economic Damage (£)	£26,577K	£60,880K	£108,448K	
Annual Average Damage (£)		£2,844K		
Present Value (£)		£84,799K		
IPPC sites (Number)	1	1	1	1
IPPC sites	1	1	1	1
Community Assets (Number)	2	3	3	61
Care Homes (Nursing + Residential)	0	0	0	18
GP Surgeries	0	0	0	10
Fire Stations	1	1	1	1
Hospitals	0	1	1	1
Police Stations	0	0	0	1
Schools	1	1	1	30
Key Infrastructure (Number)	20	40	58	254
NIW Wastewater Treatment Works	0	0	0	0
Wastewater Treatment Works (other ownership)	0	0	0	0
NIW Sewage Pumping Stations	4	7	7	9
Sewage Pumping Stations (other ownership)	1	1	1	1
NIW Water Treatment Works	0	0	0	0
NIW Treated Water Pumping Stations	0	0	0	0
NIE Substation 6 to 11kV	15	30	48	240
NIE Substation 33kV	0	2	2	3
NIE Substation 110kV	0	0	0	1
NIE Substation 275kV	0	0	0	0
*DfI Roads - Trunk Road length (Km)	0.5	1.7	3.3	19.4
Environmental Designated sites (Number)	8	8	8	8
AONB	0	0	0	0
ASSI	1	1	1	1
Environmentally Sensitive Areas	0	0	0	0
Maritime Nature Reserve	0	0	0	0
Nature Reserve	0	0	0	0
RAMSAR	1	1	1	1
SAC	0	0	0	0
Sites of Local Conservation Importance	5	5	5	5
SPA	1	1	1	1
RSPB Reserve	0	0	0	0
UWT Nature Reserve	0	0	0	0
Built Heritage Sites (Number)	2	6	7	74
National Trust	0	0	0	0
Listed Buildings	0	0	0	52
Sites and Monuments	0	2	3	16
Buildings of Special Architectural or Historical interest	0	1	1	3
Areas of Significant Archaeological Interest	0	0	0	0
Historic Parks & Gardens	2	3	3	3

Table 5.7-6: Potential Adverse Consequences - **Fluvial Flooding**

Bangor APSFR	Flood Event % AEP				Total Count within APSFR
	10% AEP	4% AEP	1% AEP	0.1% AEP	
Residential (Number)	31	83	185	454	23,214
Non-Residential (Number)	9	14	19	45	1,649
Economic Damage (£)	£121K	£423K	£2,048K	£9,999K	
Annual Average Damage (£)	£179K				
Present Value (£)	£5,327K				
IPPC sites (Number)	0	0	0	0	1
IPPC sites	0	0	0	0	1
Community Assets (Number)	0	0	0	0	61
Care Homes (Nursing + Residential)	0	0	0	0	18
GP Surgeries	0	0	0	0	10
Fire Stations	0	0	0	0	1
Hospitals	0	0	0	0	1
Police Stations	0	0	0	0	1
Schools	0	0	0	0	30
Key Infrastructure (Number)	8	9	10	15	254
NIW Wastewater Treatment Works	0	0	0	0	0
Wastewater Treatment Works (other ownership)	0	0	0	0	0
NIW Sewage Pumping Stations	4	4	4	5	9
Sewage Pumping Stations (other ownership)	0	0	0	0	1
NIW Water Treatment Works	0	0	0	0	0
NIW Treated Water Pumping Stations	0	0	0	0	0
NIE Substation 6 to 11kV	3	4	5	9	240
NIE Substation 33kV	1	1	1	1	3
NIE Substation 110kV	0	0	0	0	1
NIE Substation 275kV	0	0	0	0	0
*DfI Roads - Trunk Road length (Km)	0.0	0.0	0.0	0.2	19.4
Environmental Designated sites (Number)	5	5	5	5	8
AONB	0	0	0	0	0
ASSI	1	1	1	1	1
Environmentally Sensitive Areas	0	0	0	0	0
Maritime Nature Reserve	0	0	0	0	0
Nature Reserve	0	0	0	0	0
RAMSAR	1	1	1	1	1
SAC	0	0	0	0	0
Sites of Local Conservation Importance	2	2	2	2	5
SPA	1	1	1	1	1
RSPB Reserve	0	0	0	0	0
UWT Nature Reserve	0	0	0	0	0
Built Heritage Sites (Number)	1	1	1	1	74
National Trust	0	0	0	0	0
Listed Buildings	0	0	0	0	52
Sites and Monuments	1	1	1	1	16
Buildings of Special Architectural or Historical interest	0	0	0	0	3
Areas of Significant Archaeological Interest	0	0	0	0	0
Historic Parks & Gardens	0	0	0	0	3

Table 5.8-5: Potential Adverse Consequences - **Pluvial Flooding**

Portadown/Craigavon APSFR	Flood Event % AEP			Total Count within APSFR
	3.3% AEP	0.5% AEP	0.1% AEP	
Residential (Number)	382	1,009	1,990	11,930
Non-Residential (Number)	158	399	685	1,906
Economic Damage (£)	£20,890K	£44,893K	£73,819K	
Annual Average Damage (£)	£2,048K			
Present Value (£)	£61,067K			
IPPC sites (Number)	3	3	4	4
IPPC sites	3	3	4	4
Community Assets (Number)	1	9	9	35
Care Homes (Nursing + Residential)	0	0	0	7
GP Surgeries	0	7	7	8
Fire Stations	0	0	0	1
Hospitals	1	1	1	1
Police Stations	0	1	1	1
Schools	0	0	0	17
Key Infrastructure (Number)	8	20	32	177
NIW Wastewater Treatment Works	0	0	0	0
Wastewater Treatment Works (other ownership)	0	0	0	1
NIW Sewage Pumping Stations	3	4	5	11
Sewage Pumping Stations (other ownership)	0	0	0	2
NIW Water Treatment Works	0	0	0	0
NIW Treated Water Pumping Stations	0	0	0	0
NIE Substation 6 to 11kV	5	16	27	157
NIE Substation 33kV	0	0	0	5
NIE Substation 110kV	0	0	0	1
NIE Substation 275kV	0	0	0	0
*DfI Roads - Trunk Road length (Km)	0.8	1.7	2.2	9.1
Environmental Designated sites (Number)	3	3	3	3
AONB	0	0	0	0
ASSI	2	2	2	2
Environmentally Sensitive Areas	0	0	0	0
Maritime Nature Reserve	0	0	0	0
Nature Reserve	1	1	1	1
RAMSAR	0	0	0	0
SAC	0	0	0	0
Sites of Local Conservation Importance	0	0	0	0
SPA	0	0	0	0
RSPB Reserve	0	0	0	0
UWT Nature Reserve	0	0	0	0
Built Heritage Sites (Number)	0	1	2	78
National Trust	0	0	0	0
Listed Buildings	0	0	0	63
Sites and Monuments	0	1	2	14
Buildings of Special Architectural or Historical interest	0	0	0	0
Areas of Significant Archaeological Interest	0	0	0	0
Historic Parks & Gardens	0	0	0	1

Table 5.8-6: Potential Adverse Consequences - **Fluvial Flooding**

Portadown/Craigavon APSFR	Flood Event % AEP				Total Count within APSFR
	10% AEP	4% AEP	1% AEP	0.1% AEP	
Residential (Number)	24	57	288	747	11,930
Non-Residential (Number)	37	60	106	194	1,906
Economic Damage (£)	£2,985K	£6,038K	£15,558K	£50,391K	
Annual Average Damage (£)	£2,223K				
Present Value (£)	£66,276K				
IPPC sites (Number)	1	1	1	1	4
IPPC sites	1	1	1	1	4
Community Assets (Number)	7	7	7	7	35
Care Homes (Nursing + Residential)	0	0	0	0	7
GP Surgeries	7	7	7	7	8
Fire Stations	0	0	0	0	1
Hospitals	0	0	0	0	1
Police Stations	0	0	0	0	1
Schools	0	0	0	0	17
Key Infrastructure (Number)	7	11	17	25	177
NIW Wastewater Treatment Works	0	0	0	0	0
Wastewater Treatment Works (other ownership)	0	0	0	0	1
NIW Sewage Pumping Stations	3	5	7	7	11
Sewage Pumping Stations (other ownership)	0	0	0	0	2
NIW Water Treatment Works	0	0	0	0	0
NIW Treated Water Pumping Stations	0	0	0	0	0
NIE Substation 6 to 11kV	4	6	10	18	157
NIE Substation 33kV	0	0	0	0	5
NIE Substation 110kV	0	0	0	0	1
NIE Substation 275kV	0	0	0	0	0
*DfI Roads - Trunk Road length (Km)	0.8	0.1	0.1	0.2	9.1
Environmental Designated sites (Number)	3	3	3	3	3
AONB	0	0	0	0	0
ASSI	2	2	2	2	2
Environmentally Sensitive Areas	0	0	0	0	0
Maritime Nature Reserve	0	0	0	0	0
Nature Reserve	1	1	1	1	1
RAMSAR	0	0	0	0	0
SAC	0	0	0	0	0
Sites of Local Conservation Importance	0	0	0	0	0
SPA	0	0	0	0	0
RSPB Reserve	0	0	0	0	0
UWT Nature Reserve	0	0	0	0	0
Built Heritage Sites (Number)	1	1	3	3	78
National Trust	0	0	0	0	0
Listed Buildings	0	0	1	1	63
Sites and Monuments	1	1	2	2	14
Buildings of Special Architectural or Historical interest	0	0	0	0	0
Areas of Significant Archaeological Interest	0	0	0	0	0
Historic Parks & Gardens	0	0	0	0	1

Table 5.9-5: Potential Adverse Consequences - **Pluvial Flooding**

Omagh APSFR	Flood Event % AEP			Total Count within APSFR
	3.3% AEP	0.5% AEP	0.1% AEP	
Residential (Number)	150	424	719	5,675
Non-Residential (Number)	114	251	377	1,304
Economic Damage (£)	£4,074K	£13,040K	£26,415K	
Annual Average Damage (£)	£527K			
Present Value (£)	£15,711K			
IPPC sites (Number)	1	1	2	2
IPPC sites	1	1	2	2
Community Assets (Number)	0	0	1	21
Care Homes (Nursing + Residential)	0	0	0	8
GP Surgeries	0	0	0	0
Fire Stations	0	0	1	1
Hospitals	0	0	0	0
Police Stations	0	0	0	1
Schools	0	0	0	11
Key Infrastructure (Number)	10	15	23	111
NIW Wastewater Treatment Works	0	0	0	0
Wastewater Treatment Works (other ownership)	0	0	0	0
NIW Sewage Pumping Stations	4	6	7	12
Sewage Pumping Stations (other ownership)	0	0	0	0
NIW Water Treatment Works	0	0	0	0
NIW Treated Water Pumping Stations	0	0	0	0
NIE Substation 6 to 11kV	4	7	14	97
NIE Substation 33kV	2	2	2	2
NIE Substation 110kV	0	0	0	0
NIE Substation 275kV	0	0	0	0
*DfI Roads - Trunk Road length (Km)	0.3	0.7	1.2	9.6
Environmental Designated sites (Number)	0	0	0	0
AONB	0	0	0	0
ASSI	0	0	0	0
Environmentally Sensitive Areas	0	0	0	0
Maritime Nature Reserve	0	0	0	0
Nature Reserve	0	0	0	0
RAMSAR	0	0	0	0
SAC	0	0	0	0
Sites of Local Conservation Importance	0	0	0	0
SPA	0	0	0	0
RSPB Reserve	0	0	0	0
UWT Nature Reserve	0	0	0	0
Built Heritage Sites (Number)	2	3	3	62
National Trust	0	0	0	0
Listed Buildings	0	1	1	47
Sites and Monuments	0	0	0	12
Buildings of Special Architectural or Historical interest	0	0	0	0
Areas of Significant Archaeological Interest	0	0	0	0
Historic Parks & Gardens	2	2	2	3

Table 5.9-6: Potential Adverse Consequences - **Fluvial Flooding**

Omagh APSFR	Flood Event % AEP				Total Count within APSFR
	10% AEP	4% AEP	1% AEP	0.1% AEP	
Residential (Number)	27	17	279	617	5,675
Non-Residential (Number)	26	31	365	441	1,304
Economic Damage (£)	£891K	£1,505K	£66,715K	£111,774K	
Annual Average Damage (£)	£2,000K				
Present Value (£)	£59,613K				
IPPC sites (Number)	0	0	1	2	2
IPPC sites	0	0	1	2	2
Community Assets (Number)	0	0	2	2	21
Care Homes (Nursing + Residential)	0	0	1	1	8
GP Surgeries	0	0	0	0	0
Fire Stations	0	0	0	0	1
Hospitals	0	0	0	0	0
Police Stations	0	0	0	0	1
Schools	0	0	1	1	11
Key Infrastructure (Number)	5	5	24	33	111
NIW Wastewater Treatment Works	0	0	0	0	0
Wastewater Treatment Works (other ownership)	0	0	0	0	0
NIW Sewage Pumping Stations	4	4	7	8	12
Sewage Pumping Stations (other ownership)	0	0	0	0	0
NIW Water Treatment Works	0	0	0	0	0
NIW Treated Water Pumping Stations	0	0	0	0	0
NIE Substation 6 to 11kV	1	1	17	24	97
NIE Substation 33kV	0	0	0	1	2
NIE Substation 110kV	0	0	0	0	0
NIE Substation 275kV	0	0	0	0	0
*DfI Roads - Trunk Road length (Km)	0.1	0.2	0.6	2.1	9.6
Environmental Designated sites (Number)	0	0	0	0	0
AONB	0	0	0	0	0
ASSI	0	0	0	0	0
Environmentally Sensitive Areas	0	0	0	0	0
Maritime Nature Reserve	0	0	0	0	0
Nature Reserve	0	0	0	0	0
RAMSAR	0	0	0	0	0
SAC	0	0	0	0	0
Sites of Local Conservation Importance	0	0	0	0	0
SPA	0	0	0	0	0
RSPB Reserve	0	0	0	0	0
UWT Nature Reserve	0	0	0	0	0
Built Heritage Sites (Number)	1	2	11	15	62
National Trust	0	0	0	0	0
Listed Buildings	0	0	8	11	47
Sites and Monuments	0	0	1	2	12
Buildings of Special Architectural or Historical interest	0	0	0	0	0
Areas of Significant Archaeological Interest	0	0	0	0	0
Historic Parks & Gardens	1	2	2	2	3

Table 5.10-5: Potential Adverse Consequences - **Pluvial Flooding**				
Newtownabbey APSFR	**Flood Event % AEP**			**Total Count within APSFR**
	3.3% AEP	**0.5% AEP**	**0.1% AEP**	
Residential (Number)	791	1,954	3,500	15,137
Non-Residential (Number)	150	234	334	811
Economic Damage (£)	£16,603K	£35,334K	£62,649K	
Annual Average Damage (£)	£1,769K			
Present Value (£)	£52,740K			
IPPC sites (Number)	2	2	2	2
IPPC sites	2	2	2	2
Community Assets (Number)	9	11	12	38
Care Homes (Nursing + Residential)	2	2	2	10
GP Surgeries	0	0	0	4
Fire Stations	0	0	0	0
Hospitals	1	1	1	1
Police Stations	2	2	2	2
Schools	4	6	7	21
Key Infrastructure (Number)	8	17	30	155
NIW Wastewater Treatment Works	0	0	0	0
Wastewater Treatment Works (other ownership)	0	0	0	0
NIW Sewage Pumping Stations	1	1	1	7
Sewage Pumping Stations (other ownership)	0	0	0	0
NIW Water Treatment Works	0	0	0	0
NIW Treated Water Pumping Stations	0	0	0	1
NIE Substation 6 to 11kV	7	16	29	145
NIE Substation 33kV	0	0	0	2
NIE Substation 110kV	0	0	0	0
NIE Substation 275kV	0	0	0	0
*DfI Roads - Trunk Road length (Km)	0.4	1.1	1.7	9.7
Environmental Designated sites (Number)	8	9	9	11
AONB	0	0	0	0
ASSI	1	1	1	1
Environmentally Sensitive Areas	0	0	0	0
Maritime Nature Reserve	0	0	0	0
Nature Reserve	0	0	0	0
RAMSAR	1	1	1	1
SAC	0	0	0	0
Sites of Local Conservation Importance	5	6	6	7
SPA	1	1	1	2
RSPB Reserve	0	0	0	0
UWT Nature Reserve	0	0	0	0
Built Heritage Sites (Number)	4	5	10	75
National Trust	0	0	0	0
Listed Buildings	0	1	4	30
Sites and Monuments	3	3	5	43
Buildings of Special Architectural or Historical interest	0	0	0	1
Areas of Significant Archaeological Interest	0	0	0	0
Historic Parks & Gardens	1	1	1	1

Table 5.10-6: Potential Adverse Consequences - **Fluvial Flooding**					
Newtownabbey APSFR	**Flood Event % AEP**				**Total Count within APSFR**
	10% AEP	**4% AEP**	**1% AEP**	**0.1% AEP**	
Residential (Number)	84	134	254	734	15,137
Non-Residential (Number)	4	7	15	50	811
Economic Damage (£)	£155K	£242K	£413K	£2,386K	
Annual Average Damage (£)	£146K				
Present Value (£)	£4,360K				
IPPC sites (Number)	1	1	1	1	2
IPPC sites	1	1	1	1	2
Community Assets (Number)	0	0	0	0	38
Care Homes (Nursing + Residential)	0	0	0	0	10
GP Surgeries	0	0	0	0	4
Fire Stations	0	0	0	0	0
Hospitals	0	0	0	0	1
Police Stations	0	0	0	0	2
Schools	0	0	0	0	21
Key Infrastructure (Number)	1	1	2	8	155
NIW Wastewater Treatment Works	0	0	0	0	0
Wastewater Treatment Works (other ownership)	0	0	0	0	0
NIW Sewage Pumping Stations	0	0	0	1	7
Sewage Pumping Stations (other ownership)	0	0	0	0	0
NIW Water Treatment Works	0	0	0	0	0
NIW Treated Water Pumping Stations	0	0	0	0	1
NIE Substation 6 to 11kV	1	1	2	7	145
NIE Substation 33kV	0	0	0	0	2
NIE Substation 110kV	0	0	0	0	0
NIE Substation 275kV	0	0	0	0	0
*DfI Roads - Trunk Road length (Km)	0.0	0.0	0.0	0.5	9.7
Environmental Designated sites (Number)	5	6	6	6	11
AONB	0	0	0	0	0
ASSI	1	1	1	1	1
Environmentally Sensitive Areas	0	0	0	0	0
Maritime Nature Reserve	0	0	0	0	0
Nature Reserve	0	0	0	0	0
RAMSAR	1	1	1	1	1
SAC	0	0	0	0	0
Sites of Local Conservation Importance	2	2	2	2	7
SPA	1	2	2	2	2
RSPB Reserve	0	0	0	0	0
UWT Nature Reserve	0	0	0	0	0
Built Heritage Sites (Number)	1	1	1	4	75
National Trust	0	0	0	0	0
Listed Buildings	1	1	1	4	30
Sites and Monuments	0	0	0	0	43
Buildings of Special Architectural or Historical interest	0	0	0	0	1
Areas of Significant Archaeological Interest	0	0	0	0	0
Historic Parks & Gardens	0	0	0	0	1

Table 5.11-5: Potential Adverse Consequences - **Pluvial Flooding**

Carrickfergus APSFR	Flood Event % AEP			Total Count within APSFR
	3.3% AEP	0.5% AEP	0.1% AEP	
Residential (Number)	597	1,341	2,575	10,770
Non-Residential (Number)	124	305	433	951
Economic Damage (£)	£13,391K	£32,878K	£59,349K	
Annual Average Damage (£)	£1,512K			
Present Value (£)	£45,078K			
IPPC sites (Number)	5	5	5	5
IPPC sites	5	5	5	5
Community Assets (Number)	0	0	0	28
Care Homes (Nursing + Residential)	0	0	0	6
GP Surgeries	0	0	0	2
Fire Stations	0	0	0	1
Hospitals	0	0	0	0
Police Stations	0	0	0	0
Schools	0	0	0	19
Key Infrastructure (Number)	9	16	28	111
NIW Wastewater Treatment Works	1	1	1	1
Wastewater Treatment Works (other ownership)	0	0	0	0
NIW Sewage Pumping Stations	3	3	4	7
Sewage Pumping Stations (other ownership)	0	0	0	0
NIW Water Treatment Works	0	0	0	0
NIW Treated Water Pumping Stations	0	0	0	1
NIE Substation 6 to 11kV	5	12	23	99
NIE Substation 33kV	0	0	0	1
NIE Substation 110kV	0	0	0	1
NIE Substation 275kV	0	0	0	1
*DfI Roads - Trunk Road length (Km)	0.0	0.1	0.5	2.5
Environmental Designated sites (Number)	6	6	6	8
AONB	0	0	0	0
ASSI	1	1	1	1
Environmentally Sensitive Areas	0	0	0	0
Maritime Nature Reserve	0	0	0	0
Nature Reserve	0	0	0	0
RAMSAR	1	1	1	1
SAC	0	0	0	0
Sites of Local Conservation Importance	3	3	3	4
SPA	1	1	1	2
RSPB Reserve	0	0	0	0
UWT Nature Reserve	0	0	0	0
Built Heritage Sites (Number)	3	4	6	81
National Trust	0	0	0	0
Listed Buildings	0	0	1	39
Sites and Monuments	3	3	4	40
Buildings of Special Architectural or Historical interest	0	1	1	2
Areas of Significant Archaeological Interest	0	0	0	0
Historic Parks & Gardens	0	0	0	0

Table 5.11-6: Potential Adverse Consequences - **Fluvial Flooding**

Carrickfergus APSFR	Flood Event % AEP				Total Count within APSFR
	10% AEP	4% AEP	1% AEP	0.1% AEP	
Residential (Number)	54	163	852	2609	10,770
Non-Residential (Number)	3	14	48	145	951
Economic Damage (£)	£371K	£516K	£2,394K	£10,341K	
Annual Average Damage (£)	£262K				
Present Value (£)	£7,810K				
IPPC sites (Number)	1	3	4	4	5
IPPC sites	1	3	4	4	5
Community Assets (Number)	0	0	0	2	28
Care Homes (Nursing + Residential)	0	0	0	0	6
GP Surgeries	0	0	0	0	2
Fire Stations	0	0	0	0	1
Hospitals	0	0	0	0	0
Police Stations	0	0	0	0	0
Schools	0	0	0	2	19
Key Infrastructure (Number)	0	3	7	16	111
NIW Wastewater Treatment Works	0	0	1	1	1
Wastewater Treatment Works (other ownership)	0	0	0	0	0
NIW Sewage Pumping Stations	0	1	1	1	7
Sewage Pumping Stations (other ownership)	0	0	0	0	0
NIW Water Treatment Works	0	0	0	0	0
NIW Treated Water Pumping Stations	0	0	0	0	1
NIE Substation 6 to 11kV	0	2	5	14	99
NIE Substation 33kV	0	0	0	0	1
NIE Substation 110kV	0	0	0	0	1
NIE Substation 275kV	0	0	0	0	1
*DfI Roads - Trunk Road length (Km)	0.0	0.0	0.0	0.3	2.5
Environmental Designated sites (Number)	6	6	6	6	8
AONB	0	0	0	0	0
ASSI	1	1	1	1	1
Environmentally Sensitive Areas	0	0	0	0	0
Maritime Nature Reserve	0	0	0	0	0
Nature Reserve	0	0	0	0	0
RAMSAR	1	1	1	1	1
SAC	0	0	0	0	0
Sites of Local Conservation Importance	3	3	3	3	4
SPA	1	1	1	1	2
RSPB Reserve	0	0	0	0	0
UWT Nature Reserve	0	0	0	0	0
Built Heritage Sites (Number)	0	0	0	2	81
National Trust	0	0	0	0	0
Listed Buildings	0	0	0	2	39
Sites and Monuments	0	0	0	0	40
Buildings of Special Architectural or Historical interest	0	0	0	0	2
Areas of Significant Archaeological Interest	0	0	0	0	0
Historic Parks & Gardens	0	0	0	0	0

Table 5.12-5: Potential Adverse Consequences - **Pluvial Flooding**

Ballymena APSFR	Flood Event % AEP			Total Count within APSFR
	3.3% AEP	0.5% AEP	0.1% AEP	
Residential (Number)	463	1,199	2,064	9,394
Non-Residential (Number)	170	431	656	1,722
Economic Damage (£)	£10,534K	£29,673K	£59,731K	
Annual Average Damage (£)	£1,288K			
Present Value (£)	£38,396K			
IPPC sites (Number)	4	4	4	4
IPPC sites	4	4	4	4
Community Assets (Number)	0	0	4	41
Care Homes (Nursing + Residential)	0	0	0	5
GP Surgeries	0	0	0	12
Fire Stations	0	0	1	1
Hospitals	0	0	1	1
Police Stations	0	0	1	1
Schools	0	0	1	21
Key Infrastructure (Number)	5	10	22	160
NIW Wastewater Treatment Works	0	0	0	0
Wastewater Treatment Works (other ownership)	0	0	0	0
NIW Sewage Pumping Stations	1	2	2	4
Sewage Pumping Stations (other ownership)	0	0	0	0
NIW Water Treatment Works	0	0	0	0
NIW Treated Water Pumping Stations	0	0	0	1
NIE Substation 6 to 11kV	3	7	17	151
NIE Substation 33kV	1	1	2	3
NIE Substation 110kV	0	0	1	1
NIE Substation 275kV	0	0	0	0
*DfI Roads - Trunk Road length (Km)	0.8	1.0	1.6	10.6
Environmental Designated sites (Number)	0	0	0	0
AONB	0	0	0	0
ASSI	0	0	0	0
Environmentally Sensitive Areas	0	0	0	0
Maritime Nature Reserve	0	0	0	0
Nature Reserve	0	0	0	0
RAMSAR	0	0	0	0
SAC	0	0	0	0
Sites of Local Conservation Importance	0	0	0	0
SPA	0	0	0	0
RSPB Reserve	0	0	0	0
UWT Nature Reserve	0	0	0	0
Built Heritage Sites (Number)	7	17	17	99
National Trust	0	0	0	0
Listed Buildings	3	10	10	71
Sites and Monuments	3	5	5	25
Buildings of Special Architectural or Historical interest	0	1	1	2
Areas of Significant Archaeological Interest	0	0	0	0
Historic Parks & Gardens	1	1	1	1

Table 5.12-6: Potential Adverse Consequences - **Fluvial Flooding**					
Ballymena APSFR	**Flood Event % AEP**				**Total Count within APSFR**
	10% AEP	**4% AEP**	**1% AEP**	**0.1% AEP**	
Residential (Number)	23	42	269	830	9,394
Non-Residential (Number)	23	34	107	216	1,722
Economic Damage (£)	£131K	£275K	£4,543K	£39,937K	
Annual Average Damage (£)	£401K				
Present Value (£)	£11,961K				
IPPC sites (Number)	1	2	2	3	4
IPPC sites	1	2	2	3	4
Community Assets (Number)	0	0	0	5	41
Care Homes (Nursing + Residential)	0	0	0	0	5
GP Surgeries	0	0	0	2	12
Fire Stations	0	0	0	1	1
Hospitals	0	0	0	0	1
Police Stations	0	0	0	1	1
Schools	0	0	0	1	21
Key Infrastructure (Number)	2	3	6	23	160
NIW Wastewater Treatment Works	0	0	0	0	0
Wastewater Treatment Works (other ownership)	0	0	0	0	0
NIW Sewage Pumping Stations	2	2	2	3	4
Sewage Pumping Stations (other ownership)	0	0	0	0	0
NIW Water Treatment Works	0	0	0	0	0
NIW Treated Water Pumping Stations	0	0	0	0	1
NIE Substation 6 to 11kV	0	1	4	19	151
NIE Substation 33kV	0	0	0	1	3
NIE Substation 110kV	0	0	0	0	1
NIE Substation 275kV	0	0	0	0	0
*DfI Roads - Trunk Road length (Km)	0.1	0.1	0.1	0.1	10.6
Environmental Designated sites (Number)	0	0	0	0	0
AONB	0	0	0	0	0
ASSI	0	0	0	0	0
Environmentally Sensitive Areas	0	0	0	0	0
Maritime Nature Reserve	0	0	0	0	0
Nature Reserve	0	0	0	0	0
RAMSAR	0	0	0	0	0
SAC	0	0	0	0	0
Sites of Local Conservation Importance	0	0	0	0	0
SPA	0	0	0	0	0
RSPB Reserve	0	0	0	0	0
UWT Nature Reserve	0	0	0	0	0
Built Heritage Sites (Number)	2	2	6	33	99
National Trust	0	0	0	0	0
Listed Buildings	1	1	5	30	71
Sites and Monuments	1	1	1	2	25
Buildings of Special Architectural or Historical interest	0	0	0	0	2
Areas of Significant Archaeological Interest	0	0	0	0	0
Historic Parks & Gardens	0	0	0	1	1

Appendix **E**

EQUALITY OF OPPORTUNITY SCREENING ANALYSIS FORM AND RURAL NEEDS IMPACT ASSESSMENT (RNIA)

DEPARTMENT FOR INFRASTRUCTURE

SECTION 75 EQUALITY OF OPPORTUNITY SCREENING ANALYSIS FORM

The purpose of this form is to help you to consider whether a new policy (either internal or external) or legislation will require a full equality impact assessment (EQIA). Those policies identified as having significant implications for equality of opportunity must be subject to full EQIA.

The form will provide a record of the factors taken into account if a policy is screened out, or excluded for EQIA. It will provide a basis for quarterly consultation on the outcome of the screening exercise, and will be referenced in the biannual review of progress made to the Minister and in the Annual Report to the Equality Commission.

Further advice on completion of this form and the screening process including relevant contact information can be accessed via the Department for Infrastructure (DfI) Intranet site.

HUMAN RIGHTS ACT

When considering the impact of this policy you should also consider if there would be any Human Rights implications. Guidance is at:

- https://www.executiveoffice-ni.gov.uk/articles/human-rights-and-public-authorities

Should this be appropriate you will need to complete a Human Rights Impact Assessment. A template is at:

- https://www.executiveoffice-ni.gov.uk/publications/human-rights-impact-assessment-proforma

Don't forget to carry out a Rural Needs Impact Assessment

Part 1. Policy scoping

The first stage of the screening process involves scoping the policy under consideration. The purpose of policy scoping is to help prepare the background and context and set out the aims and objectives for the policy, being screened. At this stage, scoping the policy will help identify potential constraints as well as opportunities and will help the policy maker work through the screening process on a step by step basis.

Public authorities should remember that the Section 75 statutory duties apply to internal policies (relating to people who work for the authority), as well as external policies (relating to those who are, or could be, served by the authority).

Information about the policy

Name of the policy Flood Risk Management Plan – 2nd Cycle (Plan preparation is on a 6 year cycle)
Is this an existing, revised or a new policy? Existing: the 1st cycle of Flood Risk Management Planning precedes this 2nd cycle. A previous Screening was undertaken in November 2014.
What is it trying to achieve? (intended aims/outcomes) The preparation of a Flood Risk Management Plan (the Plan) is 3rd stage of the cyclical process towards the implementation of the European Directive on the Assessment and Management of Flood Risks (2007/60/EC), transposed in Northern Ireland to The Water Environment (Floods Directive) Regulations (Northern Ireland) 2009. The Plan applies mainly to areas within NI that have been identified as being at potential significant flood risk. The Plan sets objectives for the purpose of managing flood risk and then identifies a range of measures/actions that can be undertaken to achieve these objectives. The Plan objectives are aimed at reducing the risk to human health, the environment, cultural heritage and economic activity. The Plan measures fall into 3 main headings, Flood Prevention through the implementation of appropriate land use planning policies; Flood Protection by structural and non-structural measures and Flood Preparedness through flood forecasting, flood warning and emergency response procedures. Coordination with the EU Water Framework Directive and engagement with interested parties and the public is also a requirement of the Directive.
Are there any Section 75 categories which might be expected to benefit from the intended policy? Yes – all Section 75 categories will benefit should any members of those categories be living within the areas of flood risk benefiting from the implementation of flood mitigation measures identified in the Plan.

If so, explain how. Flooding is indiscriminate. The Plan will provide flood mitigation measures for predicted flooding from the main sources of flooding, rivers, sea, surface water. The measures undertaken will reduce the flood risk to people and property, irrespective of Section 75 category, living or working in the flooded area. The Plan therefore does not make any distinction between the different Groups.
Who initiated or wrote the policy? The European Commission developed the European Directive on the Assessment and Management of Flood Risks (2007/60/EC) (The Floods Directive). This is transposed to Northern Ireland law by The Water Environment (Floods Directive) Regulations (Northern Ireland) 2009.
Who owns and who implements the policy? The competent authority for the implementation of the Floods Directive in Northern Ireland is the Department for Infrastructure (NI) (Note: For the 1st cycle DARD was the competent authority).
Background The policy arises out of the legal requirements of the European Directive on the Assessment and Management of Flood Risks (2007/60/EC), transposed in Northern Ireland to The Water Environment (Floods Directive) Regulations (Northern Ireland) 2009.

Implementation factors

Are there any factors which could contribute to/detract from the intended aim/outcome of the policy/decision?

If yes, are they

- [x] financial
- [ ] legislative
- [ ] other, please specify ___________________________________

Implementation of measures / actions in the Plan is subject to availability of resources.

Main stakeholders affected

Who are the internal and external stakeholders (actual or potential) that the policy will impact upon?

☐ staff

☐ service users

☐ other public sector organisations

☐ voluntary/community/trade unions

☑ other, please specify

The Plan provides flood mitigation objectives and measures to all members of society who are at risk from flooding within the Areas of Potential Significant Flood Risk in Northern Ireland. The measures/actions proposed in the Plan will reduce the flood risk to people and property, irrespective of the Section 75 category, living or working in the flooded area. The Plan therefore does not make any distinction between different Groups.

Other policies with a bearing on this policy

- what are they?

Coordination with the EU Water Framework Directive is a requirement of the Floods Directive. This Directive focuses on improving water quality (water status) within defined water bodies. Flooding can have impacts on water bodies and water quality hence the connection between the two Directives.

- who owns them?

DAERA is the competent authority in NI for the implementation of the EU Water Framework Directive

Available evidence

Evidence to help inform the screening process may take many forms. Public authorities should ensure that their screening decision is informed by relevant data.
What evidence/information (both qualitative and quantitative) have you gathered to inform this policy? Specify details for each of the Section 75 categories.

Section 75 category	Details of evidence/ information
Religious belief	None. The Plan measures are applied to all people and properties at flood risk and take no account of any or all of the Section 75 Groups. Plan proposals including this Screening document will be subject to a public consultation process (as were the 1st cycle Plans). All Section 75 groups will have opportunity to comment on a draft of the Plan and to influence the proposed measures / actions outlined. Consultation will take place over a 6 month period in the first half of 2021.
Political opinion	As above
Racial group	As above
Age	As above
Marital status	As above
Sexual orientation	As above
Men and women generally	As above
Disability	As above
Dependants	As above

Needs, experiences and priorities

Taking into account the information referred to above, what are the different needs, experiences and priorities of each of the following categories, in relation to the particular policy/decision? Specify details for each of the Section 75 categories

Section 75 category	Details of needs/experiences/priorities
Religious belief	No particular needs, experiences or priorities have been identified for this group.
Political opinion	As above
Racial group	As above
Age	As above
Marital status	As above
Sexual orientation	As above
Men and women generally	As above
Disability	As above
Dependants	As above

Part 2. Screening questions

Introduction

In making a decision as to whether or not there is a need to carry out an equality impact assessment, the public authority should consider its answers to the questions 1-4 which are given on pages 66-68 of this Guide.

If the public authority's conclusion is **<u>none</u>** in respect of all of the Section 75 equality of opportunity and/or good relations categories, then the public authority may decide to screen the policy out. If a policy is 'screened out' as having no relevance to equality of opportunity or good relations, a public authority should give details of the reasons for the decision taken.

If the public authority's conclusion is **<u>major</u>** in respect of one or more of the Section 75 equality of opportunity and/or good relations categories, then consideration should be given to subjecting the policy to the equality impact assessment procedure.

If the public authority's conclusion is **<u>minor</u>** in respect of one or more of the Section 75 equality categories and/or good relations categories, then consideration should still be given to proceeding with an equality impact assessment, or to:

- measures to mitigate the adverse impact; or
- the introduction of an alternative policy to better promote equality of opportunity and/or good relations.

In favour of a 'major' impact

a) The policy is significant in terms of its strategic importance;
b) Potential equality impacts are unknown, because, for example, there is insufficient data upon which to make an assessment or because they are complex, and it would be appropriate to conduct an equality impact assessment in order to better assess them;
c) Potential equality and/or good relations impacts are likely to be adverse or are likely to be experienced disproportionately by groups of people including those who are marginalised or disadvantaged;
d) Further assessment offers a valuable way to examine the evidence and develop recommendations in respect of a policy about which there are

concerns amongst affected individuals and representative groups, for example in respect of multiple identities;

e) The policy is likely to be challenged by way of judicial review;

f) The policy is significant in terms of expenditure.

In favour of 'minor' impact

a) The policy is not unlawfully discriminatory and any residual potential impacts on people are judged to be negligible;

b) The policy, or certain proposals within it, are potentially unlawfully discriminatory, but this possibility can readily and easily be eliminated by making appropriate changes to the policy or by adopting appropriate mitigating measures;

c) Any asymmetrical equality impacts caused by the policy are intentional because they are specifically designed to promote equality of opportunity for particular groups of disadvantaged people;

d) By amending the policy there are better opportunities to better promote equality of opportunity and/or good relations.

In favour of none

a) The policy has no relevance to equality of opportunity or good relations.

b) The policy is purely technical in nature and will have no bearing in terms of its likely impact on equality of opportunity or good relations for people within the equality and good relations categories.

Taking into account the evidence presented above, consider and comment on the likely impact on equality of opportunity and good relations for those affected by this policy, in any way, for each of the equality and good relations categories, by applying the screening questions given overleaf and indicate the level of impact on the group i.e. minor, major or none.

Screening questions

1 What is the likely impact on equality of opportunity for those affected by this policy, for each of the Section 75 equality categories? minor/major/none		
Section 75 category	Details of policy impact	Level of impact? minor/major/none
Religious belief	Flooding is indiscriminate. The Plan will provide flood mitigation measures for predicted flooding from the main sources of flooding, rivers, sea and surface water. The measures undertaken will reduce the flood risk to people and property, irrespective of Section 75 category, living or working in the flooded area. The Plan therefore does not make any distinction between the different Groups.	None
Political opinion	As above	None
Racial group	As above	None
Age	As above	None
Marital status	As above	None
Sexual orientation	As above	None
Men and women generally	As above	None

Disability	As above	None
Dependants	As above	None

2 Are there opportunities to better promote equality of opportunity for people within the Section 75 equalities categories?		
Section 75 category	If **Yes**, provide details	If **No**, provide reasons
Religious belief		No – Neither Flooding nor the implementation of Plan measures to reduce its impacts, creates opportunity for people within this particular Section 75 category. The Plan measures when implemented should provide opportunity to participate in community engagement and contribute to local emergency flood planning and resilient construction measures. The policy should increase the safety of people in all Section 75 Groups (should they be at flood risk).
Political opinion		No - As above
Racial group		No - As above
Age		No - As above
Marital status		No - As above

Sexual orientation		No - As above
Men and women generally		No - As above
Disability		No - As above
Dependants		No – As above

3 To what extent is the policy likely to impact on good relations between people of different religious belief, political opinion or racial group? minor/major/none		
Good relations category	Details of policy impact	Level of impact minor/major/none
Religious belief	The Plan may have a positive impact on good relations through the reduction in flooding by recommending flood protection measures and the opportunity for people to work together through community engagement and planning to manage the threat of flooding.	
Political opinion	As above	
Racial group	As above	

4 Are there opportunities to better promote good relations between people of different religious belief, political opinion or racial group?		
Good relations category	If **Yes**, provide details	If **No**, provide reasons
Religious belief	The Plan may promote good relations through the opportunity for people to work together through community engagement and planning to manage the threat of flooding.	
Political opinion	As above	
Racial group	As above	

Additional considerations

Multiple identity

Generally speaking, people can fall into more than one Section 75 category.

Taking this into consideration, are there any potential impacts of the policy/decision on people with multiple identities? (*For example; disabled minority ethnic people; disabled women; young Protestant men; and young lesbians, gay and bisexual people). Please give some details:*

Provide details below of data on the impact of the policy on people with multiple identities. Specify relevant Section 75 categories concerned.

Not Applicable

Part 3. Screening decision

If the decision is not to conduct an equality impact assessment, please provide details of the reasons:

The Flood Risk Management Plan identifies a range of measures, namely Prevention, Protection and Preparedness that aim to remove or reduce the impact of flooding to people and property. All these measures would be considered as having a positive effect on people and are applied indiscriminately to all areas that are at significant flood risk across NI, and irrespective of what Section 75 equality group that people belong to.

If the decision is not to conduct an equality impact assessment the public authority should consider if the policy should be mitigated or an alternative policy be introduced:

It is NOT planned to conduct an Equality Impact Assessment.

If the decision is to subject the policy to an equality impact assessment, please provide details of the reasons.

All public authorities' equality schemes must state the authority's arrangements for assessing and consulting on the likely impact of policies adopted or proposed to be adopted by the authority on the promotion of equality of opportunity. The Commission recommends screening and equality impact assessment as the tools to be utilised for such assessments. Further advice on equality impact assessment may be found in a separate Commission publication: Practical Guidance on Equality Impact Assessment.

Mitigation

When the public authority concludes that the likely impact is ‘minor’ and an equality impact assessment is not to be conducted, the public authority may consider mitigation to lessen the severity of any equality impact, or the introduction of an alternative policy to better promote equality of opportunity or good relations.

Can the policy/decision be amended or changed or an alternative policy introduced to better promote equality of opportunity and/or good relations?:

Yes / No

If so, give the **reasons** to support your decision, together with the proposed changes/amendments or alternative policy:

Timetabling and prioritising

Factors to be considered in timetabling and prioritising policies for equality impact assessment.

If the policy has been **'screened in'** for equality impact assessment, then please answer the following questions to determine its priority for timetabling the equality impact assessment.

On a scale of 1-3, with 1 being the lowest priority and 3 being the highest, assess the policy in terms of its priority for equality impact assessment.

Priority criterion	Rating (1-3)
Effect on equality of opportunity and good relations	
Social need	
Effect on people's daily lives	
Relevance to a public authority's functions	

Note: The Total Rating Score should be used to prioritise the policy in rank order with other policies screened in for equality impact assessment. This list of priorities will assist the public authority in timetabling. Details of the Public Authority's Equality Impact Assessment Timetable should be included in the quarterly Screening Report.

Is the policy affected by timetables established by other relevant public authorities?

If yes, please provide details

Part 4. Monitoring

Public authorities should consider the guidance contained in the Commission's Monitoring Guidance for Use by Public Authorities (July 2007).

The Commission recommends that where the policy has been amended or an alternative policy introduced, the public authority should monitor more broadly than for adverse impact (See Benefits, P.9-10, paras 2.13 – 2.20 of the Monitoring Guidance).

Effective monitoring will help the public authority identify any future adverse impact arising from the policy which may lead the public authority to conduct an equality impact assessment, as well as help with future planning and policy development.

Part 5 - Approval and authorisation

Screened by:	**Position/Job Title:**	**Date:**
Stephen Dawson	SPTO DfI W&DPD	16 Sept 2020
Approved by:		
Damian Curran	Acting Director WDPD	09/10/20

Note: A copy of the Screening Template, for each policy screened should be 'signed off' and approved by a senior manager responsible for the policy, made easily accessible on the public authority's website as soon as possible following completion and made available on request.

For Equality Team Completion:

Date received:	16.09.20
Amendments requested?	Yes - minor
Date returned to Business Area:	24.09.20
Date final version received:	13.10.20
Date placed on S75 Screening Webpage:	15.10.20

Rural Needs Impact Assessment (RNIA)

SECTION 1 - Defining the activity subject to Section 1(1) of the Rural Needs Act (NI) 2016

1A. Name of Public Authority.

DEPARTMENT FOR INFRASTRUCTURE (NI)

1B. Please provide a short title which describes the activity being undertaken by the Public Authority that is subject to Section 1(1) of the Rural Needs Act (NI) 2016.

Preparation of a Flood Risk Management Plan for Northern Ireland for the 2nd cycle of implementation of The Water Environment (Floods Directive) Regulations (Northern Ireland) 2009. Note that the final Plan once published in Dec 2021, will constitute a review of the 1st cycle Flood Risk Management Plans published in December 2015.

1C. Please indicate which category the activity specified in Section 1B above relates to.

Developing a	Policy ☐	Strategy ☐	Plan √
Adopting a	Policy ☐	Strategy ☐	Plan √
Implementing a	Policy ☐	Strategy ☐	Plan √
Revising a	Policy ☐	Strategy ☐	Plan √
Designing a Public Service	☐		
Delivering a Public Service	☐		

1D. Please provide the official title (if any) of the Policy, Strategy, Plan or Public Service document or initiative relating to the category indicated in Section 1C above.

Flood Risk Management Plan for Northern Ireland (2nd cycle Floods Directive Regulations)

1E. Please provide details of the aims and/or objectives of the Policy, Strategy, Plan or Public Service.

The objective in preparing a Flood Risk Management Plan is to fulfil the requirements of The Water Environment (Floods Directive) Regulations (Northern Ireland) 2009 (Clause 21). This requires the undertaking of a staged process on a 6 yearly cycle to prepare and review Flood Risk Management Plans for identified Areas of Potential Significant Flood Risk.

1F. What definition of 'rural' is the Public Authority using in respect of the Policy, Strategy, Plan or Public Service?

Population Settlements of less than 5,000 (Default definition).	√
Other Definition (Provide details and the rationale below).	
A definition of 'rural' is not applicable.	

Details of alternative definition of 'rural' used.

Rationale for using alternative definition of 'rural'.

Reasons why a definition of 'rural' is not applicable.

SECTION 2 - Understanding the impact of the Policy, Strategy, Plan or Public Service

2A. Is the Policy, Strategy, Plan or Public Service likely to impact on people in rural areas?

Yes [√] No [ ] If the response is **NO** GO TO Section **2E**.

2B. Please explain how the Policy, Strategy, Plan or Public Service is likely to impact on people in rural areas.

The Flood Risk Management Plan (the Plan) for Northern Ireland sets out objectives and measures / actions to address Flood Risk in Areas identified to be at Potential Significant Flood Risk. Because these areas are where damages due to flooding are potentially greatest, they are predominantly in urban areas where there is the highest density of people, buildings and infrastructure, which will be affected if flooding occurs.

Should significant flooding occur in areas which are outside the defined Areas of Potential Significant Flood Risk, such as in rural conurbations, the Plan allows for mitigation measures (e.g. schemes or works) to be brought forward and prioritized alongside measures set out in the Plan for urban areas. It allows for flood alleviation measures to be carried out to protect rural people and property through normal programmes of work (outside of the Plan) undertaken by government agencies. Also, with regard to consideration of planning & development of both urban and rural areas, government equally advises against development in areas of floodplain.

Preparation of the Plan will not affect how government or emergency response agencies respond to incidences of flooding; government will provide the same response to flooding whether a flood location is in an urban or rural location.

2C. If the Policy, Strategy, Plan or Public Service is likely to impact on people in rural areas *differently* from people in urban areas, please explain how it is likely to impact on people in rural areas differently.

See 2B above.

Because flooding naturally occurs in flood plains in rural river environs, the government does not normally provide flood protection to agricultural land to the same level of protection as urban property because of its inherently lower value and because it is less densely developed. Indeed, such natural floodplains are essential to the health of the river environment and for its biodiversity. Natural floodplains also mitigate flood risk and against the need for costly man-made flood defences.

However, for populations in rural villages and conurbations, the Plan does allow for flood mitigation measures to be progressed and prioritized alongside those planned for urban areas and also for flood alleviation measures to be carried out to protect rural dwellings and commercial property through normal programmes of work (outside of the Plan) undertaken by government agencies. The aim of Flood Risk Management Planning is to allocate resources to where the needs are greatest.

2D. Please indicate which of the following rural policy areas the Policy, Strategy, Plan or Public Service is likely to primarily impact on.

Rural Businesses	√
Rural Tourism	
Rural Housing	√
Jobs or Employment in Rural Areas	
Education or Training in Rural Areas	
Broadband or Mobile Communications in Rural Areas	
Transport Services or Infrastructure in Rural Areas	√
Health or Social Care Services in Rural Areas	
Poverty in Rural Areas	
Deprivation in Rural Areas	
Rural Crime or Community Safety	
Rural Development	√
Agri-Environment	
Other (Please state)	

If the response to Section 2A was YES GO TO Section 3A.

2E. Please explain why the Policy, Strategy, Plan or Public Service is NOT likely to impact on people in rural areas.

See 2B and 2c above.

The Plan is focused on Areas of Potential Significant Flood Risk which are urban in nature. But the Plan does not preclude against mitigation of flooding in rural conurbations.

SECTION 3 - Identifying the Social and Economic Needs of Persons in Rural Areas

3A. Has the Public Authority taken steps to identify the social and economic needs of people in rural areas that are relevant to the Policy, Strategy, Plan or Public Service?

Yes ☐ No ☑ If the response is **NO** GO TO Section **3E**. [Note: See 3C below]

3B. Please indicate which of the following methods or information sources were used by the Public Authority to identify the social and economic needs of people in rural areas.

Consultation with Rural Stakeholders	☐	Published Statistics	☐
Consultation with Other Organisations	☐	Research Papers	☐
Surveys or Questionnaires	☐	Other Publications	☐

Other Methods or Information Sources (include details in Question 3C below). ☑

3C. Please provide details of the methods and information sources used to identify the social and economic needs of people in rural areas including relevant dates, names of organisations, titles of publications, website references, details of surveys or consultations undertaken etc.

Please note that a Public Consultation will take place with a wide range of stakeholders, organisations and the general public which will inform the production of the final Flood Risk Management Plan. This Consultation with take place in the first half of 2021.

Appendix A of the 3 No current, 1st cycle Flood Risk Management Plans (link to Flood Risk Management Plans) provides an indication of the extensive range of consultees that will receive notification of the publication of the draft Plan and will be able to provide comment during the consultation period.

3D. Please provide details of the social and economic needs of people in rural areas which have been identified by the Public Authority?

If the response to Section 3A was YES GO TO Section 4A.

3E. Please explain why no steps were taken by the Public Authority to identify the social and economic needs of people in rural areas?

As aforementioned, the Flood Risk Management Plan for Northern Ireland sets out objectives and measures / actions to address Flood Risk in Areas identified to be at Potential Significant Flood Risk. Because these areas are where damages due to flooding are potentially greatest, they are in predominantly urban areas where there is the highest density of buildings and infrastructure, which will be affected if flooding occurs.

SECTION 4 - Considering the Social and Economic Needs of Persons in Rural Areas

4A. Please provide details of the issues considered in relation to the social and economic needs of people in rural areas.

SECTION 5 - Influencing the Policy, Strategy, Plan or Public Service

5A. Has the development, adoption, implementation or revising of the Policy, Strategy or Plan, or the design or delivery of the Public Service, been influenced by the rural needs identified?

Yes ☐ **No** √ **If the response is NO GO TO Section 5C.**

5B. Please explain how the development, adoption, implementation or revising of the Policy, Strategy or Plan, or the design or delivery of the Public Service, has been influenced by the rural needs identified.

If the response to Section 5A was YES GO TO Section 6A.

5C. Please explain why the development, adoption, implementation or revising of the Policy, Strategy or Plan, or the design or the delivery of the Public Service, has NOT been influenced by the rural needs identified.

As aforementioned, the Flood Risk Management Plan for Northern Ireland sets out objectives and measures / actions to address Flood Risk in Areas identified to be at Potential Significant Flood Risk. Because these areas are where damages due to flooding are potentially greatest, they are in predominantly urban areas where there is the highest density of buildings and infrastructure, which will be affected if flooding occurs.

SECTION 6 - Documenting and Recording

6A. Please tick below to confirm that the RNIA Template will be retained by the Public Authority and relevant information on the Section 1 activity compiled in accordance with paragraph 6.7 of the guidance.

I confirm that the RNIA Template will be retained and relevant information compiled. √

Rural Needs Impact Assessment undertaken by:	Stephen Dawson
Position/Grade:	Senior PTO
Division/Branch	DfI Water & Drainage Policy Division
Signature: STEPHEN DAWSON	
Date:	16 Sept 2020
Rural Needs Impact Assessment approved by:	Damian Curran
Position/Grade:	G5 (Acting)
Division/Branch:	Water and Drainage Policy Division
Signature:	D Curran
Date:	09/10/20

Appendix **F**

FRMP 2021-2027 CONSULTATION FORM

Draft Flood Risk Management Plan 2021-2027 including, the Strategic Environmental Assessment and Habitats Regulations Assessment

Consultation Response Form

Responses should be received no later than

Friday 25 June 2021

This Consultation Response Form (CRF) aims to provide you with an opportunity to comment on the draft:

- Flood Risk Management Plan 2021-2027 (FRMP)
- Strategic Environmental Assessment (SEA) and
- Habitats Regulations Assessment (HRA)

It is intended that through the CRF you will have an opportunity to put forward your comments, to help inform the FRMP, SEA and HRA for Northern Ireland.
The CRF should be considered in conjunction with the consultation document available on the Department's website at the following link:
https://www.infrastructureni.gov.uk/consultations/consultation-draft-flood-risk-management-plan-2021-2027-second-cycle

Additional copies of both the CRF and the consultation document can be obtained from the Department for Infrastructure:

Email: floods.directive@infrastructure-ni. gov.uk

Writing to:
Flood Risk Management Plan Consultation Response
Department for Infrastructure
Water and Drainage Policy Division
Room 1-22, Clarence Court
10-18 Adelaide Street
BELFAST
BT2 8GB

Alternative formats of the CRF can also be made available on request and you should forward any such requests using one of the methods detailed above.

Responses should be received no later than **17:00 on Friday 25 June 2021**. All responses received by this date will be considered.

Please note that all responses will be treated as public, and may be published on the Department's website. If you do not want your response to be used in this way, or if you prefer for it to be used anonymously, please indicate this when responding (The Freedom of Information Act 2000 and

Environmental Information Regulations 2004 gives the public a right of access to any information held by a public authority, namely, the Department in this case).

Following consideration of all responses, a report may be published on the Department's website.

Thank you for taking the time to complete this CRF and providing your comments.

I am responding

As individual ☐

On behalf of an organisation ☐

Your Details

Name:

Postal address (including postcode):

Email address:

Please select from which of the following groups you belong to

- ☐ Individual
- ☐ Individual at perceived flood risk
- ☐ Utilities/Infrastructure provider
- ☐ Business sector
- ☐ Consultant / Contractor
- ☐ Environmental management
- ☐ Academia/Research
- ☐ Farming / Land management
- ☐ Local Government
- ☐ Central Government
- ☐ Leisure / Tourism
- ☐ Manufacturing
- ☐ Transport / Navigation
- ☐ Developer
- ☐ Other (*please specify*)

After the 6 month consultation period we will publish our response document and will let you know what people have said, how we have taken their comments into account and what changes will be made before we publish the final FRMP, SEA and HRA by 22 December 2021.

Freedom of Information Act 2000 – Confidentiality of Consultations

Please note that your response and the responses of others to the consultation may be disclosed on request. The Department can only refuse to disclose information in exceptional circumstances. Before you submit your response please read the paragraphs in the consultation document on the confidentiality of consultations which provide guidance on the legal position about any information given by you in response to this consultation.

Questions on the Draft Flood Risk Management Plan

Question 1

Do you agree that, using the methodology noted, the draft plan highlights the most significant flood risk areas in each of the three River Basin Districts?

☐ **Yes**

☐ **No**

If not, please give your reasons below.

Enter text here ....

Please add below any additional comments you may wish to make about the methodology.

Enter text here ....

Question 2

Do you understand and agree with the objectives as described in the draft plan?

☐ **Yes**

☐ **No**

If not, please give your reasons below.

Enter text here ....

Please add below any additional comments you may wish to make about the objectives.

Enter text here ....

Question 3

Do you agree that there is the right balance between the social, economic and environmental objectives?

☐ **Yes**

☐ **No**

If not, what could be done to redress the balance? Please give your views below.

Enter text here ....

Question 4

Do you agree with the proposed measures identified for each of the Areas of Potential Significant Flood Risk (APSFR)?

☐ **Yes**

☐ **No**

If not, what would you change and why? Please give your views below.

Enter text here ....

Question 5

What measures do you think should be given the highest priority to manage the flood risk in your area?

Please explain what they are and why they should be given a high priority?

Enter text here ....

Question 6

Do you see any ways that you or your community can support and contribute to any of the measures set out in the draft Plan to reduce the flood risk?

☐ **Yes**

☐ **No**

If yes, explain what could be done.

Enter text here ....

Question 7

Are there things you think should be done to improve the co-ordination of river basin and flood risk management planning?

☐ **Yes**

☐ **No**

If yes, explain what could be done.

Enter text here ....

Questions on the environmental reports (SEA and HRA)

A Strategic Environmental Assessment (SEA) and Habitats Regulations Assessment (HRA) have been undertaken to consider how the draft Flood Risk Management Plan could affect communities and the wider environment. These reports present the results of these assessments and summarise the effects that are significant for the river basin districts.

Question 8

Do you agree with the conclusions of the environmental reports?

☐ **Yes**

☐ **No**

If not, please explain why.

Enter text here ....

Question 9

Are there any further significant environmental effects of the draft Plan which you think should be considered?

☐ **Yes**

☐ **No**

If yes, please describe what they are.

Enter text here ....

Question 10

Are there further mitigations or opportunities that should be considered for the Plan?

☐ **Yes**

☐ **No**

If yes, please explain.

Enter text here ....

Please sent the completed form to:

Email: floods.directive@infrastructure-ni.gov.uk

Post to:

Flood Risk Management Plan Consultation Response
Department for Infrastructure
Water and Drainage Policy Division
Room 1-22, Clarence Court
10-18 Adelaide Street
BELFAST
BT2 8GB

Abbreviations

LIST OF ABBREVIATIONS

Abbreviation	Full Term
AAAD	Aggregated Annual Average Damages
AAD	Annual Average Damages
AEP	Annual Exceedance Probability
AFS	Areas for Further Study
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
APSFR	Area(s) of Potential Significant Flood Risk
ASSI	Areas of Special Scientific Interest
BMAP	Belfast Metropolitan Area Plan
CC	Climate Change
CCG	Civil Contingencies Group
CCRA	Climate Change Risk Assessment
CIRIA	Construction Industry Research and Information Association
DAERA	Department of Agriculture, Environment and Rural Affairs
DARD	Department of Agriculture and Rural Development
DfC	Department for Communities
DfI	Department for Infrastructure
DTM	Digital Terrain Model
EC	European Commission
EPGs	Emergency Preparedness Groups
EU	European Union
FAS	Flood Alleviation Scheme
FD	Floods Directive
FDTSG	Flood Directive Technical Stakeholder Group
FGDB	File Geodatabase
FHRM	Flood Hazard and Risk Maps
FIPG	Flood Investment Planning Group

Abbreviation	Full Term
FRA	Flood Risk Area
FRISM	Flood Risk Metric tool
FRMP	Flood Risk Management Plan
FSSG	Flood Strategy Steering Group
GIS	Geographical Information System
HSCT	Health and Social Care Trust
HRA	Habitats Regulations Assessment
IPPC	Integrated Pollution Prevention Control
IRBD	International River Basin District
JBA	Jeremy Benn Associates
LCRG	Local Community Resilience Group
LDP	Local Development Plan
LGD	Lead Government Department
LiDAR	Light Detecting and Ranging
LMAs	Local Management Areas
LWWP	Living With Water Programme
MEP	Moderate Ecological Potential
NFM	Natural Flood Management
NI	Northern Ireland
NIAO	Northern Ireland Audit Office
NICCAP	Northern Ireland Climate Change Adaptation Programme
NIEA	Northern Ireland Environmental Agency
NIFRA	Northern Ireland Flood Risk Assessment (2018)
NIFRS	Northern Ireland Fire and Rescue Service
NIHE	Northern Ireland Housing Executive
NISRA	Northern Ireland Statistics and Research Agency
NI Water	Northern Ireland Water

Abbreviation	Full Term
NRPs	Non-Residential Properties
OPW	Office of Public Works
OSNI	Ordnance Survey Northern Ireland
PC 15	Price Control for period 2015-2021
PC 21	Price Control for period 2021-2027
PEDU	Performance and Efficiency Delivery Unit
PFRA	Preliminary Flood Risk Assessment (2011)
PLP	Property Level Protection
PSNI	Police Service Northern Ireland
RCRG	Regional Community Resilience Group
RBD	River Basin District
RBMP	River Basin Management Plan
RC	Reinforced Concrete
RoI	Republic of Ireland
RPs	Residential Properties
SAC	Special Areas of Conservation
SCaMP NI	Sustainable Catchment Area Management Programme Northern Ireland
SDIP	Strategic Drainage Infrastructure Plan
SEFA	Scheme of Emergency Financial Assistance
SFRA	Significant Flood Risk Area

Abbreviation	Full Term
SMG	Stormwater Management Group
SMR	Sites and Monuments Records
SoP	Standard of Protection
SPA	Special Protection Areas
SPPS	Strategic Planning Policy Statement
SPAR	Strategic Planning And Resources group
SuDS	Sustainable Drainage Systems
TAPSFR	Transitional Area(s) of Potential Significant Flood Risk
TEO	The Executive Office
UK	United Kingdom
UKCMF	United Kingdom Coastal Monitoring Forecasting Service
UKCP09	United Kingdom Climate Projections 2009
UKCP18	United Kingdom Climate Projections 2018
UN	United Nations
WDPD	Water and Drainage Policy Division
WFD	Water Framework Directive
WwTW	Wastewater Treatment Works