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Bonneagair

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LIVING WITH WATER IN BELFAST

An Integrated Plan for Drainage and
Wastewater Management in Greater Belfast



**PROTECT
ENHANCE
GROW**



LIVING WITH WATER IN BELFAST

An aerial photograph of Belfast, Northern Ireland, showing the city built on a peninsula and along the River Liffey. The harbor is filled with shipping containers and a large ship. In the foreground, there is a green grassy area. A circular graphic with a green and blue border is overlaid on the image, containing the text 'PROTECT', 'ENHANCE', and 'GROW' stacked vertically.

PROTECT
ENHANCE
GROW

MINISTERIAL FOREWORD

NICHOLA MALLON



**DEPARTMENT FOR
INFRASTRUCTURE
MINISTER**

Water is an essential part of our daily lives and it is in all our interests to identify and deliver the best solutions to PROTECT against flooding, ENHANCE the environment and GROW the economy.

In November 2020, as part of my commitment to a green and sustainable recovery and to delivering the commitments made by government in the New Decade, New Approach deal, I published the Living With Water in Belfast consultation document – an integrated plan for drainage and wastewater management in greater Belfast. This Plan aims to deliver a new, strategic, long term approach to drainage and wastewater management to protect from flooding, provide a cleaner and greener environment and ensure that Belfast is open for business and investment. It was hugely important that everyone had the opportunity to express their views and to articulate the importance of our water and wastewater infrastructure to their particular sector, to the economy and to the environment here more generally.



In recent years, flooding has had devastating consequences for those living and working in affected areas, and the impact of climate change places even more pressure on our ageing infrastructure.

How we treat wastewater is critical for our health and wellbeing and to the economic prosperity of Belfast. The current underfunding of our wastewater systems means that many of the sewerage networks and wastewater treatment works across Belfast are at, or nearing, capacity, meaning future connections for new developments may not be accepted by Northern Ireland Water.

If this is allowed to continue, there will be significant constraints on economic growth and house building, likely increased pollution and damage to the environment, and an increased risk to the population's health.

Infrastructure is an integral part of the Programme for Government and I am committed to the important job of developing and investing in much needed wastewater infrastructure. An already challenging funding position has been made worse by the financial impact of the Covid 19 crisis. However, infrastructure is the key that unlocks our opportunities for growth. This Plan clearly makes the case for investment that will provide a 21st century wastewater system to serve the growing population and allow for economic growth. I am pleased that responses to the consultation were overwhelmingly positive and there was clear consensus that Belfast is facing significant drainage and wastewater management issues and that certainty around funding should be a key priority.

This new approach will help protect communities from flooding, enhance the environment through effective wastewater management and the provision of blue/green infrastructure, and grow the economy by providing the necessary capacity in our sewer and wastewater treatment systems to allow development and to build the many new homes our citizens need.

My department has been working creatively and collaboratively within government, and across the public sector, to identify sustainable solutions and new opportunities to collectively address a range of issues across a number of partner organisations for the benefit of all our citizens. This plan sets out how we will achieve this and create a thriving and resilient Belfast which is better protected and better prepared for the future.

I welcome the widespread support, articulated in the consultation, for the objectives and approach taken by the Plan, both in terms of the scale of the partnership working proposed and the whole catchment methodology.

Whilst this Plan focuses on the greater Belfast area, the principles advocated in it will be rolled out across Northern Ireland, to inform future drainage investment.



Water is an essential part of our daily lives and it is in all our interests to identify and deliver the best solutions to **PROTECT** against flooding, **ENHANCE** the environment and **GROW** the economy.



EXECUTIVE SUMMARY

THE LIVING WITH WATER PROGRAMME

- 1 In 2014, when it became clear that the drainage infrastructure across Belfast was unable to meet the requirements expected of it, the Northern Ireland Executive approved the development of a Strategic Drainage Infrastructure Plan (SDIP) for Belfast to:
 - **protect** against flooding by managing the flow of water through a catchment from source to sea;
 - **enhance** the environment through effective wastewater management and the provision of enhanced blue/green spaces to benefit local communities; and
 - **grow** the economy by providing the necessary capacity in our drainage and wastewater management systems to facilitate new development projects including house building.
- 2 To develop and deliver this Plan, an interdepartmental group, called the Living With Water Programme (LWWP), was established. This Plan, "Living With Water in Belfast" is the Strategic Drainage Infrastructure Plan for Belfast and is hereafter referred to as the Plan.
- 3 Living With Water is a new approach to the provision of drainage and wastewater infrastructure which promotes holistic and integrated solutions that achieve multiple benefits at reduced cost and disruption. For example, the use of open spaces and watercourses to enhance the environment, can also promote recreational opportunities, and sustainably manage water to help reduce flood risk. This is commonly referred to as blue/green infrastructure. In addition to blue/green measures it is recognised that significant investment is also required in more traditional "hard engineered" infrastructure, like sewers, pumping stations and upgrades to our wastewater treatment works.
- 4 Whilst the Department for Infrastructure (DfI) is leading this programme, there are many partners¹ from across central and local government who are working collaboratively through the LWWP to develop integrated and sustainable drainage solutions.
- 5 This Plan sets out the challenges involved, the opportunities for potential solutions and the scale of investment needed.
- 6 Implementation of this Plan is central to the delivery of the Floods Directive, the Water Framework Directive, the United Nations Sustainable Development Goals (SDG), the Regional Development Strategy (RDS) and the Long Term Water Strategy (LTWS). In February 2020 the Northern Ireland Assembly declared a climate emergency. This Plan will help Belfast to adapt to changing rainfall patterns and mitigate against increased greenhouse gas emissions.
- 7 The policy, regulation and funding of drainage and wastewater management in Northern Ireland is currently provided by a number of different organisations. This Plan coordinates and optimises the strategic planning of future drainage and wastewater-related works in the greater Belfast area.
- 8 Since 2015, detailed surveys, engineering studies, modelling and investment appraisals have been carried out to inform this Plan and identify potential opportunities for integrated solutions. This has found that around £1.4

¹ Department for Infrastructure, Northern Ireland Environment Agency (NIEA), Utility Regulator (UR), Belfast City Council, NI Water.

billion is required to provide a modern and efficient drainage and wastewater system with the capacity needed to facilitate economic growth. Whilst it will be a challenge to provide the investment needed to implement the Plan, without it flooding and pollution will intensify and future development of the area covered by the Plan may be constrained.

- 9 We all live with water so we all have a stake in delivering a long term, integrated solution for our drainage and wastewater management needs. The drainage of surface water and the effective treatment and management of sewage are essential for good public health, economic growth and a healthy natural environment. It is also needed to support development of homes, schools, hospitals and businesses.

- 10 The Northern Ireland Executive's 2020 New Decade New Approach document recognises the importance of investing in drainage and wastewater. The document states:



The Executive will invest urgently in wastewater infrastructure which is at or nearing capacity in many places across Northern Ireland, including in Belfast, limiting growth.



EXECUTIVE SUMMARY

BACKGROUND

- 11 As Belfast's population and commerce continue to grow and climate change produces more intense rainfall events, the ageing drainage infrastructure will continue to come under pressure. Due to constraints in investment over the past 20 years, many parts of the wastewater and drainage infrastructure serving greater Belfast are now having to operate at or over design capacity.
- 12 The wastewater system urgently needs significant levels of additional investment to facilitate future growth and development. Furthermore, Belfast has experienced a number of serious flooding events in recent years and the water quality in Inner Belfast Lough has been deteriorating due to a combination of pollution from agriculture and discharges from Wastewater Treatment Works (WwTW) and Combined Sewer Overflows (CSOs).
- 13 For example, Belfast WwTW is having to treat a load that is 40% greater than it was designed for, and around 50% of the estimated 340 CSOs that exist in the area have been assessed as being unsatisfactory because they result in pollution (raw sewage mixed with rainwater) entering the rivers and the Lough when it rains. If these issues are not addressed, future development may be constrained and flooding and pollution will intensify.
- 14 The Living With Water approach combines carefully planned investment in wastewater and drainage infrastructure with a range of catchment management measures to help manage surface water generated from rainfall in a more natural way. Together this will help reduce the risk of flooding in urban areas and will reduce the pollution to our watercourses and the sea.
- 15 Green spaces such as parks, pitches, golf courses, fields and gardens have not traditionally been considered to be drainage infrastructure. Yet, when these green spaces are developed and replaced with hard surfaces, the rainwater that was previously absorbed and attenuated becomes surface water which can cause flooding and overload combined sewers resulting in pollution. Green spaces therefore already play a key role in managing surface water flood risk and should be considered as an integral part of the urban drainage system. When considered holistically, green spaces potentially form an extensive city-wide network of permeable spaces that can absorb and hold water.
- 16 Although blue/green infrastructure has a key role to play in helping to address our future drainage needs, the most significant investment will be in conventional 'hard engineered' drainage and wastewater infrastructure assets that are required to provide sufficient capacity to reduce flooding, improve wastewater collection and treatment standards and facilitate growth. For example, five of the six WwTW that discharge into Belfast Lough need to be upgraded to help improve the Belfast Lough water quality and to provide additional treatment capacity needed to enable development and growth. The necessary investment in sewerage networks and WwTW represents around 80% of the investment needed to implement the Plan.
- 17 Whilst it is recognised that significant investment is needed, this in itself is not enough to ensure the long term sustainable management of drainage and wastewater. We need to change and influence behaviour to ensure maximum benefit from the investment and avoid unintentionally contributing to these problems in the future, for example, through

ineffective planning decisions and historical land management practices. Policy and procedural proposals to facilitate integrated and sustainable drainage provision include the use of Sustainable Drainage Systems (SuDS), the roll out of Natural Flood Management (NFM) guidance and development of an integrated investment planning guide.

- 18 The geographical scope of the Plan covers the whole of the Belfast City Council area, as well as lands that are within four other local council boundaries: Lisburn & Castlereagh City, Antrim & Newtownabbey Borough, Mid & East Antrim Borough and Ards & North Down Borough. This is to ensure that flooding and water quality issues can be addressed in the optimum way to cover the drainage areas of each of the six WwTW that discharge into Inner Belfast Lough.
- 19 For the purposes of structuring this Plan, the geographical area of the Plan has been subdivided into four study areas:
 - **Blackstaff** - which extends westwards to include the portion of the Colin Glen River catchment that is within the Belfast WwTW drainage area.
 - **Connswater & Lagan Embankment**- which extends eastwards to include Dundonald and Crawfordsburn.
 - **North Foreshore** - which extends northwards to include Carrickfergus and Mallusk / Newtownabbey.
 - **Inner Belfast Lough** – which includes the 6 wastewater treatment works that discharge into it and their associated sewerage networks.

THE CASE FOR CHANGE

- 20 Much of the drainage and wastewater infrastructure serving the greater Belfast area is in need of urgent upgrade and requires significant levels of investment. NI Water has already had to provide negative responses to planning application consultations, and applications for new trade effluent discharges, due to capacity issues in the network, and has indicated that this is likely to become more frequent without the necessary investment. NI Water will, however, continue to provide new connections for developments with previously approved planning applications.
- 21 One of the biggest issues that needs addressed is the amount of rainwater entering our wastewater infrastructure. Not only does this increase wastewater collection and treatment costs by allowing the rainwater to mix with sewage, it causes increased instances of pollution and flooding.
- 22 The LWWP team within DfI is working collaboratively with the drainage providers and other key stakeholders to develop a new integrated, strategic and sustainable long-term approach to drainage and wastewater management on a whole catchment basis.
- 23 This could mean that the solution to a flooding or environmental issue in one location, that is the responsibility of one drainage organisation, could well be solved by using land or assets owned by a different organisation at another location in the Plan area. This involves the organisations working together, outside their normal areas of responsibility, to develop solutions that not only address their own problems but which could address issues faced by other partners.

EXECUTIVE SUMMARY

24 The LWWP approach also promotes the use of existing blue/green infrastructure rather than continuing our reliance on hard engineered measures such as bigger pipes and higher flood defences. Blue/green infrastructure offers many additional benefits to communities than just drainage, such as providing new opportunities for walking and cycling and acting as a catalyst for cultural change in the way we live and travel.

THE PLAN OUTPUTS

- 25 Each study area was assessed by a Technical Working Group comprising representatives from DfI Roads and Rivers, NI Water, NIEA and other key partners, including the relevant Councils. These groups helped identify the strategic drainage pressures and issues within the four areas along with potential opportunities to provide solutions, such as existing green spaces to help control the flow of water, or planned schemes that could be modified to incorporate integrated drainage.
- 26 A series of potential integrated drainage proposals were then developed for the four study areas, focused on achieving the overarching objectives which can be broadly categorised under the following three headings.
- **Policy Measures** - new policies and procedures to encourage greener drainage solutions and a collaborative approach to drainage and wastewater management.
 - **Catchment Based Solutions** – these potential measures are focused on managing rain water more naturally through the catchment by controlling run-off, reducing peak flows in the drainage systems and providing areas for flood storage. These measures include both blue/green infrastructure and conventional hard engineered measures.

- **Upgrades to Wastewater Treatment Works** – no amount of catchment based solutions will remove the need for the effective treatment of the wastewater that we produce. Upgrades to WwTW within the Plan area are needed in terms of the volume of wastewater they can treat and the standard to which it is treated.

- 27 Although all of these proposals have been subjected to initial high level feasibility studies and environmental assessment, they are still at conceptual stage. Progression to a programme of capital works is dependent on the successful outcome from further public engagement and consultation, detailed appraisal and design work and securing the necessary funding and approvals.
- 28 In the Plan Outputs Section, the pressures and issues and the potential opportunities for solutions are presented in map format to clearly identify the key areas of consideration.

THE ENVIRONMENTAL ASSESSMENTS

- 29 A Strategic Environmental Assessment and Habitats Regulations Assessment have been undertaken for the Plan.
- 30 These assessment processes have been developed and undertaken in integration with the development and assessment of the Plan process. This Plan has been guided by the wider environmental objectives which have been integrated with the water management objectives, to ensure more sustainable water management.

THE DELIVERY FRAMEWORK

- 31 Delivery of sustainable integrated solutions necessitates careful phasing of capital improvements, so that no part of the system is detrimentally affected, either in the short or the long term. This critical path has informed the strategic programme for implementation of this £1.4 billion Plan over the next 12 years and beyond.
- 32 Over £1.2 billion of this funding is needed for hard engineered measures such as upgrades to sewerage networks and wastewater treatment facilities, which have established delivery mechanisms through NI Water and its regulators. With NI Water continuing to receive around 70% of its funding from public expenditure, it will be a significant challenge for the Northern Ireland Executive to fund delivery of the Plan in the current financial climate. However, without investment, there will continue to be development constraints in the wastewater treatment system in many areas across Belfast, which will have implications for economic development, housing, the environment, and our recovery from COVID-19.
- 33 It is currently estimated that a further £200m of public funding is needed for blue/green infrastructure measures such as river floodplain restoration. However, to progress delivery of these measures, new arrangements are needed for the various key stages of scheme development, from planning through to construction, and for long-term maintenance. DfI's LWWP team will be responsible for overseeing delivery of the Plan through new programme governance and delivery structures. The established regulatory Price Control (PC) structures for water and sewerage services will also play a key part in monitoring NI Water's delivery of its elements of the Plan.

- 34 In terms of benefits realisation, the delivery of the Plan will be monitored annually as part of DfI's reporting processes, with a full review of the Plan to be completed in advance of the next Price Control period for water and sewerage services (PC27).

PUBLIC CONSULTATION

- 35 The proposals in this Plan are informed by the responses received to the public consultation on the draft Plan which opened on 11th November 2020 and closed on 29th January 2021.

FURTHER ENGAGEMENT

- 36 Further public consultation and engagement will be carried out as part of the detailed development and delivery of the individual projects in the Plan.

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SETTING THE SCENE



VIEW OF BELFAST FROM CAVEHILL



CHAPTER 01 INTRODUCTION

THE LIVING WITH WATER PROGRAMME

1.1 Drainage infrastructure throughout Northern Ireland is currently inadequate to meet the requirements expected of it. The problems are most acute in the greater Belfast area. To address this, in 2014 the Northern Ireland Executive approved the development of a Strategic Drainage Infrastructure Plan (SDIP) for Belfast to:

- **protect** against flooding by managing the flow of water through a catchment from source to sea;
- **enhance** the environment through effective wastewater management and the provision of enhanced blue/green spaces to benefit local communities; and
- **grow** the economy by providing the necessary capacity in our drainage and wastewater management systems to facilitate new development projects including house building.

1.2 To deliver this, the interdepartmental Living With Water Programme (LWWP) was established. Whilst the Department for Infrastructure (Dfi) is leading this programme, there are many key stakeholders² from across central and local government who are working collaboratively through the LWWP to develop sustainable drainage solutions. The LWWP promotes a holistic and integrated approach to future drainage and wastewater management and this document helps to explain the challenges involved, the potential solutions and the scale of investment needed to deliver them.

1.3 Due to the scale of the environmental and flooding problems in greater Belfast, and the significant levels of investment needed, the LWWP team has initially focused on developing the SDIP for the greater Belfast area. This Plan entitled, 'Living With Water in Belfast', is the SDIP for greater Belfast and is hereafter referred to as the Plan.

1.4 After the development and publication of this Plan, the LWWP team will develop an 'Integrated Drainage Investment Planning Guide' and Programme to allow strategic drainage infrastructure plans to be developed across Northern Ireland.



2 Department for Infrastructure, Northern Ireland Environment Agency (NIEA), Utility Regulator (UR), Belfast City Council, NI Water.

LIVING WITH WATER AIMS

- 1.5 This Plan coordinates the strategic planning of future drainage works for more efficient and effective management, allowing for the future growth and prosperity of the city, greater protection from flooding and the enhancement of the water environment. In accordance with the principles set out in **Sustainable Water - A Long Term Water Strategy (LTWS)** for Northern Ireland, this Plan has the following key aims:

Key Aims of Living With Water in Belfast	
1.	Reduce flood risk in compliance with the Floods Directive (Protect)
2.	Maintain and achieve environmental compliance by improving the quality of water in the rivers and Belfast Lough (Enhance)
3.	Support economic growth by enabling development (Grow)
4.	Maintain essential drainage and wastewater assets
5.	Adapt to climate change by providing increased resilience
6.	Where possible, as part of the solutions, provide new and improved amenity benefits to the community;
7.	Reduce the burden of operational costs relating to drainage and the provision of wastewater services;
8.	Determine the most cost effective solutions through integrated investment planning.

SCALE OF THE PLAN

- 1.6 The topography of Belfast provides a significant challenge to our drainage and wastewater infrastructure. Built up around the mouths of the Lagan and Farset Rivers and on the shores of Belfast Lough, most of Belfast lies in a 'bowl' surrounded by hills on three sides: Divis Mountain and Cave Hill to the west and north; Castlereagh Hills to the south; and Craigantlet Hills to the east. This leaves Belfast exposed to flooding from rivers, the sea and, additionally, to flash flooding caused by rainwater falling on hard surfaces that is unable to drain away quickly enough.
- 1.7 Figure 1.7 provides an illustration of the geographical scope of the Plan, which covers the catchments feeding the six Wastewater Treatment Works (WwTW) that discharge into Belfast Lough.

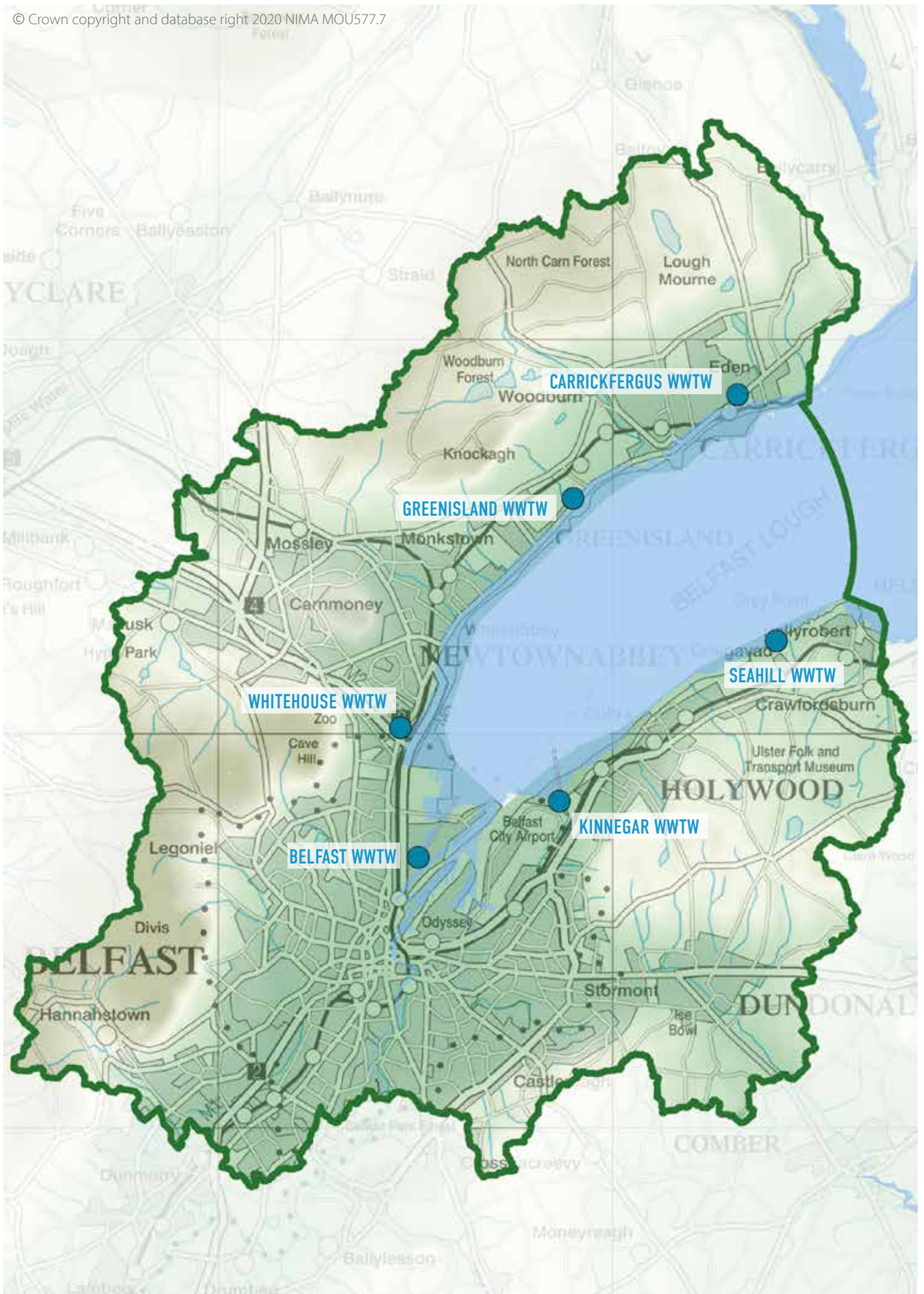


Figure 1.7 - Geographical Scope of this Plan

THE CHALLENGES AND OPPORTUNITIES

- 1.8 Initial estimates indicate that implementation of the Plan could cost around £1.4 billion over the next 12 years, with over £1.2 billion of this needed to upgrade our WwTW and sewerage networks. Approximately £200m is also needed for investment in blue/green infrastructure which includes more natural drainage solutions to help manage the flow of water through the urban areas. There is no doubt that it will be a challenge to deliver the Plan in the current financial climate, particularly given the impact that COVID-19 is having on our economy. However, this Plan provides an opportunity to invest in essential drainage and wastewater infrastructure in the greater Belfast area and provides the foundation to grow the city in a sustainable manner and enhance the environment.
- 1.9 We all live with water and therefore have a stake in delivering an efficient and resilient drainage and wastewater system. This is essential for good public health, economic growth, a healthy natural environment and the development of homes, schools, hospitals and businesses. The Northern Ireland Executive's 2020 New Decade New Approach document recognises the importance of investing in wastewater and sewerage infrastructure. The document states:
- 1.10 There is also a challenge, for those involved in planning and regeneration, to promote a more sustainable approach to drainage and wastewater management in new developments, public realm schemes and environmental improvement schemes.
- 1.11 A Strategic Environmental Assessment (SEA) has been prepared for the Plan, in accordance with the Environmental Assessment of Plans and Programmes Regulations (Northern Ireland) 2004 (S.R. 280/2004). A Habitats Regulations Assessment (HRA) has also been undertaken for the Plan, in accordance with the Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995. These assessment processes have been developed and undertaken in integration with the development and assessment of the Plan process. This Plan has been guided by the wider environmental objectives, which have been integrated with the water management objectives, to ensure more sustainable water management.

ENVIRONMENTAL ASSESSMENTS




“The Executive will invest urgently in wastewater infrastructure which is at or nearing capacity in many places across Northern Ireland, including in Belfast, limiting growth.”



CHAPTER 01


INTRODUCTION

SCREENING OF OTHER POTENTIAL IMPACTS

1.12 The impact of the proposed Plan was assessed in terms of regulatory and rural needs and on equality of opportunity, and the need for an Equality Impact Assessment (EQIA) was screened out. A copy of the screening form can be viewed on the Equality Section of the Department's website at <https://www.infrastructure-ni.gov.uk/publications/integrated-plan-drainage-and-wastewater-management-greater-belfast-screening-form> 

PUBLIC CONSULTATION

1.13 An eleven week consultation on the draft Plan was launched on 11 November 2020. The consultation was sent to a total of 331 consultees, including Section 75 groups, MPs, MLAs, government departments and other public consultees. The consultation closed on 29 January 2021. LWWP officials met with a number of stakeholders, in the lead up to and, during the consultation period to provide further clarification of the proposals contained in the draft Plan.

1.14 Consultees were invited to respond to the consultation by email to LivingWithWater@infrastructure-ni.gov.uk or to submit responses by post. The consultation and related Strategic Environmental Assessment (SEA) and Habitats Regulations Assessment (HRA) remain available on the Department's website at: <https://www.infrastructure-ni.gov.uk/consultations/living-water-belfast-consultation> 

1.15 A total of thirty one, largely positive, responses were received and electronic copies of these are held by the Living With Water Programme team. Twenty seven of these came from representative bodies, political parties/elected representatives, local government or industry and four were from private individuals.

1.16 The Department has published a Consultation Report which provides a summary of the responses received and the key issues raised. The Department wishes to thank the members of all the various working groups that contributed to the development of this Plan and all stakeholders and members of the public who took the time to respond to the consultation.

FURTHER ENGAGEMENT

1.17 Further engagement with stakeholders and the public will be necessary as the proposals in this Plan continue to be developed and delivered over the next 12 years.



CHAPTER 02

BACKGROUND AND STRATEGIC CONTEXT

BACKGROUND

2.1 Every day we rely on a vast drainage network, much of which is hidden beneath our towns and cities and usually goes unnoticed. It is only during times of flooding that the resilience and capability of this “invisible” infrastructure comes into the spotlight. Belfast has experienced a number of serious flooding events in recent years which have had devastating consequences for those living and working in the affected areas.

2.2 As our economy, population and tourist numbers continue to grow, and climate change produces more intense rainfall, the ageing drainage infrastructure in the greater Belfast area will continue to come under ever greater pressure. This may lead to:

- Reduced capacity within the drainage and wastewater infrastructure leading to development restrictions in terms of new homes, businesses, hospitals and schools;
- Increased instances of drainage and wastewater infrastructure failure such as sewer collapses and blockages;
- Additional cost of pumping increasing volumes of rain water mixed with sewage to wastewater treatment works for treatment; and
- More frequent spills from sewerage overflows causing pollution in our inland and coastal waters.

2.3 If these issues are not addressed future development may be constrained, and flooding and pollution will intensify. Due to the complex nature of the drainage problems, no one organisation can tackle these alone. This new integrated approach to drainage and wastewater management is needed to address these inter-related problems.

STRATEGIC CONTEXT

2.4 It is essential we have a sustainable water sector which contributes to achieving the United Nations Sustainable Development Goals (SDG) whilst supporting economic growth, in line with the Northern Ireland Regional Development Strategy 2035 (RDS). Northern Ireland must meet the requirements of a number of Directives designed to protect and improve the quality of the water environment, such as the Water Framework, Urban Waste Water Treatment, Bathing Waters, Groundwater and Floods Directives.

2.5 The Long-Term Water Strategy ([Sustainable Water](#)) focuses on complying with these Directives by setting out a range of initiatives to deliver the long-term goal of a sustainable water sector in Northern Ireland. It encourages a sustainable and integrated approach to managing the different water needs in a way which promotes regional development, without compromising the environment or increasing flood risk.

2.6 Sustainable Water seeks to develop cross-departmental working and stakeholder partnerships, and references the need for the development of a strategic drainage infrastructure plan for Belfast and the development of guidance for similar plans across Northern Ireland.

- 2.7 Also, in February 2020 the Northern Ireland Assembly declared a climate emergency. Key issues that need to be addressed are the need for infrastructure to be adapted to cope with more intense rainfall and to mitigate against increased greenhouse gas emissions. The ongoing energy requirements associated with the traditional methods of drainage and wastewater management contribute significantly to greenhouse gases and there is a need to develop a long term sustainable approach.
- 2.8 The LWWP is therefore central to the delivery of the Floods Directive, Water Framework Directive, the United Nations SDG, the Northern Ireland RDS and the Long Term Water Strategy as shown in the Strategic Context Graphic set out on the next page.
- 2.9 In addition to contributing to these International and Regional strategies, Living With Water in Belfast must contribute to delivering the local development and community plans of the five council areas³ impacted by the Plan. This includes Belfast City Council's [Belfast Green and Blue Infrastructure Plan and Open Spaces Strategy](#) [↗](#) and [Belfast Resilience Strategy](#) [↗](#).

3 Antrim and Newtownabbey, Ards and North Down, Belfast City, Lisburn and Castlereagh City, Mid and East Antrim

CHAPTER 02

BACKGROUND AND STRATEGIC CONTEXT

LONG TERM WATER STRATEGY

The Long-Term Water Strategy's flood risk vision is to:

“manage flood risk and drainage in a sustainable manner to facilitate social, economic and environmental development.”

This Vision is translated into the following five strategic aims:

1. Deliver Sustainable Flood Resilient Development;
2. Manage the Catchment to Reduce Flood Risk;
3. Provide Sustainable Integrated Drainage in Rural and Urban Areas;
4. Improve Flood Resistance and Resilience in High Flood Risk Areas; and
5. Be Prepared for Extreme Weather Events.

These aims are about proactively reducing flood risk by making space for water through land-use planning, catchment management and by making best use of existing drainage and blue/green infrastructure.

The Strategy suggests that a framework must be put in place that ensures drainage providers work openly and collaboratively to achieve this. Such an approach will help make investment more effective and reduce the future costs of maintaining and operating drainage and wastewater infrastructure. This is the crux of integrated urban drainage and is what LWWP is all about - making the best use of the finite resources available to manage surface water in an effective and sustainable manner.

THE REGIONAL DEVELOPMENT STRATEGY (RDS)

The Regional Development Strategy (RDS) is the spatial strategy of the Northern Ireland Executive which informs the spatial aspects of the strategies of all Government Departments in Northern Ireland. Council Local Development Plans and development schemes are required to 'take account' of the RDS by considering how they might:

- Promote a more sustainable approach to the provision of water and sewerage services and flood risk management.
- Integrate water and land-use planning.
- Manage future water demand.
- Encourage sustainable surface water management.

One of the strategic aims of the RDS is to: **Strengthen Belfast as the regional economic driver and Londonderry as the principal city of the North West.**

LONG TERM WATER

01

02

LIVING WITH WATER

ER STRATEGY

R PROGRAMME

05

04

03

THE WATER FRAMEWORK DIRECTIVE

Our unique natural environment is important to all of us and is something we need to nurture. It enhances our everyday lives by promoting our health and well-being, encouraging economic growth and tourism and helping to tackle the social issues which often develop in run down areas.

The Water Framework Directive (WFD) establishes an integrated approach to the protection, improvement and sustainable use of water bodies.

The WFD also includes Shellfish Water Protected Areas (SWPAs) which must be protected and improved to contribute to the high quality of shellfish products harvested for human consumption from licensed aquaculture beds.

The Urban Waste Water Treatment Directive (UWWTD) is one of a number of existing directives that sit below the WFD and its objective is to protect the environment from sewage pollution through the effective collection, treatment and discharge of waste water. The Directive sets treatment levels based on the size of population (population equivalent) served by the sewerage system and the sensitivity of waters receiving their treated discharges.

THE FLOODS DIRECTIVE

The Floods Directive requires Member States to establish a framework for the assessment and management of flood risks that aims to reduce the adverse consequences of flooding on human health, the environment, cultural heritage and economic activity. While many areas may be at risk of flooding, the Directive requires areas at significant risk to be identified and looked at in more depth.

Four of the twelve identified Areas of Potential Significant Flood Risk that require Flood Risk Management Plans to be developed fall within the scope of this Plan.

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS

The 17 Sustainable Development Goals (also known as SDGs) were formally agreed by the UN at the Sustainable Development Summit in New York in September 2015, and came into effect from January 2016. The Goals are an internationally agreed set of global high level targets relating to international development to tackle poverty and inequality.

SECTION 1

SYNOPSIS

- The Living With Water Programme (LWWP) is a new multi-agency initiative, established to take forward a holistic and integrated approach to future drainage and wastewater management, through the development of a strategic drainage infrastructure plan for the greater Belfast area and an 'Integrated Drainage Investment Planning Guide' for the rest of Northern Ireland.
- The LWWP is central to the delivery of the Floods Directive, Water Framework Directive, the United Nations SDG, the Northern Ireland Regional Development Strategy and the Long Term Water Strategy. It will help adapt and mitigate against climate change.
- 'Living With Water in Belfast', is the strategic drainage infrastructure plan for the greater Belfast area and covers the areas served by the six Wastewater Treatment Works which discharge into Belfast Lough.





THE CASE FOR CHANGE

OUT-OF-SEWER FLOODING AT A RESIDENTIAL PROPERTY IN BELFAST



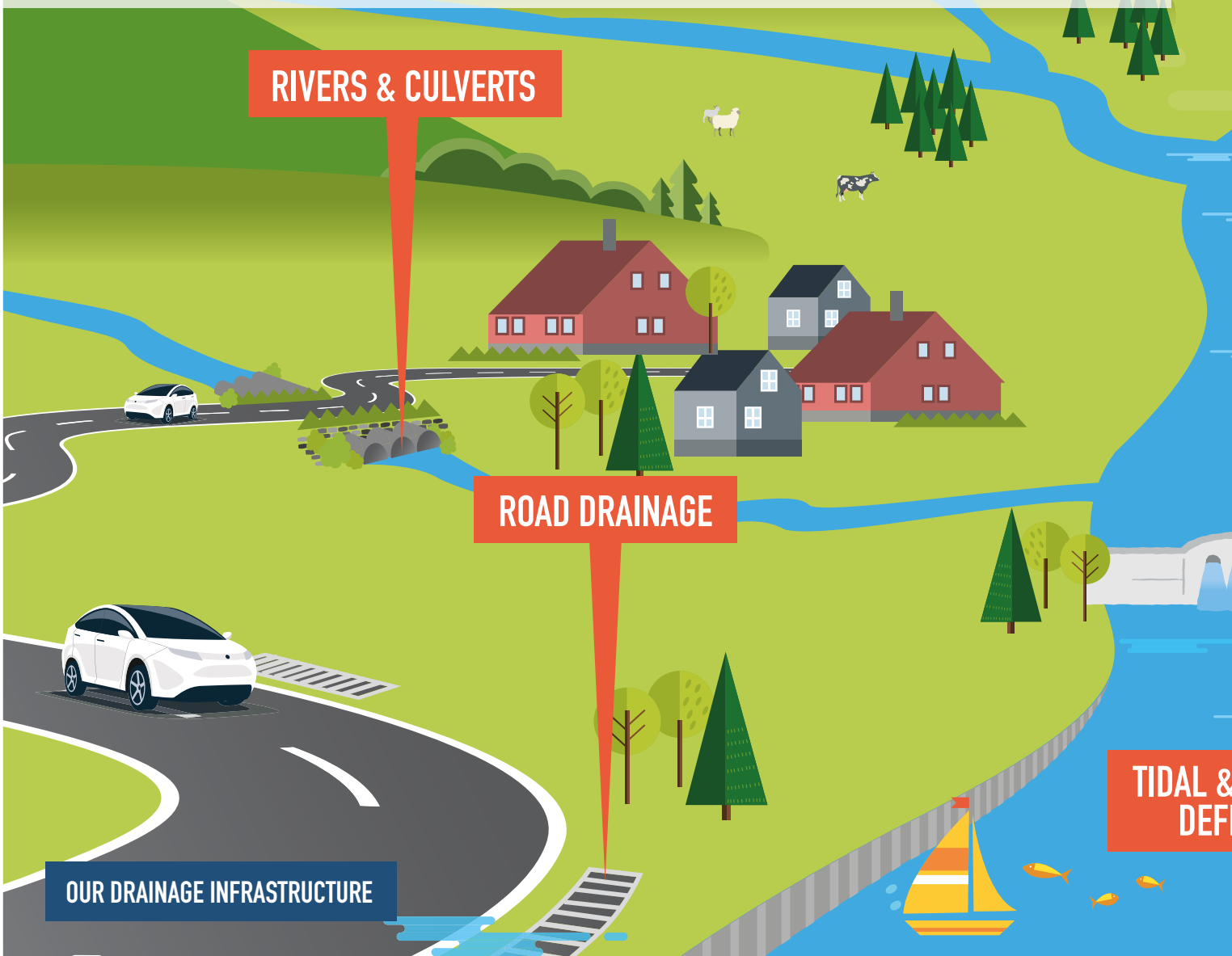


CHAPTER 03

OVERVIEW OF EXISTING INFRASTRUCTURE

When it rains, some of the water naturally seeps into the earth or makes its way directly to a watercourse. The rest finds its way via a network of underground pipes, into rivers and estuaries and finally into Belfast Lough. Some of this water is carried by separate storm drains and pipes and some flows into the sewers and is carried along with sewage to a wastewater treatment works. We rely upon a vast network of drainage and flood defence infrastructure, including: rivers, culverts and weirs; sewers, wastewater treatment works and pumping stations; road gullies and drainage pipes; waterways and canals; lakes, loughs and reservoirs; green infrastructure (parks, open spaces); and coastal and river flood defences.

This graphic provides examples of some of the existing infrastructure within Belfast.

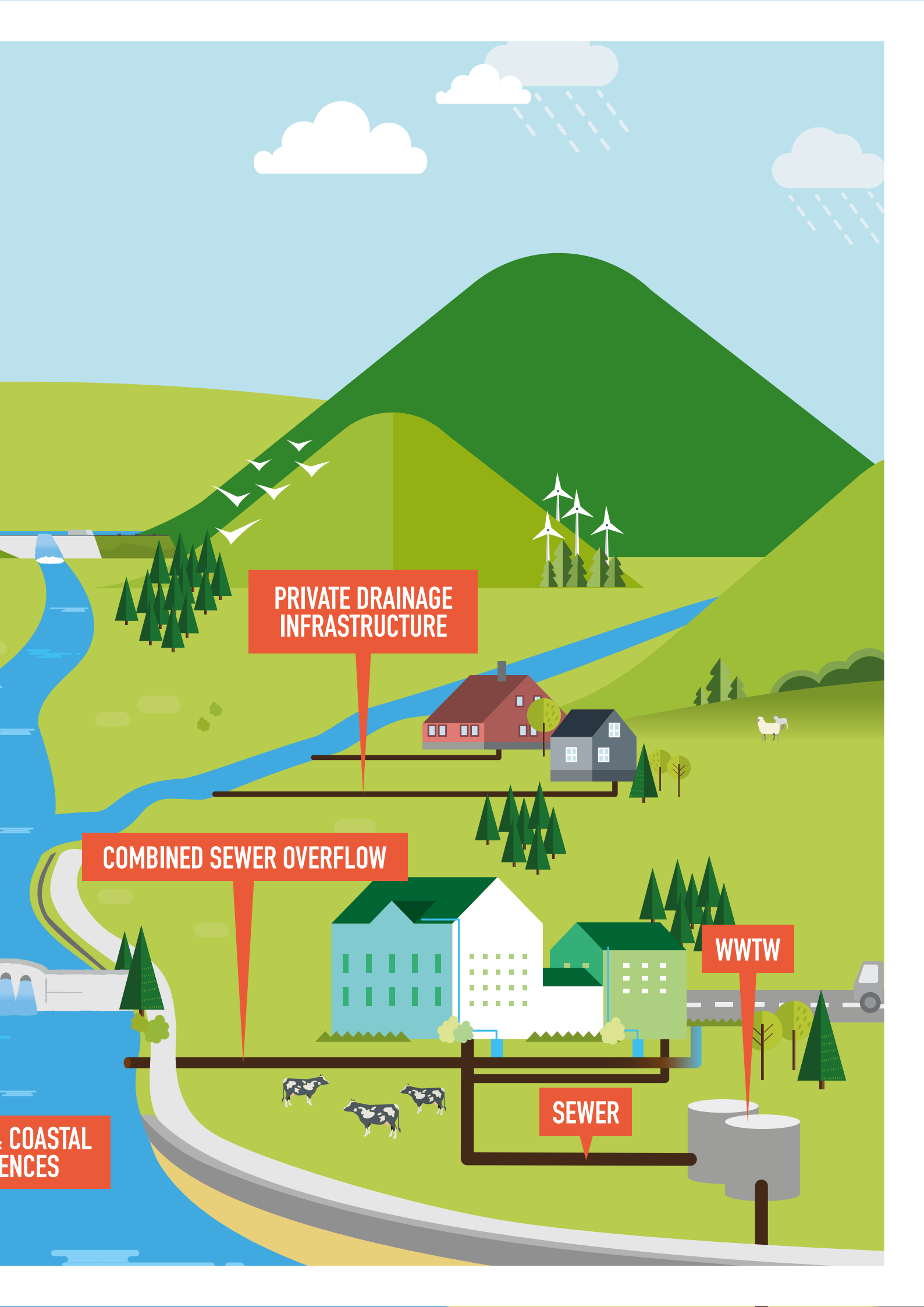


RIVERS & CULVERTS

ROAD DRAINAGE

OUR DRAINAGE INFRASTRUCTURE

TIDAL & DEF



**PRIVATE DRAINAGE
INFRASTRUCTURE**

COMBINED SEWER OVERFLOW

WWTW

SEWER

**COASTAL
DEFENCES**

CHAPTER 03

OVERVIEW OF EXISTING INFRASTRUCTURE

HOW IT ALL WORKS

3.1 The policy, regulation and funding of drainage and wastewater management in Northern Ireland is currently provided by a number of different organisations.

Organisation	Responsibilities
Dfi	<ul style="list-style-type: none">• water and drainage policy, funding and legislation• road drainage (parts of which discharge into NI Water sewers), management and maintenance of designated rivers and flood defences• flood risk management planning under the floods directive• planning policy and strategic planning
DAERA / NIEA	<ul style="list-style-type: none">• wastewater policy and legislation• environmental standards and regulation• river basin management planning under the water framework directive
NI Water	<ul style="list-style-type: none">• drinking water provision• ownership, management and operation of some reservoirs and their associated catchments (NI Water is the second biggest land owner in NI)• surface water collection associated with its licence• wastewater collection (via combined and foul sewers) and treatment
Utility Regulator	<ul style="list-style-type: none">• Economic regulation of NI Water's activities relating to the provision of water and sewerage services
Councils	<ul style="list-style-type: none">• development control and planning• ownership, management and operation of some ponds, lakes and reservoirs• community assets including parks and other public spaces

3.2 Although the majority of existing drainage and wastewater infrastructure is managed and operated by these public bodies, some is the responsibility of private landowners. This can cause significant problems if it is not maintained adequately in critical locations.



Figure 3.2: Examples of Existing Drainage Infrastructure

WATERCOURSES & FLOOD DEFENCES

3.3 Figure 3.4 below shows the main urban watercourses and culverts which feed into Belfast Lough, all of which have the potential to flood during periods of prolonged heavy rainfall. DfI Rivers is responsible for maintaining the free flow of water in all watercourses in NI that have been designated by the Drainage Council.

3.4 Belfast is currently protected from coastal and fluvial (river) flooding by seawalls around the harbour area and flood defences along a number of the key watercourses. Many of the watercourses are culverted (piped) and therefore have limited capacity for taking additional flows.

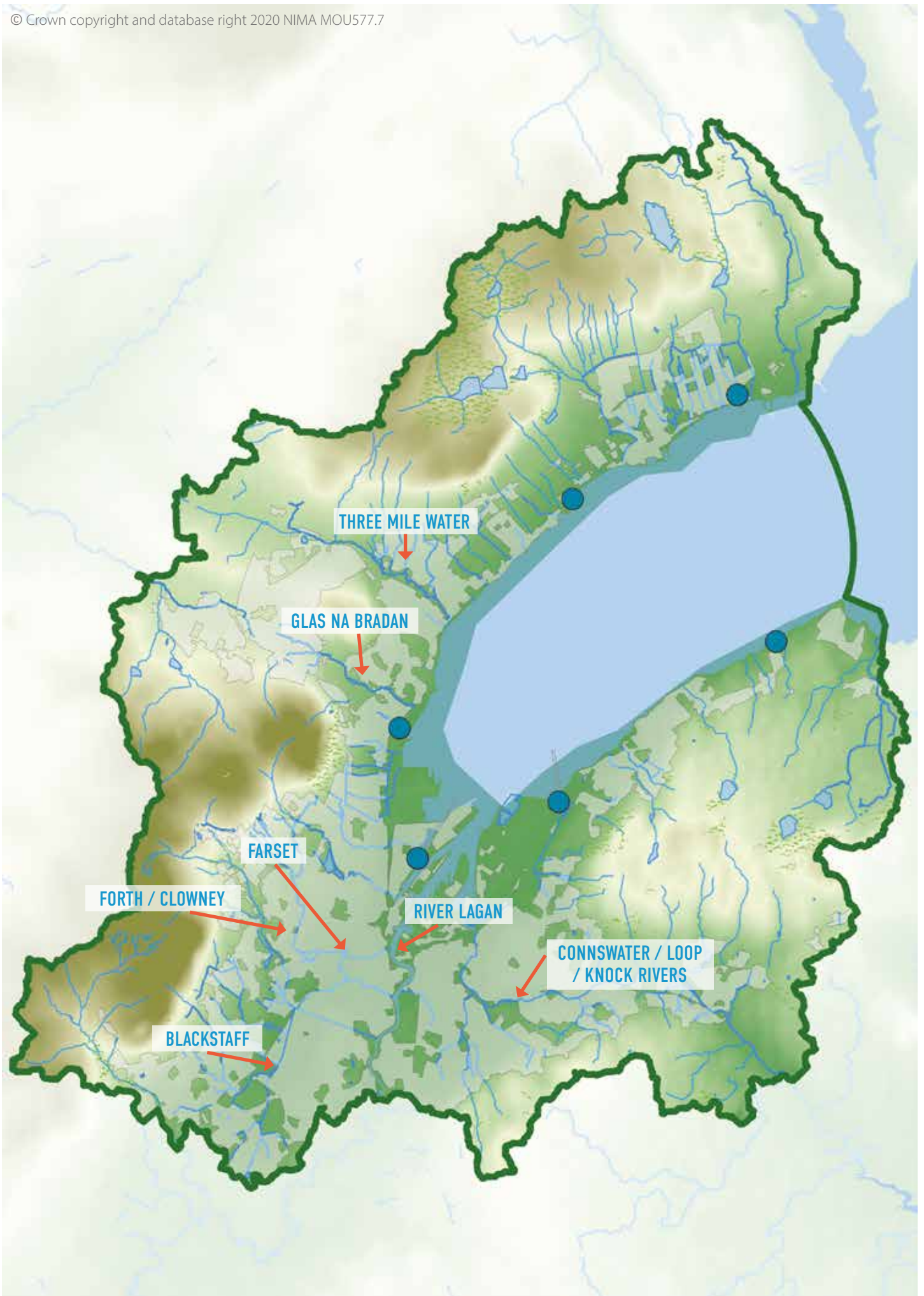


Figure 3.4 – Main Belfast Watercourses

ROAD DRAINAGE

3.5 The drainage of public roads, footways and public realm areas in Belfast is the responsibility of DfI Roads. These hard surfaces are usually drained via a system of gullies, drainage channels and pipes which collect and discharge water to a nearby watercourse, surface water sewer or combined sewer. However, given the age of the infrastructure in Belfast, most of the surface water from roads is discharged into the combined sewerage network, where it is mixed with sewage and other pollutants and pumped to one of the six Wastewater Treatment Works (WwTW) for treatment.

PRIVATE DRAINAGE SYSTEMS

3.6 A significant length of drainage infrastructure in the greater Belfast area is privately owned and not maintained by any public body. Some of this private drainage infrastructure (PDI) carries significant flows from the public drainage and sewerage networks. A recent desk-based assessment estimated that there are around 87km of known PDI in the Belfast area (excluding private open watercourses). Over time the condition of all drainage infrastructure deteriorates and, without maintenance, will eventually fail, leading to flooding and other types of disruption. The majority of PDI has been in existence for many decades and is therefore likely to be in poor condition.

SEWERAGE NETWORKS

3.7 The sewerage networks in the greater Belfast area comprise hundreds of kilometres of sewers and over 100 pumping stations, including the largest two in Northern Ireland: Sydenham Wastewater Pumping Station (WwPS) and the Belfast Sewers Tunnel Terminal Pumping

Station. Whilst there has been significant investment in sewerage networks in the greater Belfast area in recent times including, most notably, the £164m Belfast Sewers Project (completed in 2010 - see Annex A), investment has not kept pace with the level of development and growth experienced. With the limited funding available, the priority has been to invest in the provision of secure, clean drinking water supplies. This has created a legacy of underinvestment in wastewater infrastructure with much of the original sewerage system built in the 19th century remaining in service.

- 3.8 These sewerage networks were designed as combined systems with both sewage and surface water from rainfall flowing through the same pipes; their main purpose was to take this wastewater to the nearest river. Nowadays environmental standards require wastewater to undergo appropriate treatment before being returned to the environment. The sewage which previously discharged to the nearest river is now treated at WwTW.
- 3.9 Separate foul and storm sewers have been a mandatory requirement in all new developments for over 30 years. However, a high percentage of our sewers, particularly in our town centres, remain combined, carrying both surface water and sewage within one pipe. This means that rainwater is often pumped and treated unnecessarily with sewage.



Figure 3.9 – Original Brick Combined Sewer Overflow Chamber

CHAPTER 03

OVERVIEW OF EXISTING INFRASTRUCTURE

3.10 Excessive rainfall can also overload sewerage systems which can result in flooding and pollution; this is why combined sewer overflows (CSOs) are needed. CSOs prevent overloading of sewers by allowing surface water that has been mixed with sewage to rise inside the combined sewer and eventually enter a separate pipe, which discharges directly to a river or coastal water without treatment, as shown in figure 3.10. If there was no overflow in place, this sewage would force its way out of the network of pipes to the surface, causing flooding. These overflows should, however, only operate during heavy rainfall when the discharge is diluted. Where they spill too frequently and cause pollution these are categorised as unsatisfactory and must be rectified.

WASTEWATER TREATMENT WORKS (WwTW)

- 3.11 Most of the wastewater in the greater Belfast area is collected and pumped to one of six WwTW, where it is treated, before being discharged safely into Belfast Lough. Depending on the environmental standards, there can be up to six stages in the wastewater treatment process. Figure 3.11 shows the locations of the six sewerage networks and WwTW that discharge into Belfast Lough.
- 3.12 The largest of these works is Belfast WwTW which is operating at capacity with all treatment units fully utilised. This means that treatment units cannot be taken out of service to complete routine maintenance and there is no redundancy to cope with unexpected shocks.

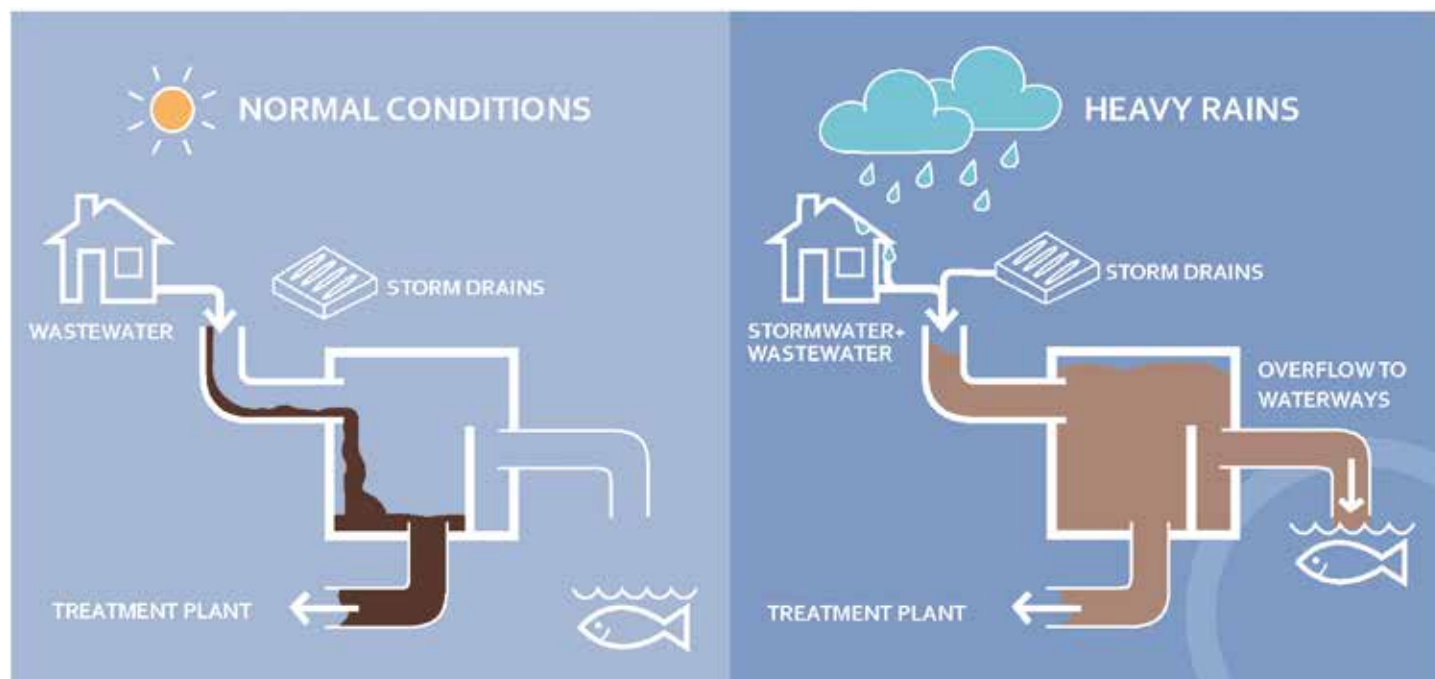
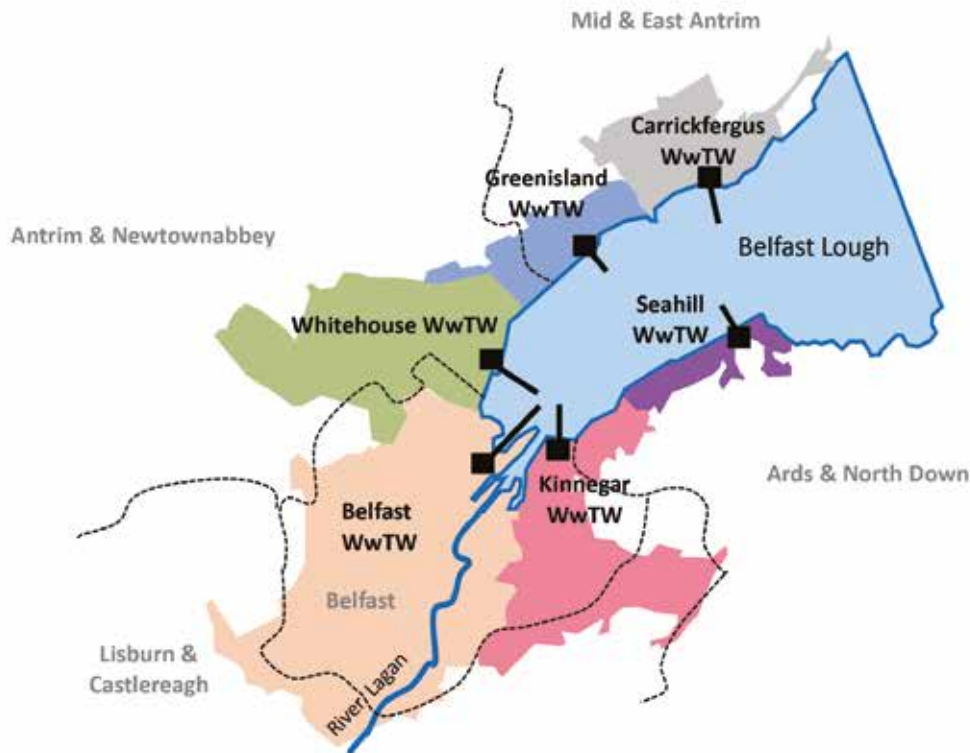


Figure 3.10 - Combined Sewer Overflow

Figure 3.11 - Belfast Sewer Networks areas and WwTW



3.13 Growth in the catchment means that Whitehouse WwTW must be upgraded in order to achieve more stringent discharge standards before it passes a key size threshold that is defined under legislation. The work to upgrade Whitehouse WwTW is predicted to occur around 2022/2023. The final effluent from Whitehouse WwTW is discharged directly to the shore at the high tide mark because its sea outfall was not extended when the M5 motorway was built on reclaimed ground. This needs to be extended to meet minimum environmental standards.



Figure 3.12 - Aerial view of Belfast WwTW

CHAPTER 03

OVERVIEW OF EXISTING INFRASTRUCTURE



Figure 3.15 – Aeration Lanes at Whitehouse WwTW



Figure 3.16 – Carrickfergus WwTW



Figure 3.17 – Belfast WwTW Outfall under construction (courtesy of National Museum NI)

- 3.14 At Greenisland WwTW the existing outfall discharges above the mean low water mark and is undersized, causing flooding of the site and pollution of Belfast Lough during periods of intense rainfall. The current WwTW was built in 2001 with a 15 year design life which means it has insufficient treatment capacity to meet future growth in the catchment.
- 3.15 To enable the water quality objectives to be met in Inner Belfast Lough, additional storm water storage is also required at Carrickfergus WwTW. As with Greenisland WwTW the existing outfall discharges above the mean low water mark, has inadequate hydraulic capacity and therefore needs to be extended.
- 3.16 Kinnegar WwTW also requires an increase in treatment capacity to meet future growth in the catchment and facilitate the closure of further unsatisfactory CSOs that have been causing odours in the adjacent wetlands.
- 3.17 Since each WwTW has been built there has been significant development around their boundaries which limits opportunities for site expansion. When Belfast WwTW was originally constructed, its 1.6km outfall discharged into the open lough. Since the early 1900s land reclamation means the sea outfall from Belfast WwTW now discharges in an enclosed bay between Giant's Park and Belfast Harbour Victoria Terminal. This has caused significant sedimentation around the end of the outfall, which has resulted in it becoming partially blocked. It must now be extended to deeper water to allow for greater dilution and dispersion.

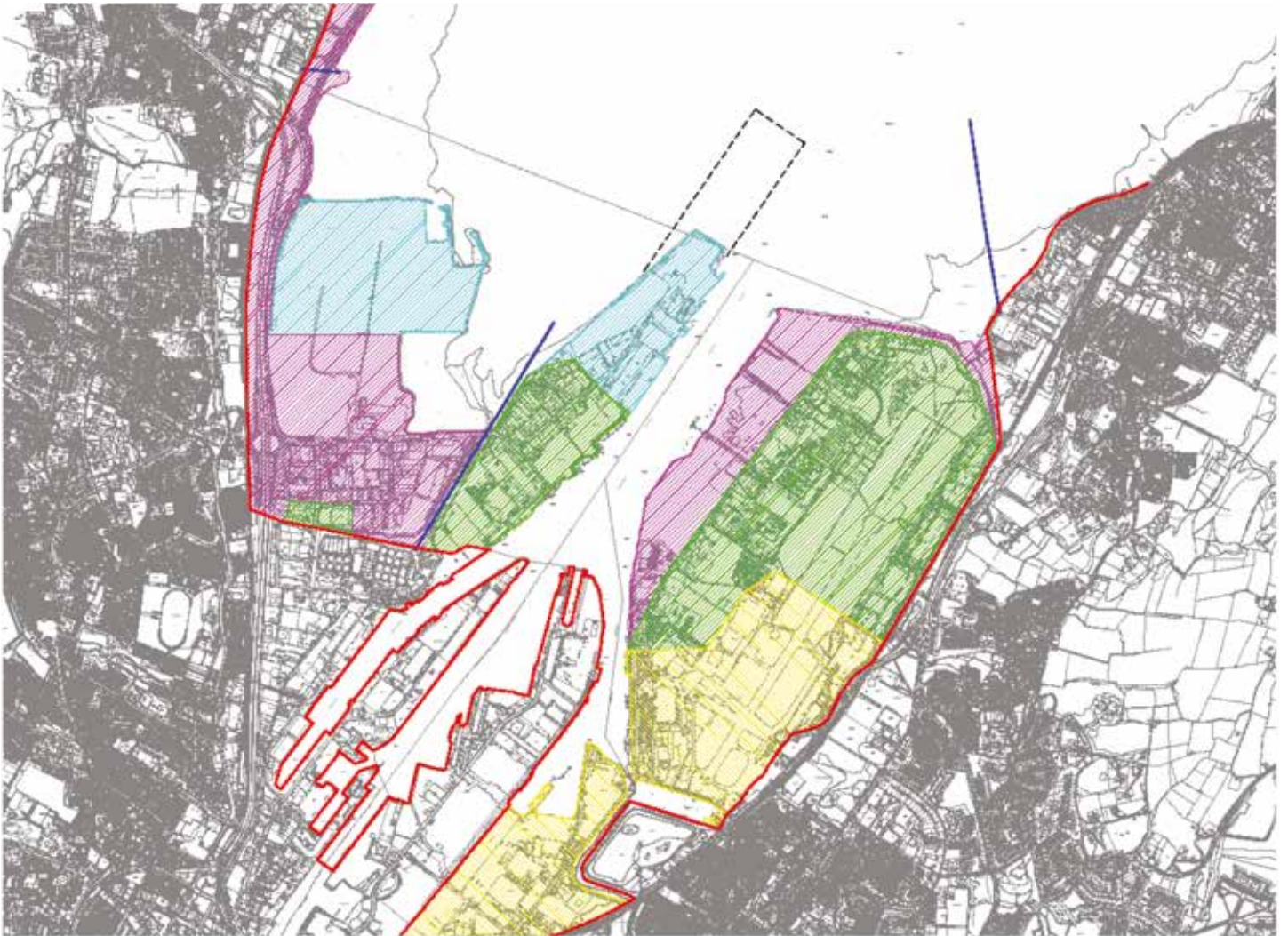


Figure 3.18 – Land Reclamation in Belfast Harbour since 1901 (coloured areas)

3.18 The solid red line defines the boundary of Belfast Harbour in 1901; the dark blue lines show the extent of the original sea outfalls, with discharge points extending out into open water. However, the coloured areas, highlighting new land reclamation, show how this is impacting on the existing outfalls to effectively discharge final effluent.

CHAPTER 04

THE NEED FOR INVESTMENT

OVERVIEW

4.1 Much of the drainage and wastewater infrastructure serving greater Belfast is in need of urgent upgrade and requires significant levels of additional investment. Signs that the drainage systems and treatment works are becoming increasingly overwhelmed and failing include: some constraints on new developments of houses and businesses; more regular instances of flooding; increased sewage spills and pollution; and more frequent sewer collapses and blockages. Figure 4.1 shows sewage related debris on scaffolding erected over the Blackstaff River at Boucher Playing fields for a concert. This will only have been a small fraction of the debris discharged into the river from upstream combined sewer overflows in the weeks before the concert. The majority of this pollution is dispersed by rivers into the sea, where it will go on to be a hazard to marine life, with some debris sorted by the sea and thrown back up onto beaches.



Figure 4.1 – Sewage related debris on scaffolding over the Blackstaff River



Figure 4.2 - Rubbish items and a fatberg recovered from sewers

4.2 Flushing inappropriate items (such as baby wipes, nappies, cotton buds and sanitary products) down toilets and drains can cause blockages in the sewerage system which in turn can then cause the sewers to overflow into the environment and pollute our rivers. Operational problems also arise from the presence and accumulation of fats, oils and greases (FOG) in the sewerage system. If poured down kitchen sinks or drains, FOG can harden and cause fat blockages known as 'fatbergs', which can lead to flooding and pollution. NI Water spends millions of pounds every year clearing blockages.



Figure 4.3 - Fly Tipping at Forth River, Belfast

4.3 Fly-tipping of rubbish is another problem that pollutes the land and waterways. It can be dangerous to human and animal health and is expensive to clear away. If you see someone fly-tipping, please report it to the local council.

4.4 Figure 4.4 on the next page provides a graphic illustration of some of the current drainage problems that exist. These issues will continue to escalate if we do not invest in our drainage and wastewater infrastructure.

Without addressing these issues, Belfast will continue to be prone to flooding, environmental problems will increase and the future development of Belfast could be threatened.

Upper Catchment

Sparse Woodland

Middle Catchment

Local parks and leisure

Lower Catchment

Combined Sewer Overflow

WwTW

Untreated effluent that is spilling

Fully treated effluent

Tidal / Coastal Flood Risk





01 Agriculture Run-off / Waste from Livestock

Poor land management practices including over-use of fertilisers and poor management of livestock can cause pollution in our rivers and coastal water.

02 Erosion

Natural erosion along the coastline / riverbank caused by the action of waves or high water flow from a river.

03 Surface Water Flooding

Also known as 'Pluvial' flooding occurs when intense rainfall cannot drain away quickly enough.

04 Tidal / Coastal Flooding

This occurs during exceptionally high tides or storm surge events.

05 River Flooding

Also known as 'Fluvial' flooding occurs when intense rainfall over a prolonged period causes a river to overflow.

06 Out of Sewer Flooding

This occurs when the sewerage network is overwhelmed by intense rainfall or when a sewer becomes blocked due to inappropriate items being flushed or when the sewer suffers from a structural failure.

Four of the twelve Areas of Potential Significant Flood Risk identified in the Northern Ireland Flood Risk Assessment 2018 fall within the Plan area.

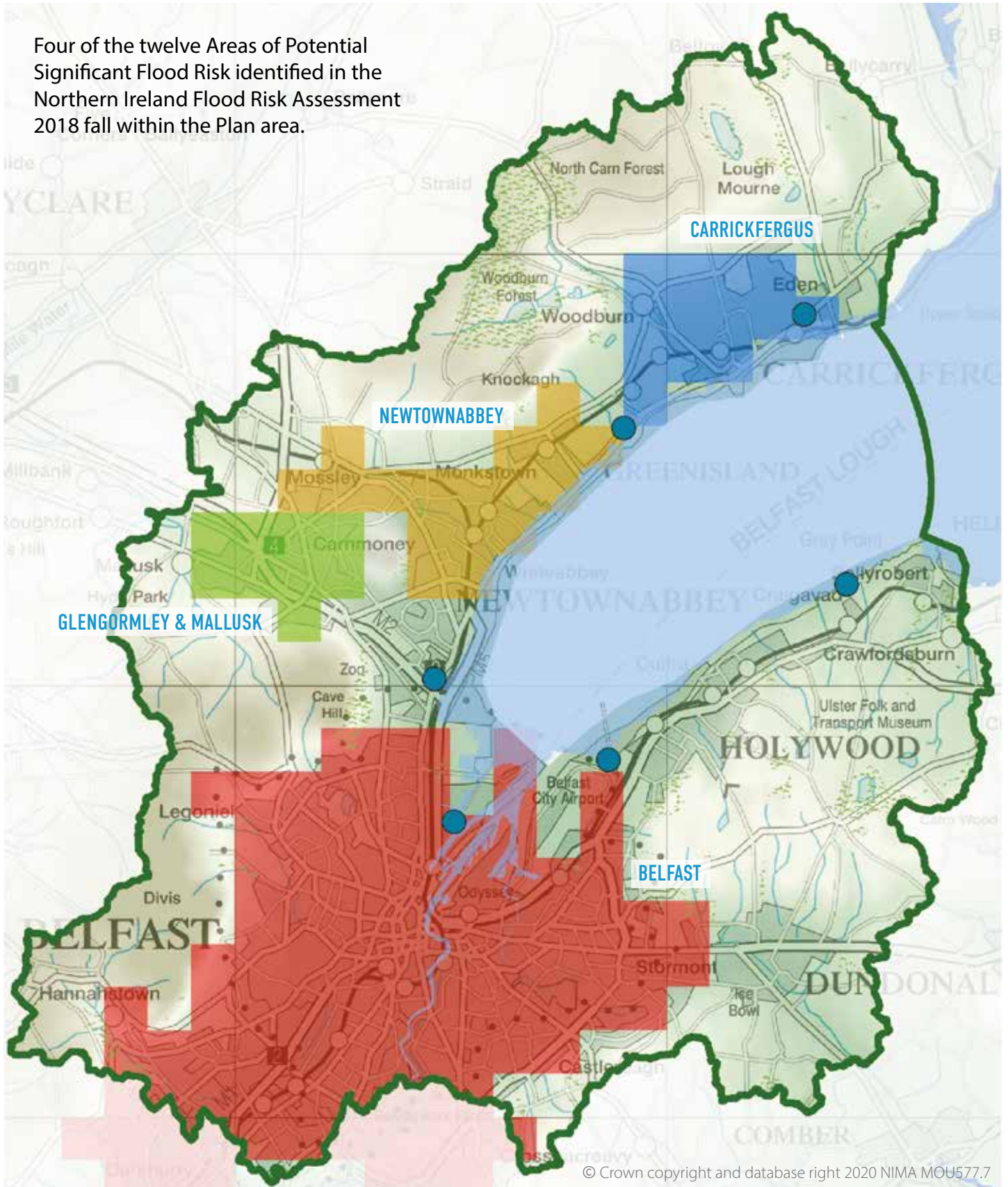


Figure 4.5 - APSFR within the Plan Area

NEED TO PROTECT AGAINST FLOODING

- 4.5 The effects of flooding on human activity are wide ranging, with the potential to impact on health, cause pollution, damage buildings and severely compromise economic and social activities. The Northern Ireland Flood Risk Assessment (NIFRA) 2018 indicates that there are around 25,000 properties at risk of coastal or fluvial flooding across NI and 24,500 properties at risk of surface water flooding. The NIFRA identifies 45 flood risk areas across Northern Ireland. Twelve of these areas have also been identified as Areas of Potential Significant Flood Risk (APSFRR) and require Flood Risk Management Plans to be developed. As shown in figure 4.5, four of the APSFRR are in the greater Belfast area and fall within the scope of this Plan. Within the last ten years there have been a number of significant flood events in Belfast which have caused considerable disruption for property owners.
- 4.6 Whilst it is recognised that not all flooding can be prevented, the impact it has can be managed by designing our systems and infrastructure in such a way that when these systems are breached the excess water can be directed away from people and property. This approach is known as design for exceedance and will become increasingly important as flood risk continues to increase due to climate change, urban creep and lack of capacity in the drainage and wastewater infrastructure.

- 4.7 In 2011, the Water Services Regulation Authority (OFWAT)⁴ predicted that:



“the combined effects of climate change, growth and urban creep will lead to a median increase in 1:10 year sewer flood volumes of 51% by around 2040 compared with current predicted flooding”



- 4.8 In January 2014, the flood defences at Belfast Harbour came within centimetres of being overtopped when we experienced the highest ever recorded tidal surge within Belfast Harbour. With much of the city centre between 1m to 2m below extreme high tide levels, and with global sea levels rising at an accelerating rate that is currently between 3 and 4mm per year, a similar event in the future could cause serious disruption to commerce, the transportation network, and the social fabric of the city.

4 OFWAT Report - Future Impacts on Sewer Systems in England. OFWAT is the body responsible for economic regulation of the Water and Sewerage industry in England and Wales.

CHAPTER 04

THE NEED FOR INVESTMENT

- 4.9 Any significant depth of tidal flooding within the city centre is likely to drain slowly as the capacity of the drainage network is exceeded. This also raises the likelihood of contamination as tidal flooding overwhelms and mixes with foul sewage and other contaminants. Flooding in Belfast city centre is likely to cause major disruption for several days or even weeks, with major clean-up and recovery consequences. Work is therefore underway on an £18m Belfast Tidal Flood Alleviation Scheme which includes approximately 8.6 km of new flood defences from Stranmillis Weir on Lockview Road to Northern Road in Belfast Harbour Estate. These defences will comprise a combination of permanent and temporary barriers and flood gates.
- 4.10 Using standard flood damage analysis, over the 100 year life of the scheme the level of flood risk is estimated to cause damages valued today at approximately £250m. This value excludes the impact on the local economy as a result of unproductive employment and loss of access which is estimated at an additional £87m (in accordance with economic national appraisal guidance).



Figure 4.9 - Belfast Harbour January 2014 Tidal Surge

NEED TO ENHANCE THE WATER ENVIRONMENT

4.11 As outlined previously, much of the wastewater infrastructure in the Plan area is now having to operate under immense pressure, well above its design capacity. Funding has not kept pace with the scale of development and growth or with improvements required to support Directives including the Water Framework Directive. These pressures are resulting in:

- Some constraints on new connections for housing, industry and businesses.
- Increased instances of out of sewer flooding throughout the catchment with approximately 80 properties already registered as being prone to internal property flooding from sewer networks. Many more properties and roads experience external flooding due to capacity constraints or blockages.
- More frequent blockages due to deteriorating sewers causing collapses, and from increasing volumes of wet wipes and other material that should not be flushed. Wet wipes also block overflow screens and combine with fats, oil and greases to form fatbergs.
- Water quality issues throughout the catchment and in Belfast Lough due to sewer overflows. It is identified that of the estimated 340 overflows in the Plan area approximately 50% are estimated to be unsatisfactory. Not all overflows contain screens, and those that do are often overwhelmed by the type and scale of inappropriate materials now being flushed into the sewers.



Figure 4.11 - Emergency Overflow at Sydenham WwPS

CHAPTER 04

THE NEED FOR INVESTMENT

4.12 These unsatisfactory intermittent sewerage overflows and continuous discharges from the WwTW along with pollution from other sources including agriculture have led to a deterioration in the water quality within the inner part of Belfast Lough. Whilst the Outer Belfast Lough area currently meets the Water Framework Directive 'Good Status' target, the classification for both the Belfast Harbour and Inner Belfast Lough are 'Moderate Status'. An assessment in

2019 by DAERA⁵ indicated a decline in quality of the Belfast Lough Shellfish Water Protected Area due to excessive amounts of bacteria. This means that the shellfish cannot be harvested and put into the food chain without complex purification processes first being followed, which impacts on the economic sustainability of this important industry.

CASE STUDY WHITEHOUSE WwTW

As an example, Whitehouse WwTW treats the wastewater from around 90,000 people and businesses in the Newtownabbey and Mallusk areas. The treated wastewater from the site discharges directly to the shore of Belfast Lough. On occasions, when the flow arriving at the treatment works is in excess of what it can treat, combined sewer overflows also operate and discharge dilute sewage at the same location.

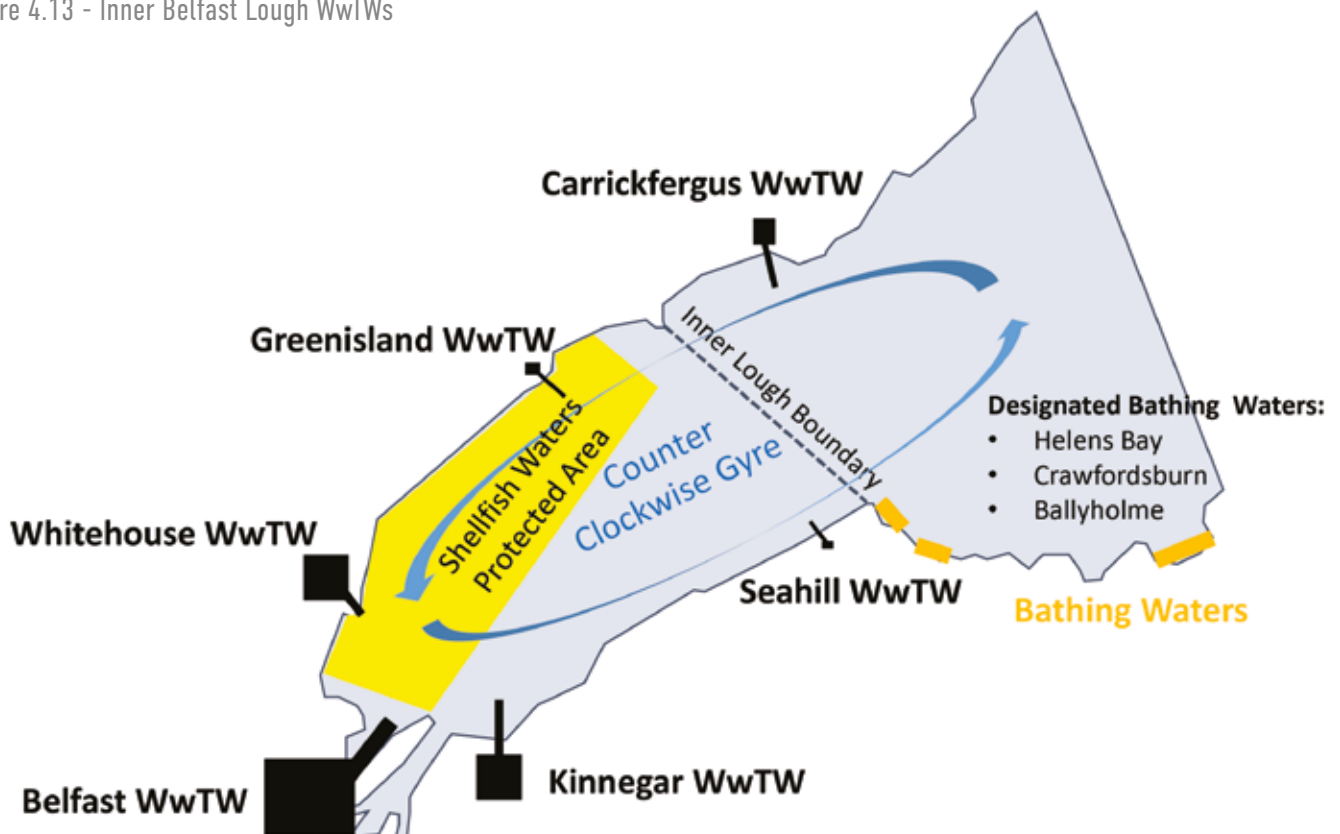
In January 2019 NI Water assessed that there was over 100 tons of sewage related debris on the shoreline near the Whitehouse area, most of which has since been removed, but will continue to

accumulate until investment is secured and the unsatisfactory overflows are resolved. This debris contains materials such as wet wipes, plastic razors and hygiene products that are not appropriate for being flushed down toilets. These items are mostly made of plastic and can block the overflow screens designed to retain material within the sewerage system when it overflows. It can also block the pipes and pumps needed to convey the sewage to the WwTW. The volume of the debris that accumulates in some locations is only an indicator of the much larger volume of materials that is dispersed into the wider freshwater and marine environment.



Sea Outfall at Whitehouse WwTW and sewerage related debris on nearby shore

Figure 4.13 - Inner Belfast Lough WwTWs



4.13 Figure 4.13 above shows the location of the designated shellfish waters within Inner Belfast Lough, the designated bathing waters in Outer Belfast Lough and the location of the 6 WwTW that discharge into Belfast Lough. As well as being subject to the tide, a counter clockwise gyre within the lough directly impacts on the dispersal of nutrients from WwTW discharges,

by drawing the nutrients from Carrickfergus and Greenisland back into the shallow waters of the inner lough. This has a direct impact on the water quality at the designated Shellfish Waters and subsequently the quality of the shellfish that are harvested.

CHAPTER 04

THE NEED FOR INVESTMENT

NEED TO FACILITATE ECONOMIC GROWTH

4.14 In recent years the city has also been revitalised through substantial investment in cultural facilities, retail, leisure and housing and there are shared ambitions for the continued significant growth of the city.

4.15 Facilitating this continued growth will however require significant levels of investment in the Belfast sewerage and WwTW network to make them fit for purpose and this has been recognised by all partners. This was summed up at the 2018 Belfast Region City Deal Conference by the Institute of Civil Engineers who stated:



If you want to put up the cranes you have to invest in the drains.



4.16 NI Water has confirmed that, without this level of investment, it may have to provide negative responses to planners for some planning applications due to a lack of capacity. The map at 4.16 provides an indicative illustration of the wastewater system capacity as identified in December 2020 and shows the impact of the under investment in the system with most of the area covered by the Belfast SDIP showing in red which means that:

- either the sewerage networks have inadequate capacity leading to unsatisfactory risk of sewage overflowing from sewers causing excessive pollution and / or internally flooding homes and business properties; or

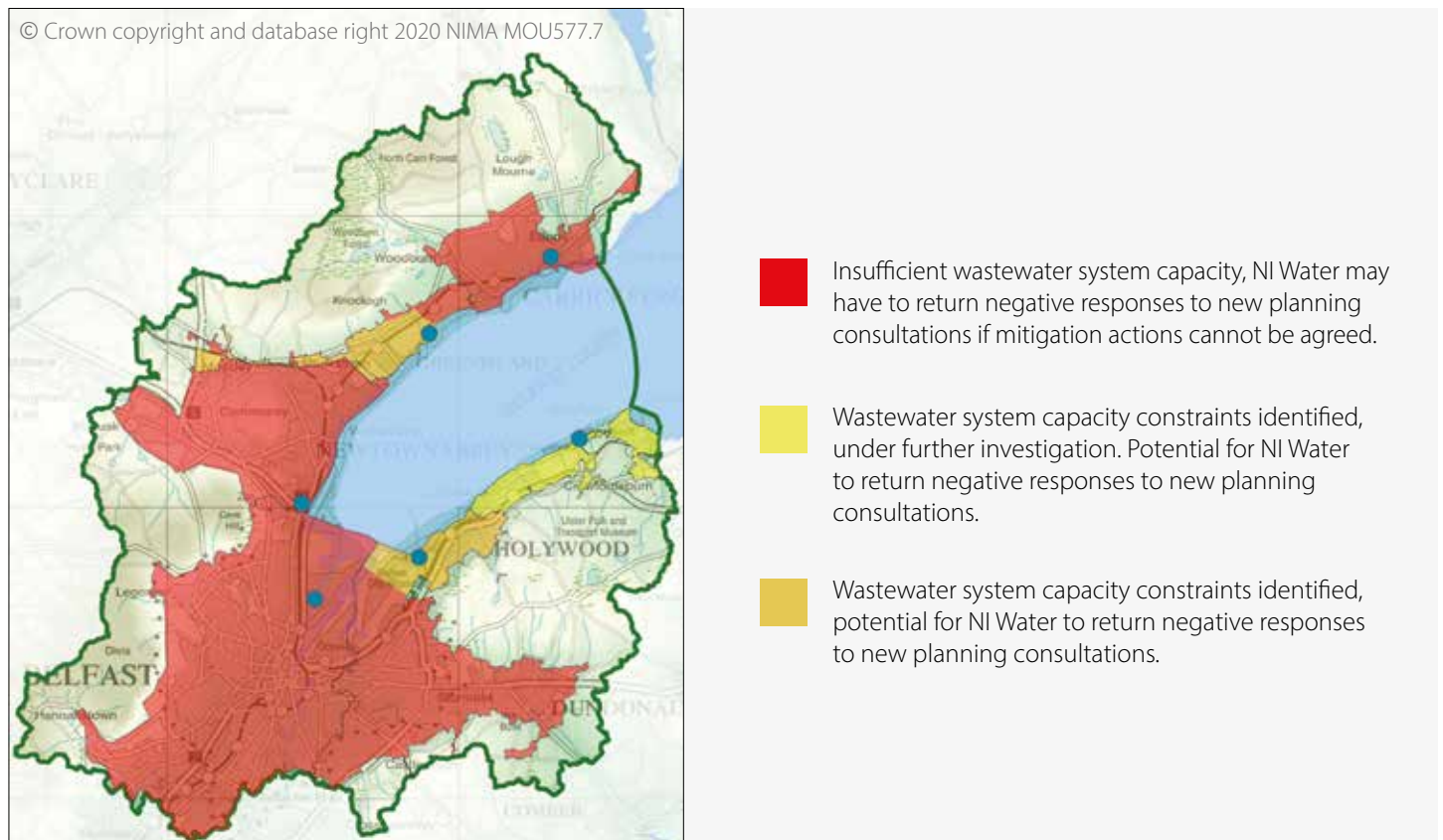
- the Wastewater treatment works have inadequate capacity, risking pollution.

4.17 Notwithstanding the constraints in these areas marked as red, NI Water has committed to:

- provide new connections for all development that already has valid planning permission; and
- work with Planners and developers to look at mitigating actions to reach agreements on planning condition clauses relating to drainage for the development so that planning permission can, where possible, subsequently be granted without risking increased flooding and / or pollution. If suitable planning conditions can be agreed they will be carefully tailored to the specifics of each development and the downstream constraints, for example, if the constraint is due to hydraulic capacity in a combined sewer the solution may involve surface water separation. For developments in brownfield areas, NI Water will take into consideration the current and recent historical loadings of the site. For other sites NI Water will consider the date at which the development will be completed and occupied. In some areas it may be possible for a developer to build a private WwTW. However, despite these mitigations, there are likely to be instances where planning permission for the development will have to wait for investment to be progressed, otherwise the development would be risking increased flooding and / or pollution.

Figure 4.16 - Indicative Wastewater System Capacity

(NI Water will honour existing commitments to provide connections for previously approved planning applications)



4.18 In addition a number of projects have already been committed which will start to address the sewerage and waste water capacity issues. Negative responses to planning application consultations will therefore be the last resort for NI Water and innovative and local solutions will continue to be sought as development comes forward. To ensure the continued development of the city there is a commitment to looking at the level and impact of development coming forward and

how this can be facilitated. As part of this, a proactive approach will be taken to carrying out regular reviews of proposed schemes, including working through the impacts on the system and working through the implications with developers and planners. The capacity map will also be kept under review and updated.

CHAPTER 05

LIVING WITH WATER: THE NEW APPROACH

NEED FOR A NEW APPROACH

- 5.1 As outlined in chapter 4, much of the drainage and wastewater infrastructure serving greater Belfast is in need of urgent upgrade and requires significant levels of additional investment to protect against flooding, enhance the water environment and to facilitate economic growth. However, investment alone is not enough, we need to do things differently and deliver an integrated and catchment based approach to future drainage and wastewater management.
- 5.2 The challenges of delivering integrated drainage are recognised in Sustainable Water, A Long Term Water Strategy which includes a strategic aim to:



Provide Sustainable Integrated
Drainage in Rural and Urban Areas.



Sustainable Water
A Long-Term Water Strategy
for Northern Ireland
(2015 – 2040)



- 5.3 This is about taking a holistic approach to rural and urban drainage provision by ensuring that watercourses, culverts, sewers, road drainage and surface water drainage are constructed and operated in an integrated manner to address flood risk. To achieve this, stakeholders must work together to develop and deliver outcomes that:
- are wider than the individual focus of any one participant, in accordance with the approach taken in the Programme for Government; and
 - address issues in water quality and the risk of flooding at the same time.
- 5.4 Without a sustainable and integrated approach to drainage, rain water will run quickly off poorly-managed land upstream of urban areas with insufficient opportunity to soak into the ground and recharge groundwater, or be captured for irrigation and other agricultural uses. This water reaches built up areas very quickly, via watercourses and culverts, and is increased by runoff from rain falling onto impermeable surfaces. This becomes a flash flood which overwhelms piped drainage systems and causes sewer overflows and property flooding (often with sewage). When this now heavily-polluted water drains away into the watercourses and sewerage networks it continues downstream to the next community causing the same problems there. The volumes of water are often also too great for WwTW to accommodate, resulting in untreated sewage discharging into the watercourses and coastal waters.

- 5.5 These problems can be alleviated through an integrated and catchment based approach to future drainage and wastewater management. For greater Belfast, this is about taking a strategic and collaborative approach to investment in drainage and wastewater management through development and delivery of this Plan. This includes managing rain water higher up the catchment through good agricultural and land management practice including the use of Natural Flood Management (NFM). This helps to control run-off, reduce agricultural pollution, soil erosion and reduce peak flows. The provision of flood storage areas further down the catchment retains water during times of high rainfall, helping to manage downstream flooding. These storage areas help even out discharge to maintain river flow in times of drought while also providing a range of habitats to improve biodiversity.
- 5.6 This catchment based approach is very much in line with current best practice including recent guidance by the Construction Industry Research and Information Association (CIRIA) on 'Delivering Better Water Management through the Planning System'⁶.

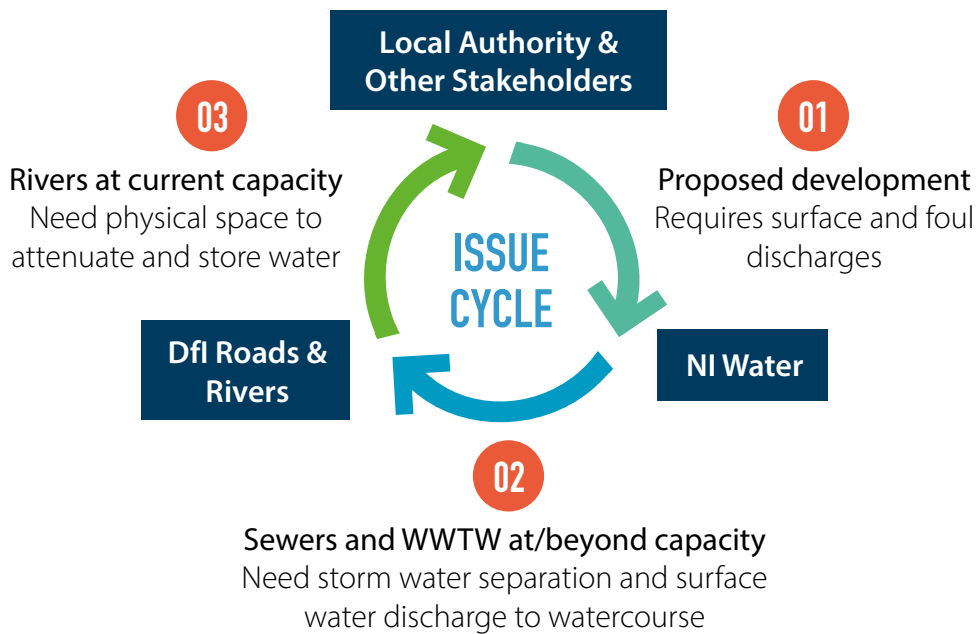
NEED FOR PARTNERSHIP WORKING

- 5.7 Through analysis carried out as part of the development of the Long Term Water Strategy, stakeholders identified that significant levels of investment were needed to provide a modern, effective and efficient drainage and wastewater system to serve greater Belfast. However, it was recognised that this could not be delivered by one organisation alone and that more effective integrated solutions had to be found.
- 5.8 Although DfI Roads and Rivers, NI Water, and the Northern Ireland Environment Agency (NIEA) all have some drainage responsibilities, their focus has traditionally been on preparing investment plans to address their own individual responsibilities related to drainage and wastewater management. This approach doesn't always lend itself to solving multiple issues and providing benefits for all.
- 5.9 For example, one of the biggest issues that needs addressed is the amount of surface water entering our drainage and wastewater infrastructure. When clean rainwater mixes with sewage, it not only increases wastewater collection and treatment costs but it also causes increased instances of pollution and flooding. However, as shown in Figure 5.9, this is a problem that cannot be solved by one organisation in isolation; an integrated and collaborative approach is needed.

CHAPTER 05

LIVING WITH WATER: THE NEW APPROACH

Figure 5.9 - The Issue Cycle



DEVELOPMENT OF THE NEW LWWP APPROACH

5.10 Through the LWWP, Dfl officials have been taking a leading role in developing partnerships with many stakeholders across central and local government and the private sector to develop a new approach for integrated drainage and wastewater management. This work has included examining alternative and innovative approaches that are being implemented in other cities with catchments similar to Belfast. Two examples of effective partnership and programme working were identified where stakeholders had successfully worked together to deliver integrated shared drainage and wastewater management solutions.

5.11 These were the [Metropolitan Glasgow Strategic Drainage Partnership \(MGSDP\)](#) and the [RainScape](#) programme delivered in Llanelli by Welsh Water and Carmarthenshire County Council. The following case study is of a surface water management project completed under the RainScape programme in Llanelli.

CASE STUDY STORING SURFACE WATER IN GREEN SPACES

QUEEN MARY'S WALK, LLANELLI, WALES

The sewerage network in Llanelli, Wales was under increasing pressure due to the high volumes of storm water it had to manage. In September 2013, Welsh Water, working in collaboration with other stakeholders, completed a RainScape project to construct a natural conveyance and storage channel known as a 'swale' on the Queen Mary's Walk playing fields. During periods of heavy

rainfall the swale holds the water back, allowing evaporation and infiltration before gradually releasing the remaining water into the sewer network. The swale has been planted out with a range of attractive plants and trees to help hold back more rainwater. The project, which cost in the region of £850,000 will potentially remove approximately 4,365 cubic metres (4.365 million litres) of water a year from the sewer network.



Photos of Swale at Queen Mary's Walk, Llanelli, Wales courtesy of ARUP

5.12 These programmes illustrated the benefits of stakeholders working together, to create catchment based solutions, where:

- surface water discharges into combined sewers are reduced or removed through a process known as 'storm separation';
- surface water is managed at source;
- drainage works undertaken in urban areas include a focus on improving amenity and biodiversity (for example daylighting a culverted watercourse to reduce the risk of flooding may also allow this to become an attractive feature within an urban park);
- detailed asset surveys and integrated drainage modelling are used to assess the most effective way of conveying water to the sea;
- detailed water quality sampling and integrated environmental modelling are used to determine the extent of increased storm storage and wastewater treatment; and
- construction works are integrated to address all types of flooding holistically at the same time.

CHAPTER 05

LIVING WITH WATER: THE NEW APPROACH

NEED FOR CATCHMENT BASED SOLUTIONS

5.13 Drainage and wastewater solutions implemented in the past have tended to be of a conventional nature whether this was via constructing bigger drainage pipes or building taller flood walls. These off-the-shelf solutions are usually tried and tested with low levels of risk and therefore appear attractive. However,

as shown in the case study below, conventional solutions can involve extensive operating and maintenance costs which can make them unsustainable in the long term.

CASE STUDY CONVENTIONAL SEWERAGE DESIGN

In 2013, NI Water estimated that for the Glenmachan sewerage sub-catchment of Belfast WwTW (which is around 15% of the total area that drains to the works) over £150m would be required to provide increased capacity to address the risk of out of sewer flooding and to close 21 unsatisfactory combined sewer overflows.

A conventional solution was scoped under which the flow from these overflows would be intercepted, stored in storm tanks before being drained via the existing Belfast Sewers Tunnel (Annex A) to Belfast WwTW and then pumped up over 45 metres before being treated and finally discharged into Belfast Lough.

If this solution had been constructed it would have led to a legacy of higher operational costs and carbon emissions. Surface water from this large area of Belfast would have been pumped up to 5 times, stored in multiple locations, and finally treated. The sheer scale of this conventional solution was thought to be the only way ahead at that time as there was:

- limited support to deal with surface water at source from policy makers and land owners;
- limited capacity in the watercourses to allow any further storm discharges so as to protect against flooding downstream; and

- inadequate understanding of the sources of pollution and how the environment naturally degrades and disperses pollution, which required NIEA to take a precautionary approach to future combined sewer overflows in order to have confidence that water quality targets would be met.

The solution for the Glenmachan Sewerage network is now being re-examined as part of the wider integrated drainage investment planning work for this Plan. This includes examining opportunities to provide additional watercourse capacity to facilitate surface water discharges and reduce the loading on the combined sewerage network which could reduce the scale of the proposed sewerage upgrades.



- 5.14 Conventional drainage and wastewater solutions are often focussed on addressing the local symptoms of a more strategic issue which requires a collaborative catchment based approach to solve, such as making space for surface water across an entire urban area. Because of this, conventional solutions sometimes inadvertently cause or exacerbate problems elsewhere in the catchment.
- 5.15 For example, building a conventional flood wall might prevent localised flooding from a river. However, the increased water levels this creates in the river during a storm event could prevent the surface drainage systems in the area being able to discharge during a storm event causing them to backup and create flooding. The bigger problem may actually be the flow of water down the river during the storm event. The catchment based solution might be to slow the river flow down by providing flood storage upstream using low impact green spaces.

IMPORTANCE OF BLUE/GREEN INFRASTRUCTURE

- 5.16 Green spaces such as parks, sports pitches, golf courses, fields and private gardens have not traditionally been considered to be drainage infrastructure. Yet, when these green spaces are developed and replaced with hard surfaces, the rainwater that was previously absorbed and attenuated becomes surface water which can cause flooding. Green spaces therefore already play a key role in managing surface water flood risk and should be considered as an integral part of the urban drainage system.

- 5.17 When considered holistically, existing green spaces and blue corridors such as rivers can form an extensive city-wide network of blue/green infrastructure that can drain, absorb and retain water. Opportunities for using blue/green infrastructure are discussed in detail in Chapters 7, 8 and 9. 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. The Infrastructure Minister, Nichola Mallon, has recognised these benefits and launched a new £20m blue/green infrastructure fund in 2020. In announcing the new fund the Minister said:



The £20m funding for blue/green infrastructure will support our communities through this transformation, promoting active travel and shaping our places to live in the new normal. This funding will be community led and departmentally supported. In partnership we can ensure lasting change for people across the north.



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CASE STUDY CONNSWATER COMMUNITY GREENWAY



The £40m Connswater Community Greenway project has developed a new 9km linear park through East Belfast, which connects existing green and open spaces and provides accessible paths for both walking and cycling.

The Greenway follows the paths of the Connswater, Knock and Loop rivers which have all been artificially altered at some time in the past. The project restored the rivers back to more natural forms in order to increase biodiversity, allowing greater public access and improving their general appearance. Debris and rubbish were also removed from riverbanks and stone-retaining walls were replaced with more natural forms including native aquatic planting. These

measures aimed to support future improvements in the rivers' ecological status, as required by the Water Framework Directive.

The Greenway has also helped alleviate flood risk in East Belfast. The flood alleviation element of the project, incorporating 4.1km of new reinforced concrete floodwalls and 1.2km of flood embankments, has helped to reduce the risk of flooding to approximately 1700 homes.

One of the most visible elements of the Connswater Community Greenway is a series of new pedestrian and cycle bridges which now provide connections between communities, linking a network of green spaces. The Connswater, Knock and Loop rivers which acted as barriers to public movement at one time are now facilitating sustainable travel and healthier lifestyles, and are reconnecting people and places. The Connswater Community Greenway, which could have been delivered as separate flood alleviation and community regeneration projects, clearly demonstrates the multiple benefits of collaborative working; such as supporting community cohesion, economic development, improvements in public health, cleaner rivers and greater flood resilience.

5.18 The importance of open blue/green spaces in managing our future drainage needs is recognised in Belfast City Council's Open Spaces Strategy. Through Strategic Principle 5 (Increase resilience to climate change) the strategy states:



Open space can be used to slow down surface water, reducing rates of discharge into our drainage system and reducing flooding risk. As part of the Living With Water Programme, NI Water is working to help reduce these risks, and increase capacity in an aging surface water network, by increasing space to deal with surges of surface water in existing open spaces. These areas would be allowed to flood safely during heavy rainfall events.



LWWP DESIGN PRINCIPLES

5.19 Building on the experiences of Glasgow and Llanelli, LWWP stakeholders developed and agreed the following design principles for developing integrated, sustainable catchment based solutions to meet the long term drainage and wastewater management needs of greater Belfast.

Table 5.19 - LWWP Design Principles

1	Manage / address water quality and flooding issues at source.
2	Use SuDS. Manage water on the surface where feasible.
3	Reduce surface water flows into the combined sewerage system.
4	Manage flows through the catchment. Reduce peak river flows downstream where appropriate.
5	Manage existing infrastructure – upgrade and adopt/designate problematic PDI where feasible.
6	Manage existing infrastructure – consider maintenance of drainage assets.
7	Create enhanced blue/green spaces – enhance biodiversity.
8	Provide amenity – consider social, environmental and wider benefits.
9	Create more resilient systems, tackling challenges of climate change and exceedance.
10	Coordinate delivery to minimise disruption and maximise value for money.
11	Establish cost effective solutions.
12	Promote sustainable development and planning policy.

5.20 Figure 5.20 provides examples of the various types of drainage and wastewater management measures being developed for the greater Belfast area through this Plan.

FIG. 5.20 – EXAMPLES OF CATCHMENT BASED DRAINAGE AND WASTEWATER MANAGEMENT SOLUTIONS

In Chapter 4 we illustrated the problems and poor practices of managing water through a catchment. The diagram below illustrates the LWWP approach to managing water through a catchment and the measures we can take to protect against flooding, improve water quality and our environment and enable the area to expand and develop. Each of the numbers on the schematic map relates to a drainage solution or measure that will contribute positively to our objectives.

Upper Catchment
Middle Catchment
Lower Catchment





01 Upper Catchment Management

Measures could include drain blocking, tree planting etc. to slow the flow of water at the top of the catchment.

02 River / Floodplain Reconnection

Re-connecting our rivers to the natural floodplain and allowing areas to flood to protect properties downstream. Measures could include changing the river line, daylighting of culverted rivers and providing instream attenuation structures.

03 Urban SuDS

Measures could include SuDS Ponds, Wetlands, Swales, Woodland / Cross-field Hedge Planting, retrofit, land management NFM, Detention Basins, Green roofs and Rainwater harvesting.

04 Water Run-off Infiltration

Measures to reduce surface water run-off such as Infiltration systems and pervious pavements. Also measures to prevent run-off from agricultural land such as filter / buffer strips to help improve water quality.

05 Storage

Constructed online storage and offline storage to help manage the flow of water through the catchment, which could include flooding of multi-function areas such as car parks or green spaces.

06 Road Alterations

Measures such as changing the camber or alignment of the road could help improve surface water run-off and help protect properties. Measures could also include raising or lowering kerbs and road levels, drainage separation and design for exceedance.

07 Drainage Network Alterations

Measures could include storm separation, oversized pipes to provide storage (hard SuDS), new sewers, CSO improvements / closures, bigger sewers.

08 Sewage treatment

Upgrade or new WwTW and improvement to WwTW outfalls.

09 Direct Defences

Measures such as flood walls and embankments, tidal barriers etc. can reduce tidal and coastal flood risk.

CHAPTER 05

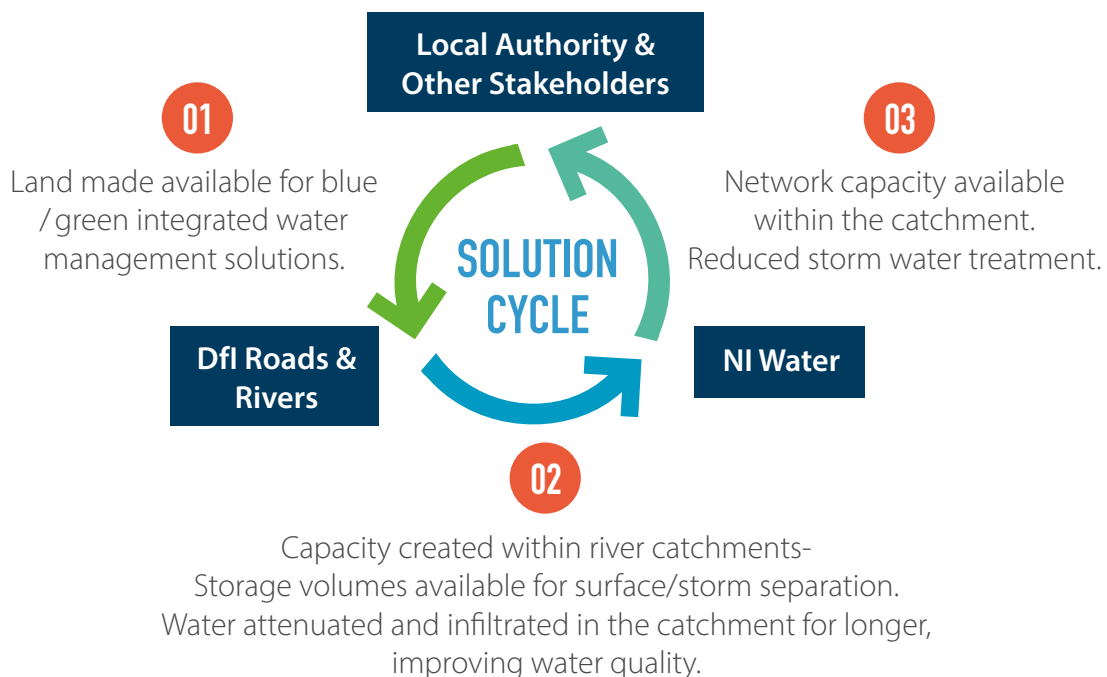
LIVING WITH WATER: THE NEW APPROACH

DELIVERING AN INTEGRATED APPROACH TO DRAINAGE INVESTMENT

5.21 It is recognised that over 80% of the capital investment needed to implement the Plan will be on hard engineered infrastructure measures, particularly sewerage networks and WwTW. However, blue/green infrastructure has an important role to play. If developed and implemented successfully as part of a fully integrated catchment based programme, this should result in the scale and cost of some of the hard engineered solutions being reduced or, in some cases, not required.

5.22 This approach is not currently 'business as usual' but rather a step change in the way drainage and wastewater is managed on a catchment basis and requires a new way of working. This step change could mean that the solution to a flooding issue which is the responsibility of one drainage organisation could be solved by holding water back in an area, like a green space, that is the responsibility of an entirely different organisation. This approach is in line with recently issued guidance from the Construction Industry Research and Information Association (CIRIA) - 'Delivering Better Water Management Through the Planning System'⁷. As illustrated in figure 5.22, by working collaboratively the organisations involved in drainage and wastewater can develop integrated solutions that not only address their own problems but also address issues faced by other stakeholders.

Figure 5.22 - The Solution Cycle



INTEGRATED DRAINAGE INVESTMENT PLANNING (IDIP)

5.23 Through the LWWP, a new integrated drainage investment planning (IDIP) process has been developed to encourage the main drainage organisations and other stakeholders to work collaboratively to develop solutions that seek to resolve drainage and surface water management issues within a catchment in a holistic manner. The IDIP process has been used to inform development of this Plan, with 3 of the 4 stages substantially completed. It is intended that the IDIP process continues to evolve and remain live over the life of the Plan as new partners are identified and new pressures, issues and opportunities emerge.

STAGE 1: ESTABLISH STUDY AREAS AND WORKING GROUPS

5.24 To ensure thorough assessment of the wider geographical area covered by the Plan, four distinct study areas were established as shown in figure 5.24, based on the natural drainage of the area and the sewerage network. Technical working groups, comprising key stakeholders, were set up to assess each study area using an IDIP process developed by the LWWP Team. Through this process, these groups helped identify the strategic drainage pressures and issues within the study areas, along with the opportunities for solutions, such as green space in existing parks that could be used to help control the flow of water.

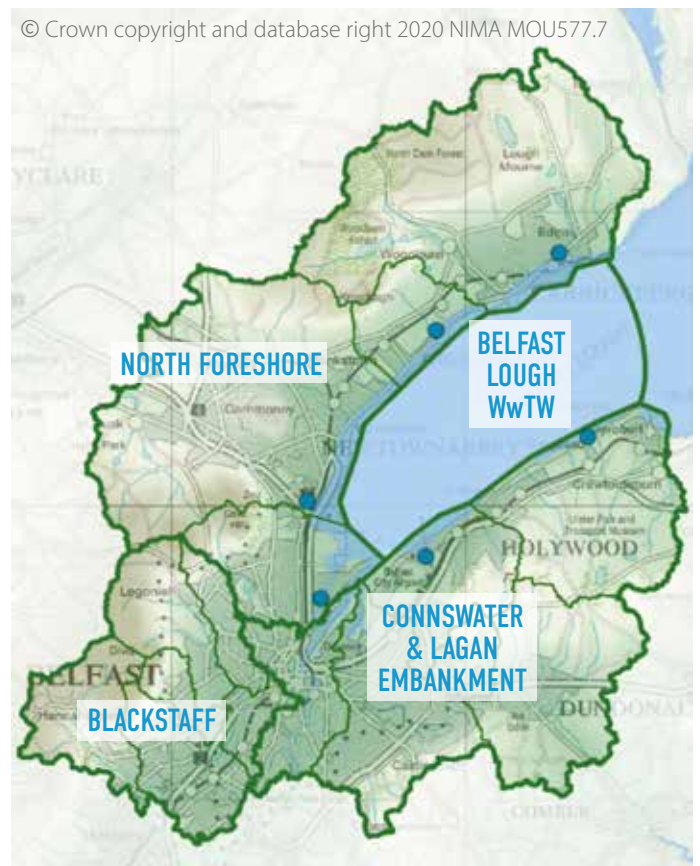


Figure 5.24 – Study Areas

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LIVING WITH WATER: THE NEW APPROACH

STAGE 2: LONG LISTING OF OPPORTUNITIES AND INITIAL SCREENING

5.25 The LWWP team then developed a long list of potential drainage and wastewater management solutions to help achieve the Plan objectives. These potential solutions were screened to see if they could contribute to meeting one or more of the objectives using the LWWP design principles in Table 5.19.

STAGE 3: INITIAL ANALYSIS

5.26 The potential drainage and wastewater management solutions in each catchment were then assessed using a high level Multi Criteria Analysis (MCA) scoring system that takes into account environmental impacts. The MCA used the following objectives:

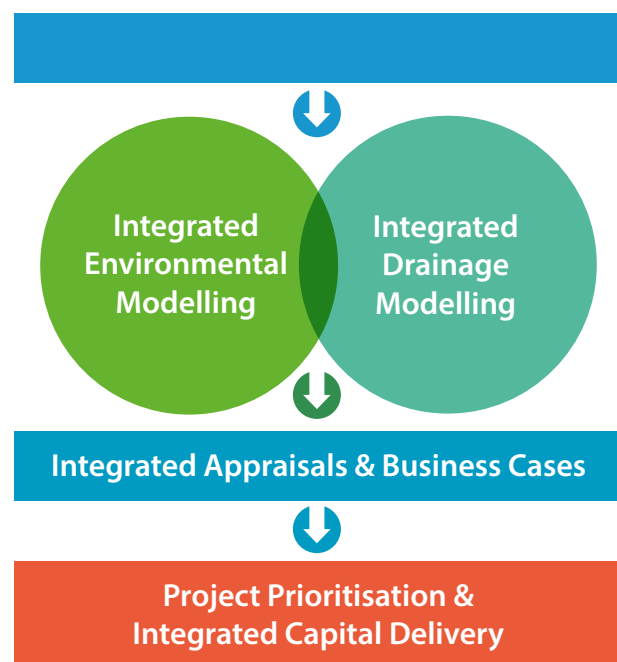
- **Primary Objectives:** Flood Risk, Water Quality and Growth.
- **Secondary Objectives:** Natural Environment, Heritage, Social Inclusion, Contribution to the Economy and Design for Exceedance / Climate Change.
- **Technical Objectives:** Plannability, Buildability and Cost (both capital and maintenance).

The potential schemes with the highest MCA score became the initially preferred options for each of the study areas, and were carried forward to the next stage and included in this Plan – see Section 3.

STAGE 4: DETAILED ANALYSIS AND SHORTLISTING (ONGOING)

5.27 The final stage involves the more detailed analysis necessary to inform business cases. This detailed technical and cost benefit analysis will inform the final schedule of preferred options for each study area. As shown in figure 5.27 this stage will be informed by three new modelling and appraisal tools that are being developed and used by the LWWP team to inform the scoping of projects and their prioritisation. Development and implementation of these new tools represents a change in the way drainage and wastewater is managed on a catchment basis and will be central to the development of a NI Integrated Drainage Investment Planning Guide.

Figure 5.27 – Detailed Analysis & Shortlisting



INTEGRATED ENVIRONMENTAL MODELLING (IEM)

5.28 To inform this Plan stakeholders agreed in 2016 to invest around £3m on:

- detailed surveys to assess all of the various sources of pollution that may be impacting on water quality;
- development of a detailed Integrated Environmental Model (IEM) for the Inner Belfast Lough catchment, including the principal watercourses, to understand how these pollutants interact with the natural ecosystem and how natural dispersion can impact water quality; and
- the use of IEM to identify the optimum combination of sustainable measures to achieve water quality objectives in accordance with the Water Framework Directive, including the future discharge standards for WwTW and wastewater storm tank sizes.

5.29 NI Water has been managing this work, most of which is being carried out by the Agri-Food and Biosciences Institute (AFBI). Feedback from the IEM independent technical reviewers confirm this work is fully aligned to, and in some areas exceeds, best practice in the UK and Ireland. Since inception the IEM has been overseen by a steering group that includes DfI, NI Water, DAERA Marine, NIEA and the Utility Regulator. Most of the surveys have been completed and the models built, with the work to be completed in 2022. The IEM completed to date has supported the outline water quality related proposals set out in this Plan.

INTEGRATED DRAINAGE MODELLING (IDM)

5.30 As NI Water is not responsible for managing all surface water in urban areas or for determining the investment required in watercourses, its Drainage Area Plan (DAP) models are focussed on the combined or foul sewerage networks that are connected to WwTW. DAPs have never therefore included the modelling of watercourses. In order to progress Stage 4 and assess the opportunities for integrated drainage solutions identified through IDIP Stages 1 to 3 in detail and to inform business cases, stakeholders agreed the scope of 'Integrated Drainage Models' (IDM). These models will be developed and used to understand all elements of the drainage system where significant investment may be necessary, from source to sea. Where necessary the scope of the IDM may include catchment modelling, particularly for more complex areas.

5.31 In early 2020, NI Water agreed to manage the IDM work, most of which will be carried out by specialist engineering companies based in Belfast that have already been developing NI Water's DAPs to ensure model alignment and integration. The IDM commenced in mid-2020 and is being overseen by a steering group that includes DfI and NI Water.

CHAPTER 05

LIVING WITH WATER: THE NEW APPROACH

INTEGRATED APPRAISALS & BUSINESS CASES

- 5.32 In order to progress detailed appraisals of integrated drainage schemes that focus on LWWP objectives rather than those of any single participant, new appraisal guidance and business case templates are being developed. Development is being overseen by a Steering Group of representatives from DfI, DoF, DAERA / NIEA, Utility Regulator, NI Water & DfI Rivers.
- 5.33 This will set out how the six components of appraisal (financial, manufactured, intellectual, human, social and relationship, and natural), can be applied in the LWWP context to assess value for money in business cases and to inform project prioritisation. All proposals included within the Plan will be subject to further environmental assessment and associated approvals.

PLAN OUTPUTS

- 5.34 Section 3 sets out the approach that is being proposed for managing drainage and wastewater on a catchment basis. The initially preferred options identified through the IDIP process are presented in the following chapters:
- (i) **Chapter 6 – Policy Measures** - New policies and procedures to encourage greener drainage solutions and a collaborative approach to drainage and wastewater management;
 - (ii) **Chapters 7, 8 & 9 – Catchment Based Solutions** – These potential measures are focused on managing rain water more naturally through the catchment by controlling runoff, reducing peak flows in the drainage systems and providing areas for flood storage. These measures include both blue/green infrastructure and conventional hard engineered measures.
 - (iii) **Chapter 10 – Upgrades to Wastewater Treatment Works** – No amount of catchment based and blue/green solutions will remove the need for the effective treatment of the wastewater that we produce. Upgrades to WwTW within the Plan area are needed in terms of the volume of wastewater they can treat and the standard to which it is treated.

SECTION 2

SYNOPSIS

- The policy, regulation and funding of drainage and wastewater management in Northern Ireland is currently provided by a number of different organisations.
- This Plan coordinates and optimises the strategic planning of future drainage and wastewater related works in the Belfast area for more efficient and effective management, allowing for the future growth and prosperity of the city, greater protection from flooding and the enhancement of the water environment.
- Much of the drainage and wastewater infrastructure serving the greater Belfast area is in need of urgent upgrade and requires significant levels of investment. Whilst it will be a challenge to provide the estimated £1.4 billion of investment that is needed, this Plan provides an opportunity to invest in essential drainage and wastewater infrastructure in Belfast and provide the foundation to grow the city in a sustainable manner. Without this investment, flooding and pollution will intensify and the future development of the city may be further constrained.
- NI Water has confirmed that, without this investment, there is a likelihood that it will not be able to provide new connections for new planning applications. In some parts of the city, NI Water has already provided negative responses to new planning applications due to constraints in its sewer networks. Negative responses will however be the last resort; NI Water will work with developers prior to applications being submitted to examine opportunities for developments to proceed through local solutions where possible and / or the agreement of special conditions (such as phasing or occupation dates). NI Water will continue to provide new connections for development with approved planning applications.
- Other signs that the drainage systems and treatment works are becoming increasingly overwhelmed and failing include: more regular instances of flooding; increased sewage spills and pollution; and sewer collapses and blockages. The frequency and intensity of these events will only continue to increase due to climate change, urbanisation and a lack of capacity in the drainage and wastewater infrastructure.
- One of the biggest issues that needs addressed is the amount of rainwater entering our drainage and sewerage infrastructure. Not only does this increase wastewater collection and treatment costs by allowing the surface water to mix with sewage, it also causes increased instances of pollution and flooding. This requires an integrated and collaborative approach and cannot be solved by one organisation in isolation. However, traditionally individual drainage organisations have focussed on their own area of responsibility, trying to solve problems by looking at their own assets and issues.
- The LWWP team is working with the drainage providers and other key stakeholders to develop a new, strategic and sustainable long-term approach to drainage and wastewater management. This approach combines a range of work by various organisations to make the most out of the opportunities that already exist within Belfast to improve

SECTION 2

SYNOPSIS

the city's resilience, not just in terms of flooding, but in terms of its ability to grow whilst delivering multiple benefits to our communities and the natural environment.

- This change could well mean that the solution to a flooding or environmental issue in one location, that is the responsibility of one drainage organisation, could well be solved by using land or assets owned by a different organisation at another location in the city. This involves the organisations working together in partnership outside their normal areas of responsibility, to develop solutions that not only address their own problems but which could also address issues faced by other stakeholders.
- This has involved the development of a new integrated drainage investment planning (IDIP) process involving a number of new tools. This new IDIP process will form the basis of a Northern Ireland Integrated Drainage Investment Planning (IDIP) Guide. This Guide will inform the development of strategic drainage infrastructure plans for other flood risk areas across Northern Ireland.
- The LWWP also promotes the use of blue/green infrastructure, such as upper catchment management and river attenuation rather than continuing our reliance on hard engineered measures such as bigger pipes and higher flood defences. Blue/green infrastructure offers many additional benefits to communities by providing new opportunities for walking and cycling and acting as a catalyst for cultural change in the way we live and travel.
- Although blue/green infrastructure has a key role to play in helping to address our future drainage needs, it is still recognised that most of the investment needed for Belfast will be on upgrading the existing hard engineered drainage and wastewater infrastructure to provide sufficient capacity to reduce flooding, improve wastewater collection and treatment standards and to facilitate growth.





THE PLAN OUTPUTS



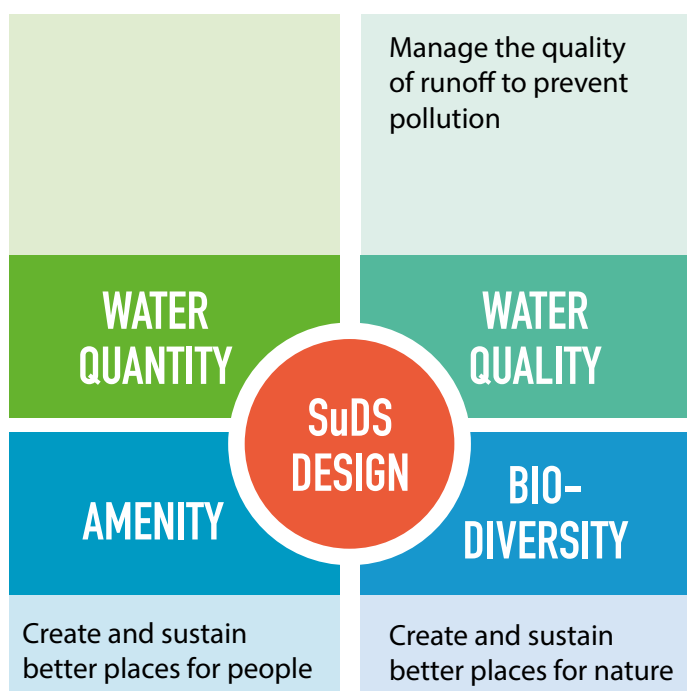
CHAPTER 06

POLICY MEASURES

OVERVIEW

- 6.1 Significant investment is needed in Belfast's drainage and wastewater infrastructure to facilitate development and growth, reduce pollution and protect the city against flooding. We also need to develop new policy measures and to change and influence behaviour to ensure that maximum benefit is gained from our investment and to avoid unintentional problems in the future, for example, through poor land management practices or flushing inappropriate items down the toilet.
- 6.2 This chapter provides an overview of key policy measures identified in the Long Term Water Strategy as being necessary to facilitate integrated and sustainable drainage provision. This list is not exhaustive and may be added to as the need for further policy is identified through time.

Figure 6.4 – Benefits of SuDS



SUSTAINABLE DRAINAGE SYSTEMS (SuDS)

Policy Background

- 6.3 Sustainable Drainage Systems (SuDS) is a collective term for a number of approaches to manage surface water that address flooding and pollution and aim to improve local amenities.
- 6.4 SuDS work by effectively mimicking the natural drainage cycle which has been altered by the increased use of hard impermeable surfaces in construction and development. They do this by:
- Storing run-off and releasing it slowly (attenuation);
 - Allowing water to soak into the ground (infiltration) or evaporate;
 - Slowly transporting (conveying) water on the surface; and
 - Filtering out pollutants by allowing sediments to settle out.
- 6.5 Typically SuDS are referred to as hard or soft. Soft SuDS are usually natural or landscaped features including swales, detention ponds and permeable paving. Hard SuDS include oversized pipes and attenuation tanks. There are many different types of SuDS, the choice of which is determined by the local characteristics of the site including the space available, topography, geology and the available discharge points. There are other benefits of SuDS over traditional drainage systems. For example, in housing developments, SuDS have been shown to improve amenity with the introduction of trees and shrubs and fewer hard surfaces. It has been suggested that the use of soft SuDS and the improved visual attractiveness they provide has increased house values by 10% to 20%⁸.

CASE STUDY RAINGARDEN AT CLANDEBOYE PRIMARY SCHOOL, BANGOR

Clandeboy Primary School in Bangor has, in a first for Northern Ireland, created a rainwater garden in its 4 acres of woodland, to reduce and prevent the risk of flooding. The innovative flagship project by NI Water and the Department for Infrastructure was a £70,000 investment as part of a wider SuDS system costing £1.7 million.

The system collects rainwater flowing overland from the school playground and filters it through a stone and vegetation strip. Rainwater from the school roof is diverted and held in an underground storage unit (disguised as a turtle). When the storage is full the valve opens, releasing the water down a channel which the pupils then use as a duck run play facility. The water then collects in 2 split-level ponds, forming the rainwater garden which provides further water storage and a fun educational resource to learn about ecosystems. This reduces the rate at which the water reaches the local watercourse, Clandeboy Stream.

The project reduces the risk of flooding in the Clandeboy area as well as encouraging biodiversity and providing an additional educational resource for the pupils. The rainwater garden provides an extra layer to the school curriculum on ecosystems, a hands-on learning tool on the environment and a safe place for children to learn about living with water.



Policy Proposal

6.6 The Water and Sewerage Services Act (Northern Ireland) 2016 removed the automatic right for developers to connect surface drains to the public sewerage system and provided NI Water with a power to refuse a connection if SuDS have not been considered. The Act also provides NI Water with powers to adopt hard SuDS. However, the use of soft SuDS in new developments remains low due to issues and concerns around maintenance, ownership and liability.

The Department for Infrastructure (Dfi) is progressing policy work to resolve the following issues that will enable soft SuDS to be widely adopted.

- Establish procedures for the approval of SuDS and blue/green infrastructure to permit construction and design in line with current CIRIA Guidance.
- Establish arrangements for the future maintenance of all types of SuDS and blue/green infrastructure.
- Make the consideration of all types of SuDS and blue/green infrastructure the preferred drainage solution in all new development.

CHAPTER 06

POLICY MEASURES

NATURAL CATCHMENT MEASURES / NATURAL FLOOD MANAGEMENT

Policy Background

6.7 Natural Flood Management (NFM) is about sustainably managing land within river catchments to provide flood storage during storm events, in order to lower peak river flows and reduce the risk of flood damage. Possible measures include:

- **Reforestation** – woodlands offer natural rainwater collection and attenuation which reduces run-off in low intensity rainfall event;
- **River Floodplain Restoration** – rivers reconnected with natural floodplains where it can be demonstrated that this would reduce downstream flood risk; and
- **Temporary Flood Storage** – at strategic locations within the catchment, river banks can be lowered allowing water to overflow onto adjacent land, or land can be used for storing rainwater.
- **Wetlands** – low lying land could be made into permanent flood storage.

- **Restoring Peatlands** - Figure 6.7 below shows how dams can be installed in channels within peatland to retain water. This can reduce run-off, prevent pollution and protect these important habitats.

Policy Proposal

- 6.8 Opportunities exist to utilise public and private land such as parks, green spaces and farmland to provide appropriate flood storage for rivers and reduce surface run-off.
- 6.9 A number of opportunity sites have been considered and identified within this Plan and are noted within the following chapters. However, there are currently no means of encouraging and incentivising private land owners to utilise their land for NFM purposes. Therefore, in order to make full use of our green spaces, new policy guidance will be developed to enable NFM to be considered and applied where appropriate.

Dfi is developing new policy and guidance to encourage public and private landowners to utilise their land for NFM including tree planting, wetlands, flood storage and attenuation.



Figure 6.7 - Drain blocking to reduce run-off from peatlands

COORDINATING AND PROMOTING DELIVERY OF THE LIVING WITH WATER APPROACH

Policy Background

- 6.10 Significant progress has already been made in recognising the role that blue/green spaces can provide in meeting our future drainage needs since inception of the LWWP and the solid foundations provided by the Long Term Water Strategy.
- 6.11 For example, following engagement with the LWWP team in 2016 and a development process that included a public consultation, Belfast City Council (BCC) launched a Green and Blue Infrastructure Plan (GBIP) for Belfast in 2020. This outlines how vegetated areas (the green) and waterways (the blue) can provide a broad range of economic, social and environmental benefits in and around our urban areas.
- 6.12 The GBIP recognises that these natural and semi-natural assets are increasingly seen as 'infrastructure' and like any type of infrastructure, these assets will only continue to provide us with benefits if we actively plan, invest in and manage them to ensure that they are utilised sustainably. To do this, it sets a vision that by 2035, green and blue infrastructure will be strategically planned to enhance ecosystem services that benefit everyone visiting, living and working in Belfast. This now provides a solid foundation for progressing the Living With Water approach across the Plan area.



Policy Proposal

- 6.13 Using blue/green spaces to attenuate and store water is only one aspect of the Living With Water approach to drainage and wastewater management as set out in Chapter 5. This approach also includes necessary hard engineered measures such as flood defences, larger pipes and enhanced WwTW. To deliver this approach, a new NI Integrated Drainage Investment Planning (IDIP) Guide along with new modelling and appraisal tools are being developed. These should provide a solid basis for the drainage providers working together to deliver a catchment based approach to drainage and wastewater management. However, it is recognised that for this approach to succeed and deliver programmes of schemes on the ground, it will need to be championed and promoted, coordinated and possibly funded centrally. This includes continuing to develop partnerships with key stakeholders including large landowners, councils, other government departments and public bodies.

CHAPTER 06

POLICY MEASURES

6.14 Similarly, it will be important that this approach is reflected in future land use planning decisions to ensure blue/green space can be retained for drainage.

Through the LWWP, DfI is developing new arrangements for a catchment based approach to drainage and wastewater management (in line with the proposed IDIP Guide) to:

- be championed and promoted, coordinated and funded centrally within DfI including determining the procurement strategy for each element of the Plan;
- be developed and delivered in partnership with key stakeholders including large land owners, councils, other government departments and public bodies; and
- become a key consideration in future land use planning decisions.

EDUCATION AND PUBLIC AWARENESS

6.15 The public sewerage system is designed to collect sewage and wastewater from our properties and carry it to a treatment works. Flushing inappropriate items (such as baby wipes, nappies, cotton buds and sanitary towels) down toilets and drains can cause blockages in the sewerage system which in turn can then cause the sewers to overflow into the environment and pollute our rivers.

6.16 To address these problems, householders and businesses must be educated to use our existing infrastructure in a much more sustainable and effective manner. This is about encouraging responsible behaviour to prevent inappropriate items and / or substances entering the public sewerage system.

6.17 NI Water's ongoing radio and TV public awareness campaigns highlight the importance of not flushing inappropriate items. NI Water also has an extensive schools education campaign including its Water Bus.

It is therefore imperative that NI Water continues this programme and its public awareness campaigns and that other key stakeholders reinforce this message at every opportunity.



OTHER DRAINAGE & ENVIRONMENTAL POLICY MEASURES

6.18 There are a number of other drainage and environmental policy measures being taken forward by Government that will help contribute to the 3 key objectives of the Plan to:

- **protect** from flooding;
- **enhance** the environment; and
- **grow** the economy.

These are summarised in table 6.18.

Table 6.18 - Other Drainage and Environmental Policy Measures

Title (Policy Lead)	Description
Dealing with Legacy Drainage Issues (Dfl)	<ul style="list-style-type: none"> • Agree way forward for dealing with flooding caused by surface water not being able to drain into rivers due to the water levels created by existing flood defences. • Policy for dealing with legacy surface water flooding caused by run-off from private land (e.g. fields). • Facilitate the provision of storm sewers for new and existing developments. • Develop partnership arrangements for integrated maintenance programmes for drainage infrastructure.
Drainage Provision for New Developments (Dfl)	<ul style="list-style-type: none"> • Develop methodology for flow calculations and greenfield / brownfield run-off from new development sites. • Establish arrangements for the future approval, inspection and enforcement of new drainage infrastructure as part of the Drainage Assessment process. • Develop a policy for 'Design for Drainage Exceedance' to be incorporated into a new drainage infrastructure.
Provision of Additional Drainage Powers (Dfl)	<p>Provide powers and associated funding for NI Water to:</p> <ul style="list-style-type: none"> • effectively deal with misconnections (e.g. foul connection to storm sewer) and adopt sections of private drainage infrastructure that have clearly become key parts of the sewerage network; and • enter on to land or watercourses to carry out works for drainage purposes.
Sustainable Land Management (DAERA)	<ul style="list-style-type: none"> • Current Nitrates Action Plan (NAP) is approved by the EC and in place from 2019 – 2022. • Implement an Ammonia Action Plan intended to deliver reductions in ammonia emissions from agriculture.
Enhanced Wastewater Collection & Treatment (DAERA)	<ul style="list-style-type: none"> • Possible sensitive water designation of the Shellfish Water Protected Area in Belfast Lough which introduces increased wastewater treatment requirements. • Review of private sewerage discharge consents to ensure private sewage treatment meets UWWTD requirements and NI Water adoption standards. • Use of Integrated Environmental Modelling to inform water quality management measures and consenting of wastewater discharges (public and private) where this is assessed to be needed. • Significant review of wastewater discharge consents and compliance assessment by NIEA.
NI Marine Litter Strategy (DAERA)	<ul style="list-style-type: none"> • Implement actions contained within NI Marine Litter Strategy.

CHAPTER 07

BLACKSTAFF STUDY AREA

CATCHMENT BASED SOLUTIONS

INTRODUCTION

- 7.1 As set out in Chapter 5, the Living With Water approach involves the development of catchment based solutions which are focused on managing rain water more naturally by controlling run-off, reducing peak flows in the drainage systems and providing areas for flood storage. This chapter identifies the strategic drainage pressures and issues within the Blackstaff study area and includes potential opportunities for integrated catchment based solutions to address these. Solutions include a combination of potential blue/green infrastructure such as river restoration works and conventional hard engineered measures such as sewerage network improvements.
- 7.2 The Blackstaff study area extends from Belfast Hills in the west, to Ligoniel in the north, to Malone in the east and Finaghy in the south. An overview of the catchment is provided at figure 7.5.

PRESSURES AND ISSUES

- 7.3 The main pressures and issues identified by the Technical Working Group are:
- Flood risk in various areas attributed to a number of sources including surface water that is unable to enter the drainage network and flood risk from rivers and sewerage networks that are overwhelmed during storm events;
 - Water quality issues arising from unsatisfactory combined sewer overflows due to lack of capacity within sewerage networks, misconnections to the network (wastewater drains connected to storm only drains) and invasive species along some rivers; and
 - Development issues throughout the area due to sewerage network capacity constraints.

OPPORTUNITIES FOR INTEGRATED CATCHMENT BASED SOLUTIONS

- 7.4 A series of opportunity sites for potential blue/green infrastructure were identified across the study area along with a number of planned capital projects that could be extended to cover integrated drainage. These are outlined in this chapter and include the surrounding Belfast Hills where upper catchment management and NFM schemes could be implemented to reduce run-off and increase water retention to slow the flow of surface water. These opportunities also include existing capital projects at Boodles Dam, BCC's Peace IV programme, the Urban Villages redevelopment of Ballysillan Playing Fields, proposed NI Water sewerage network improvements and historic water features from the linen industry that could be re-utilised to help reduce flood risk.
- 7.5 It is emphasised that while these identified opportunities have been subject to an initial high-level feasibility, they are conceptual indicative proposals that seek to identify and highlight how we may optimise our existing environment, enabling us to better manage and live with water. However, further opportunities exist within the various catchments to work with other government departments and public bodies such as the Northern Ireland Housing Executive. The LWWP team will continue to work with partners to explore opportunities. Progression to a programme of capital investment is dependent on the successful outcome of public engagement / consultation, detailed appraisal and design work and securing the necessary funding and approvals (e.g. business case, planning).

The Blackstaff study area was further divided into 6 smaller sub-catchments based on river flow and the location of pressures. The locations of the strategic pressures and issues, along with the strategic objectives and the strategic opportunity-based solutions for each of the sub-catchments, can be seen on the following maps.

The terrain generally slopes from the Belfast Hills in the west, Finaghy in the south and Malone in the east towards the Blackstaff River at Boucher.



The main rivers are the Blackstaff, Forth, Woodvale, Ladybrook, Colin Glen, Farset and the Ballygomartin.

All of the combined / foul sewer network drains to Belfast WwTW with only a small proportion of the surface water drainage network in the area separated from the combined system.

CLOWNEY CATCHMENT

01

Development issues throughout the area due to sewerage network capacity constraints.

02

Slope stability issues in Ligoniel Park

03

Flood risk in the Glenbank Drive / Crumlin Road area.

04

Water quality issues in the Clowney Water.



CATCHMENT OBJECTIVES

- Reduce the number of people and properties at risk of flooding within and downstream of the Beechmount, Glenbank Drive and Crumlin Road areas.
- Contribute to achieving Good Ecological Status in the Forth River and Clowney Water and Good Ecological Potential in the Blackstaff River.
- Facilitate sustainable development across the area and further downstream.

05

Flood risk in the Beechmount area, Royal Victoria hospital, Park Centre and Broadway.

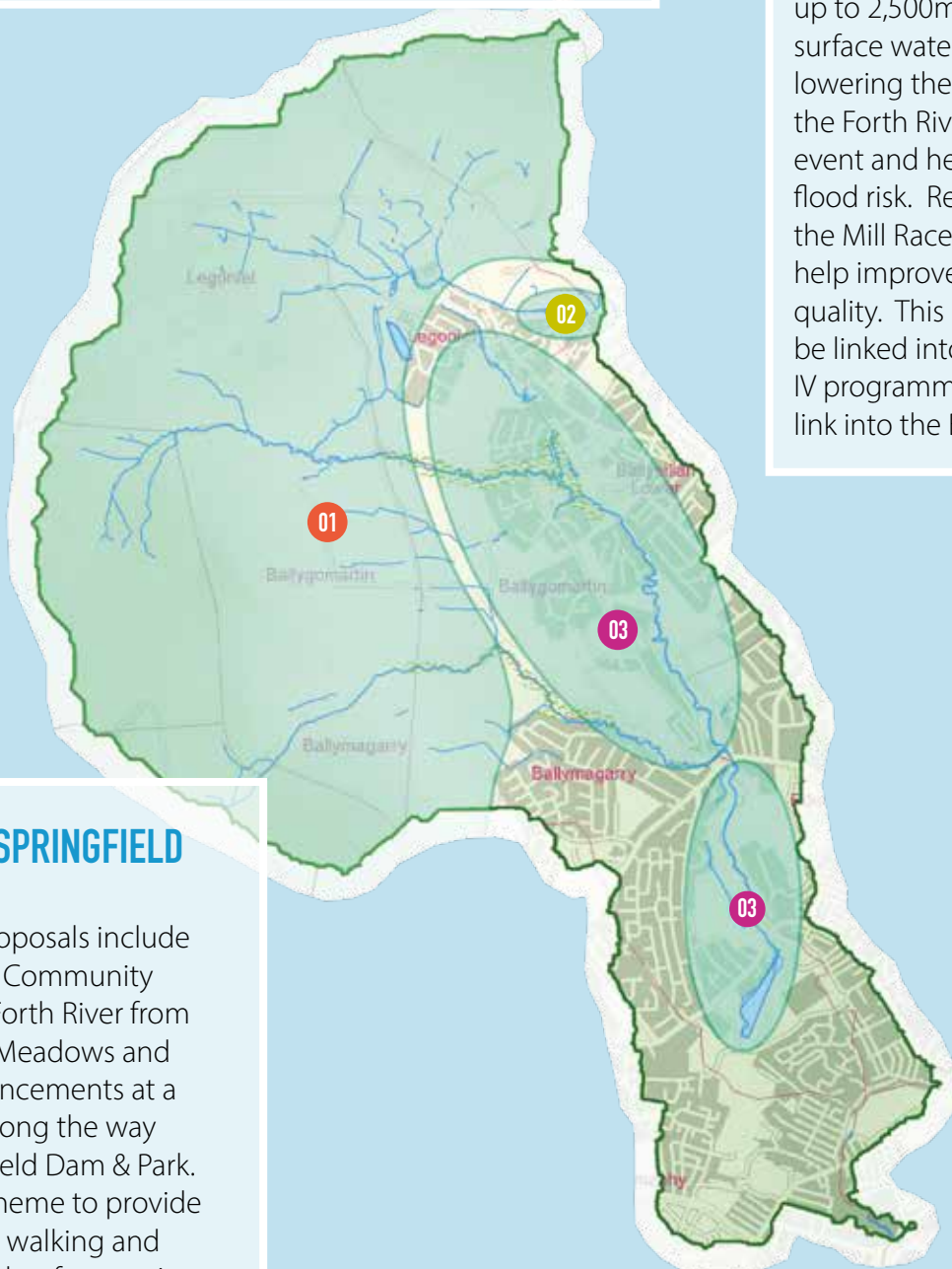
BELFAST HILLS 01

Managing the uppermost parts of the river catchments can reduce surface water run-off and increase water attenuation and retention. Woodland creation, riparian buffer strips and drain blocking slow the flows of surface water and store it. This work could potentially be taken forward in partnership with BCC, the National Trust and the Belfast Hills Partnership.

02

BOODLES DAM

Work between DfI and BCC in relation to the regeneration of Ligoniel Park is examining opportunities to reconnect an existing Mill Race to Boodles Dam and potentially provide up to 2,500m³ of temporary surface water storage, lowering the peak flows in the Forth River during a storm event and helping to reduce flood risk. Reconnection of the Mill Race should also help improve the water quality. This in time could be linked into BCC's PEACE IV programme and provide a link into the Belfast Hills.



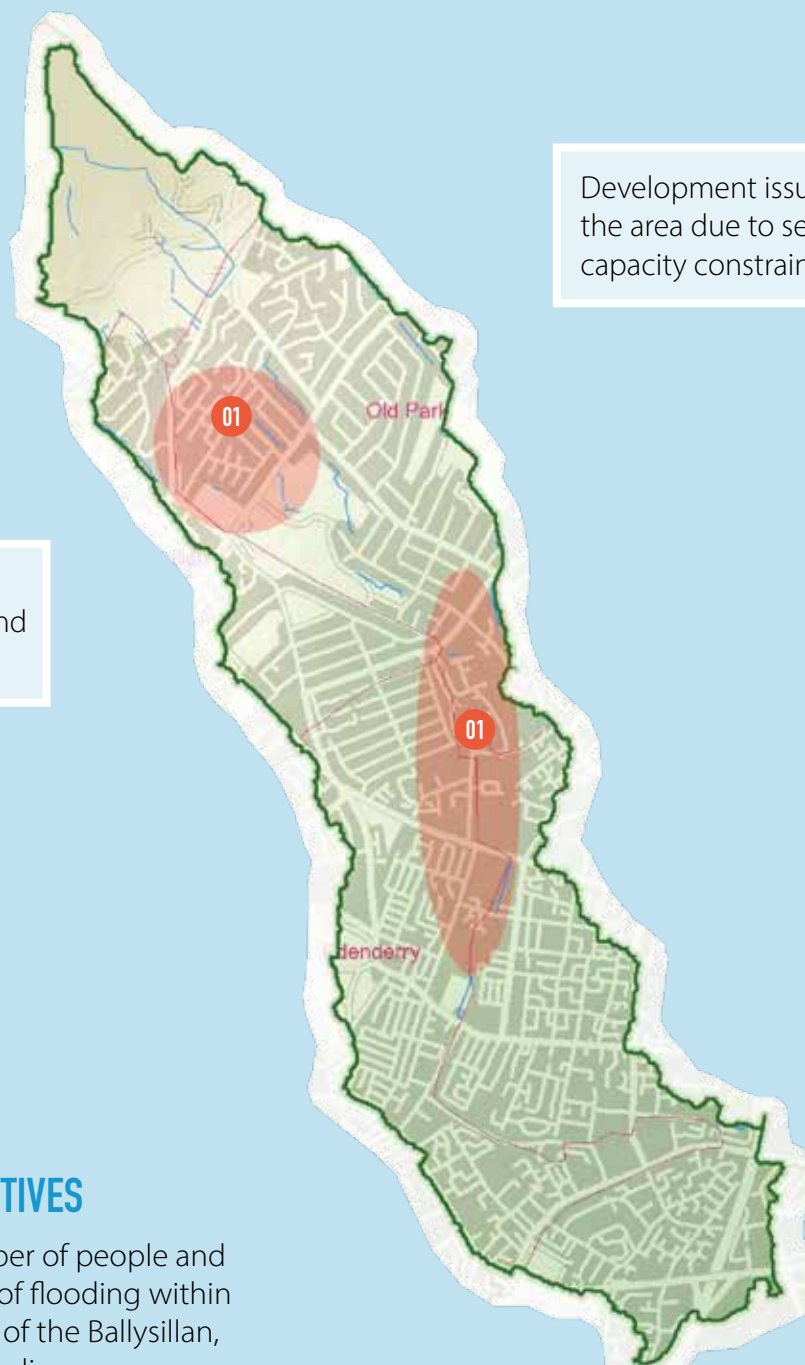
03 FORTH RIVER / SPRINGFIELD DAM

BCC's PEACE IV proposals include providing a 12km Community Greenway along Forth River from Glencairn to Bog Meadows and carrying out enhancements at a number of sites along the way including Springfield Dam & Park. Expanding the scheme to provide further integrated walking and cycling networks that feature river sections provides opportunities to reduce flood risk by incorporating attenuation features within the river channel. It also utilises Springfield Dam together with the natural ravines in the area to temporarily store storm water.

FORTH RIVER/CLOWNEY AREA - COMBINED SEWERAGE IMPROVEMENTS

NI Water works to provide increased capacity within the combined sewerage network together with appropriate screening at CSOs to help mitigate flood risk and improve water quality. Works will be dependent on the completion of further appraisals.

FARSET CATCHMENT



01

Flood risk in the Ardoyne, Crumlin and Ballysillan areas.

Development issues throughout the area due to sewerage network capacity constraints.

CATCHMENT OBJECTIVES

- Reduce the number of people and properties at risk of flooding within and downstream of the Ballysillan, Ardoyne and Crumlin areas.
- Contribute to achieving Good Ecological Potential in the River Lagan.
- Facilitate sustainable development at Springfield Road and further downstream in Belfast City Centre.

01

BELFAST HILLS

Managing the uppermost parts of the river catchments to reduce surface water run-off and to increase water attenuation and retention.

GLENWOOD / FARSET AREA – COMBINED SEWERAGE IMPROVEMENTS

NI Water works to provide increased capacity within the combined sewerage network together with appropriate screening at CSOs to help mitigate flood risk and improve water quality. Works will be dependent on the completion of further appraisals.



02

BALLYSILLAN PLAYING FIELDS

Working in partnership with the Urban Villages Initiative, BCC has produced a long-term development plan to create a thriving, welcoming and shared space at Ballysillan Playing Fields. Dfl together with the Executive Office and BCC are examining opportunities to extend the floodplain areas through the park. Such opportunities have the potential to reduce flood risk in the immediate area and further downstream as well as provide environmental and aesthetic benefits.

NI Water is also working with stakeholders to examine opportunities to remove surface water from its combined sewerage network and to improve local water quality.

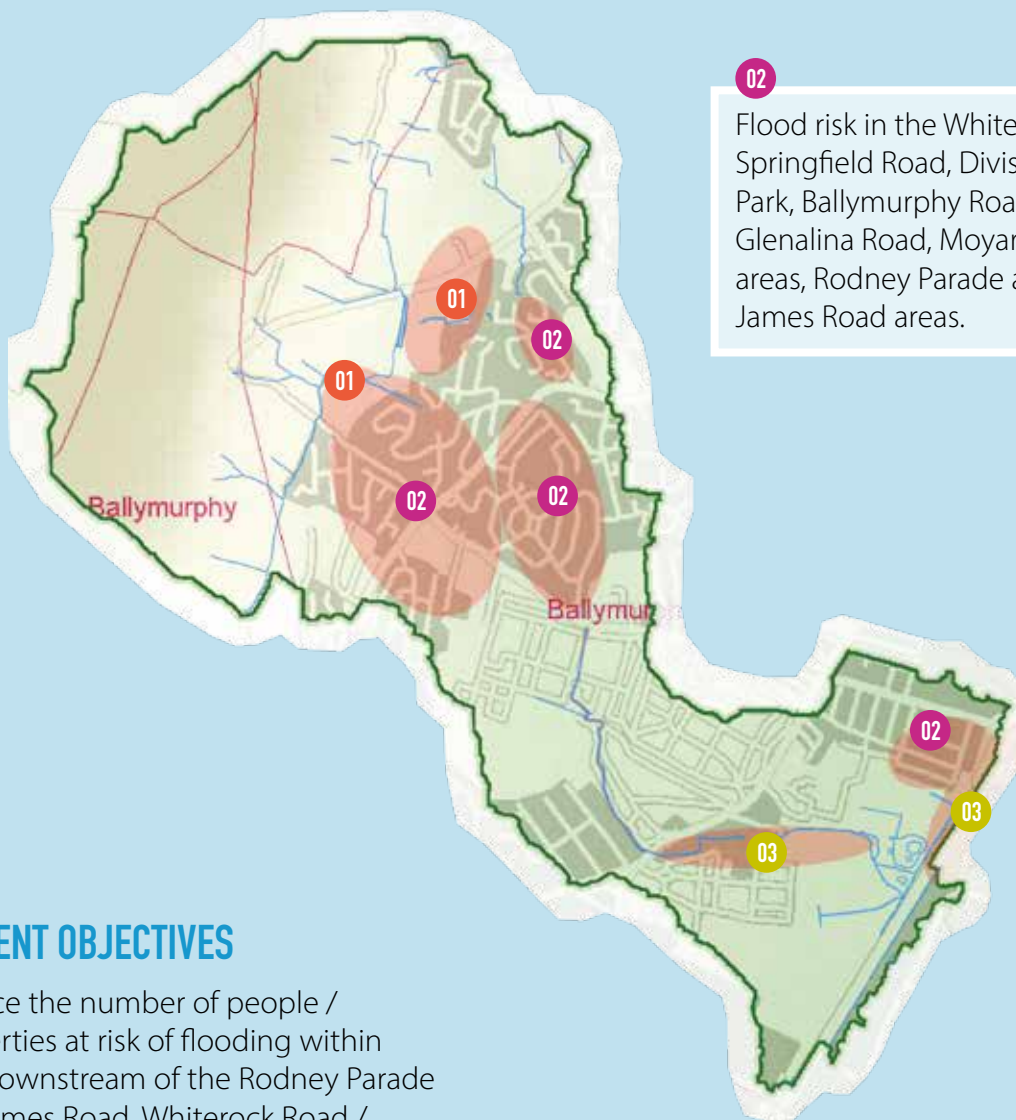
BALLYMURPHY CATCHMENT

01

Development issues throughout the area due to sewerage network capacity constraints.

02

Flood risk in the Whiterock Road, Springfield Road, Divismore Park, Ballymurphy Road, Glenalina Road, Moyard Park areas, Rodney Parade and St James Road areas.



CATCHMENT OBJECTIVES

- Reduce the number of people / properties at risk of flooding within and downstream of the Rodney Parade / St James Road, Whiterock Road / Springfield Road and Springfield Park / Moyard Park areas.
- Contribute to achieving Good Ecological Potential in the Blackstaff River.
- Facilitate sustainable development in the Whiterock Road and Springfield / Moyard Heights area as well as further downstream.

03

Water quality, aesthetic and invasive species issues in the Blackstaff River, Ballymurphy Stream and Bog Meadows.

01

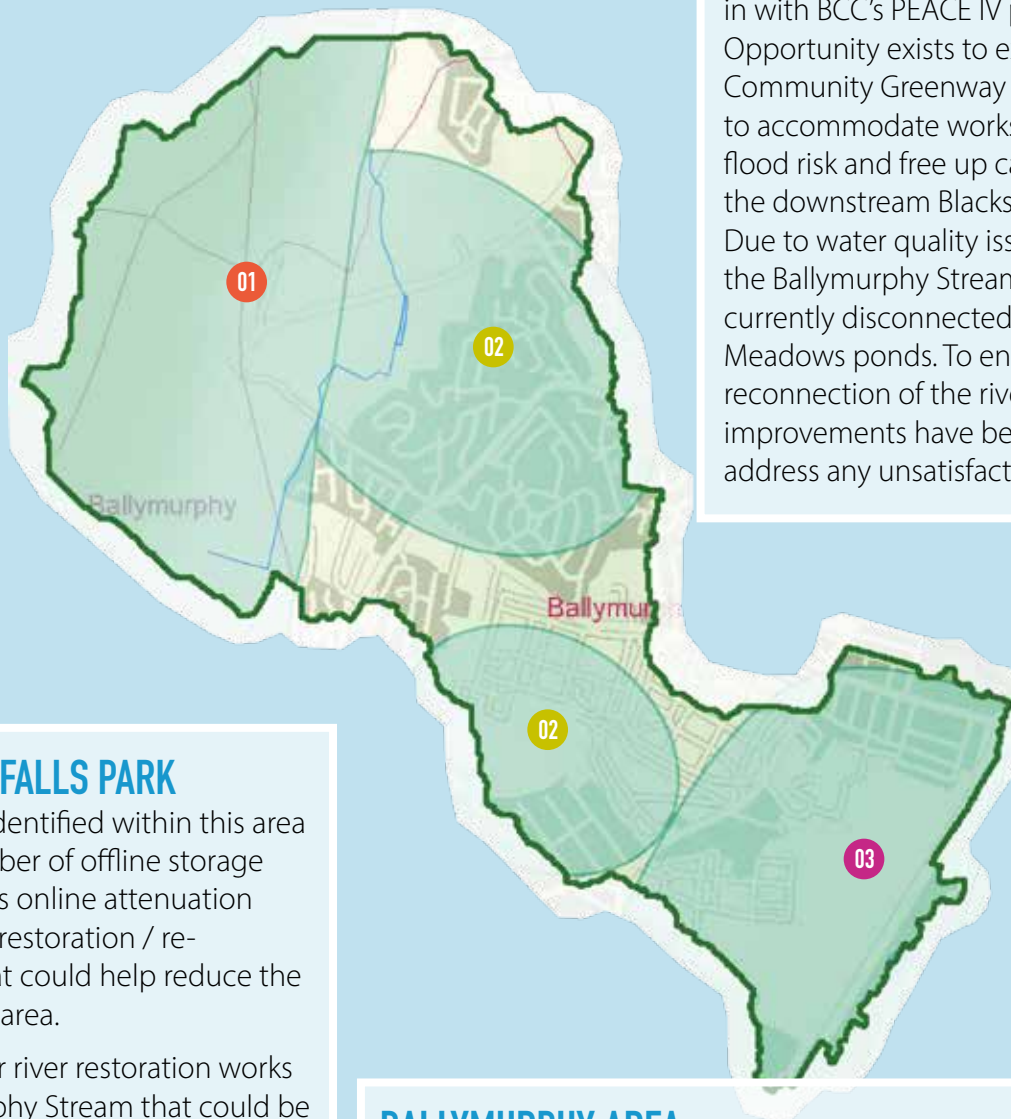
BELFAST HILLS

Managing the uppermost parts of the river catchments to reduce surface water run-off and to increase water attenuation and retention.

03

BOG MEADOWS

There is potential within the Bog Meadows to provide further storm storage as well as linking in with BCC's PEACE IV proposals. Opportunity exists to extend the Community Greenway proposals to accommodate works to reduce flood risk and free up capacity within the downstream Blackstaff Culvert. Due to water quality issues within the Ballymurphy Stream, the river is currently disconnected from the Bog Meadows ponds. To enable potential reconnection of the river, sewerage improvements have been identified to address any unsatisfactory CSOs.



02

WHITEROCK / FALLS PARK

Opportunities identified within this area to create a number of offline storage ponds, as well as online attenuation works and river restoration / re-meandering that could help reduce the flood risk in the area.

Potential also for river restoration works to the Ballymurphy Stream that could be tied into the development of BCC owned green space to create an enhanced amenity area and an area of biodiversity. Opportunities within Falls Park could see the creation of online and offline storage ponds and the possibility of storage around the existing football pitches through the re-grading of the area.

BALLYMURPHY AREA COMBINED SEWERAGE IMPROVEMENTS

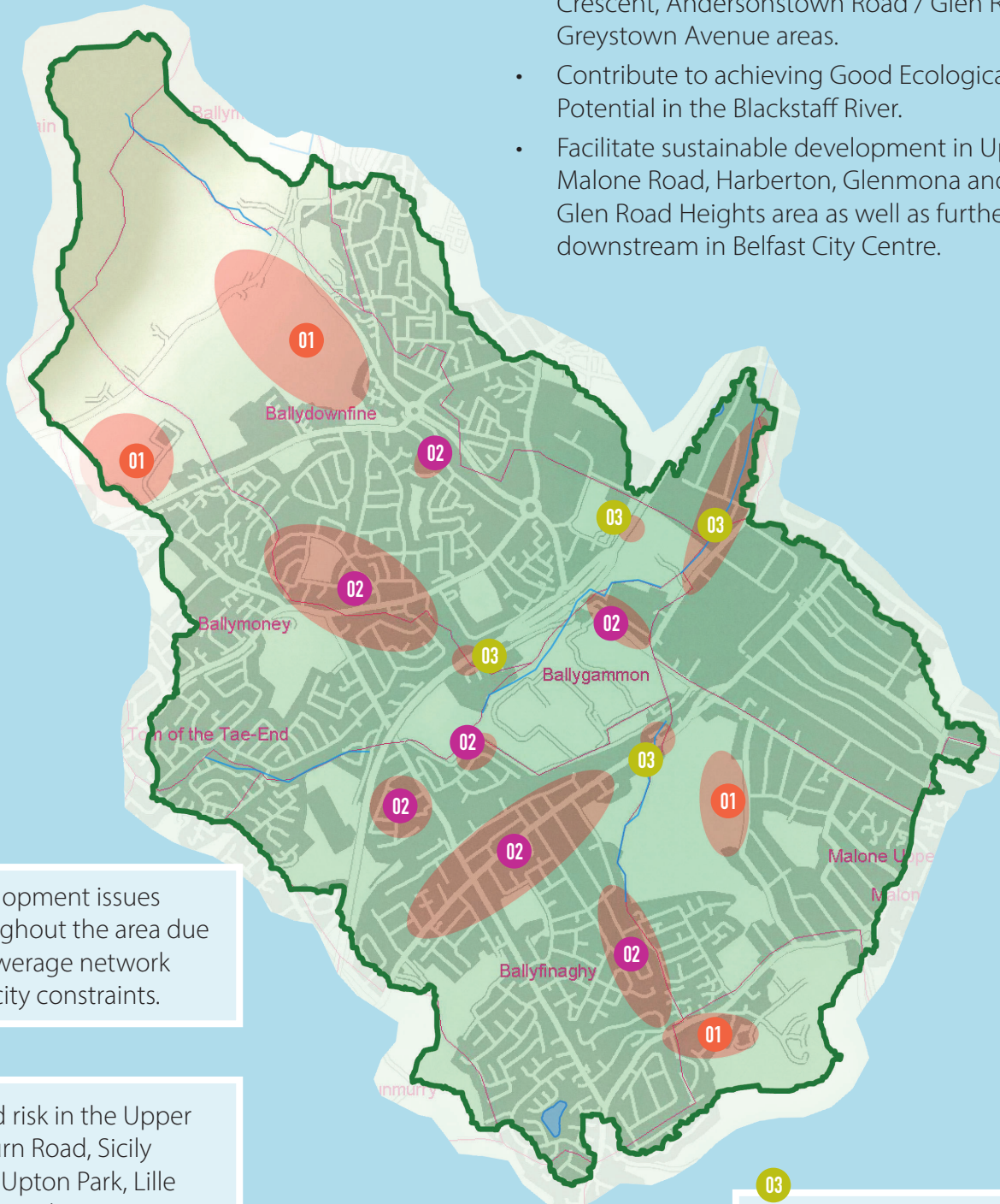
NI Water works to provide increased capacity within the combined sewerage network together with appropriate screening at CSOs to help mitigate flood risk and improve water quality.

Works will be dependent on the completion of further appraisals.

GLENMACHAN CATCHMENT

CATCHMENT OBJECTIVES

- Reduce the number of people and properties at risk from flooding within and downstream of the Sicily Park, Upton Park, Lille Park, Stockmans Lane, Glenhill Park, Orchardville Crescent, Andersonstown Road / Glen Road and Greystown Avenue areas.
- Contribute to achieving Good Ecological Potential in the Blackstaff River.
- Facilitate sustainable development in Upper Malone Road, Harberton, Glenmona and Glen Road Heights area as well as further downstream in Belfast City Centre.



01

Development issues throughout the area due to sewerage network capacity constraints.

02

Flood risk in the Upper Lisburn Road, Sicily Park, Upton Park, Lille Park, Stockmans Lane, Glenhill Park, Orchardville Crescent, Andersonstown Road, Glen Road, Ashton Park/Ardmore area and Greystown Avenue.

03

Water quality issues arising from sewage spills at CSOs as well as water quality issues in the Blackstaff River.

01

BELFAST HILLS

Managing the uppermost parts of the river catchments to reduce surface water run-off and to increase water attenuation and retention.

02

ANDERSONSTOWN

Opportunity to redevelop some BCC owned green space by opening up culverted rivers and incorporating storm attenuation features. This has the potential to create improved green spaces with attractive parklands and river walks, reduce flood risk and improve water quality.

04

FINAGHY NORTH

Opportunity to carry out river alterations to provide storage along Ladybrook River along the perimeter of the Radius Visteon Site. If coupled with storm separation, this could free up capacity in the sewerage network. There are also opportunities to link with the Stockmans / Boucher concepts.

03

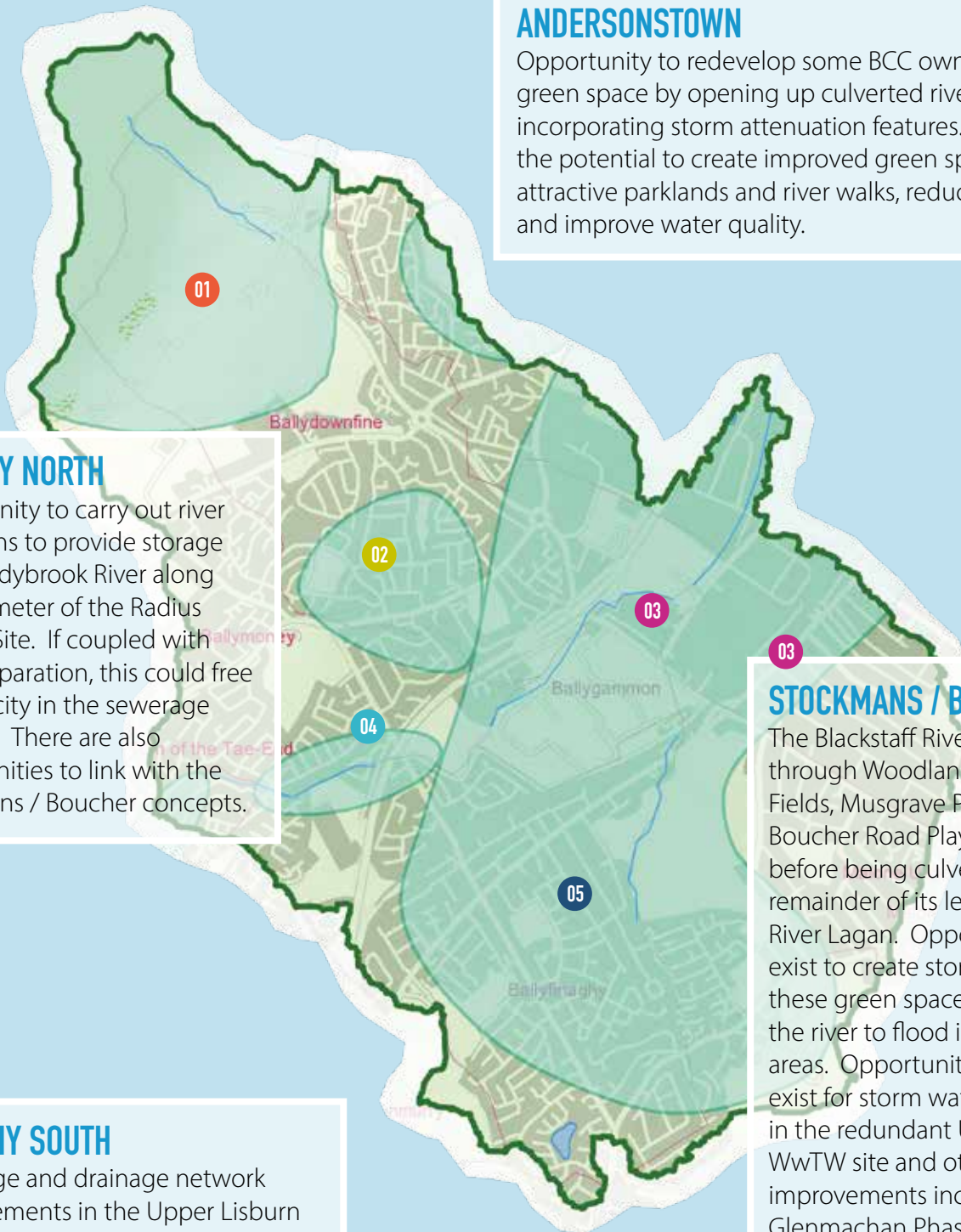
STOCKMANS / BOUCHER

The Blackstaff River passes through Woodlands Playing Fields, Musgrave Park and Boucher Road Playing Fields before being culverted for the remainder of its length to the River Lagan. Opportunities exist to create storage areas in these green spaces to allow the river to flood in these areas. Opportunities also exist for storm water storage in the redundant Upper Falls WwTW site and other capital improvements including Glenmachan Phase 2. Combined, these could help reduce flood risk in the area and free up capacity within the watercourse and improve water quality.

05

FINAGHY SOUTH

Sewerage and drainage network improvements in the Upper Lisburn Road area aimed at reducing the risk of flooding in the Sicily / Locksley Park, Marguerite, Upton / Lille Park areas of south Belfast, tied into NI Water's Glenmachan Phase 1 and 2 sewerage improvement works.



LOWER BLACKSTAFF CATCHMENT

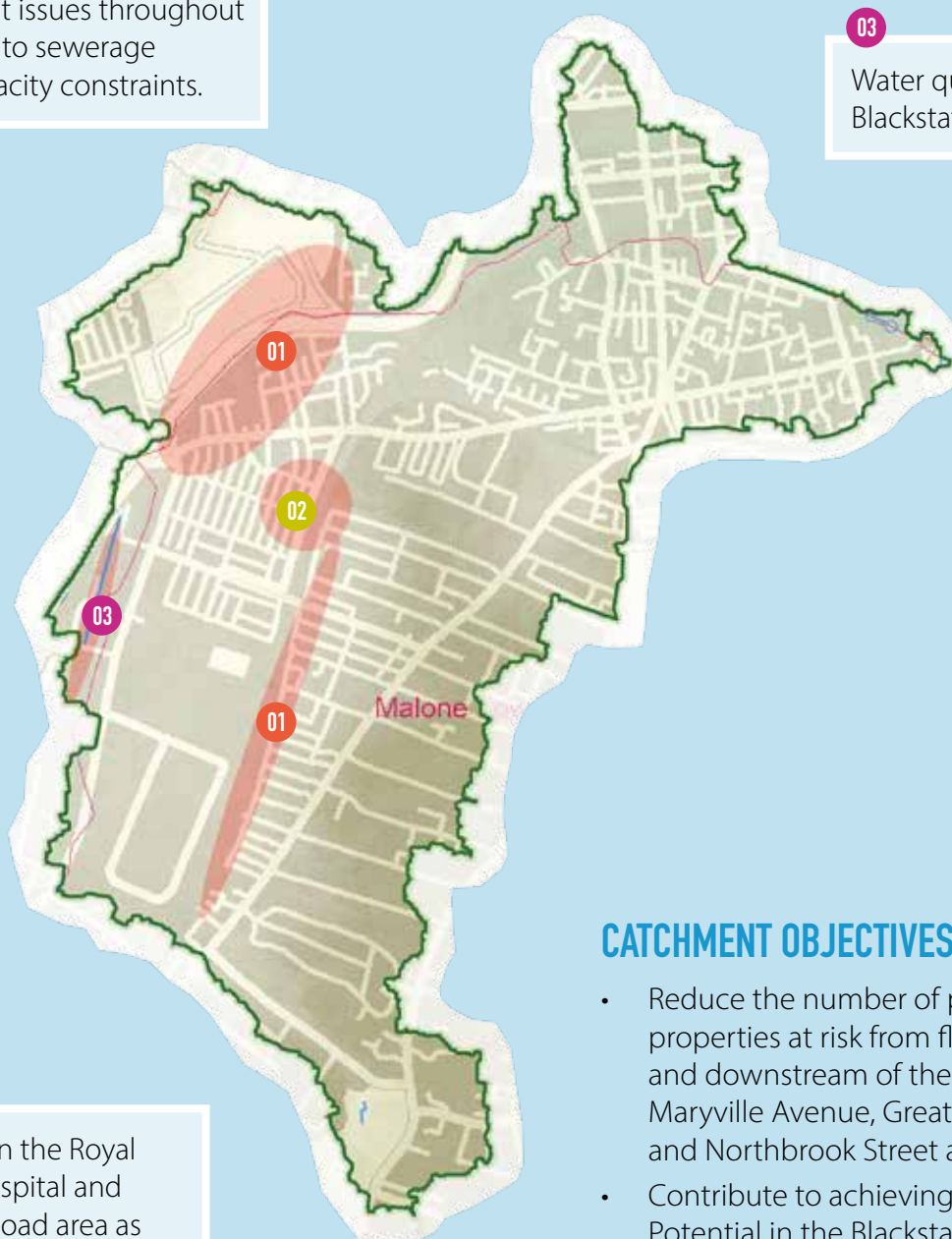
Development issues throughout the area due to sewerage network capacity constraints.

02

Critical infrastructure - Blackstaff Relief Culvert.

03

Water quality in the Blackstaff River.



01

Flood risk in the Royal Victoria Hospital and Donegall Road area as well as the Maryville Avenue, Great Northern Street and Northbrook Street areas.

CATCHMENT OBJECTIVES

- Reduce the number of people and properties at risk from flooding within and downstream of the Donegall Road, Maryville Avenue, Great Northern Street and Northbrook Street areas.
- Contribute to achieving Good Ecological Potential in the Blackstaff River and downstream in the River Lagan.
- Facilitate sustainable development in Belfast City Centre.

01

DONEGALL ROAD

As part of any regeneration proposals in this area, there is potential for storage ponds to be created in the waste ground beside Monarch Street. This could help store storm water from the nearby Blackstaff culvert as well as helping to create an area for biodiversity.

02

BANKMORE SQUARE

Opportunity to provide localised storm water attenuation as part of the redevelopment of Bankmore Street along the line of the proposals for the Belfast Rapid Transit Phase 2.

03

DISTILLERY STREET

Pilot SuDS project and Sewerage network improvements.



05

GLENMACHAN PHASE 2 PROJECT

(Boucher Tunnel & Sewer Improvements)

NI Water scheme to extend the existing deep storm water tunnel will reduce flood risk nearby in the Sicily Park and Marguerite Park areas and significantly improve water quality in the rivers by addressing approximately 20 unsatisfactory CSOs.

04

BELFAST TRANSPORT HUB

DfI and developers have been examining opportunities to disconnect storm drainage from the combined sewer network, attenuating it using SuDS, before discharging it into the Blackstaff River. This storm separation may, along with other sewer network improvements, assist NI Water in accepting the increased foul flows into the combined sewers that will result from the site being re-developed.

06

LISBURN ROAD

Opportunities exist to create a storage pond in Drumglass Park. Working in partnership with BCC, this could create an improved parkland and possible wetland area.

COLIN GLEN CATCHMENT

01

Waste management facilities in upper catchment area have potential for impacts on water quality.

Development issues throughout the area due to sewerage network capacity constraints.

02

Water quality issues in the Colin Glen River.



03

Flood risk in the Hannahstown Hill, Glen Road, Lenadoon, Stewartstown Road and Blacks Road areas.

CATCHMENT OBJECTIVES

- Reduce the number of people and properties at risk of flooding within and downstream of the Hannahstown Hill to Blacks Road area.
- Contribute to achieving Good Ecological Status in the Colin Glen River and Good Ecological Potential downstream in the River Lagan.
- Facilitate sustainable development in the catchment and downstream in the Dunmurry and Finaghy areas.

04

Erosion and deposition issues within the Colin River during high flows.

01

BELFAST HILLS

Managing the uppermost parts of the river catchments to reduce surface water run-off and to increase water attenuation and retention.

02

HANNAHSTOWN

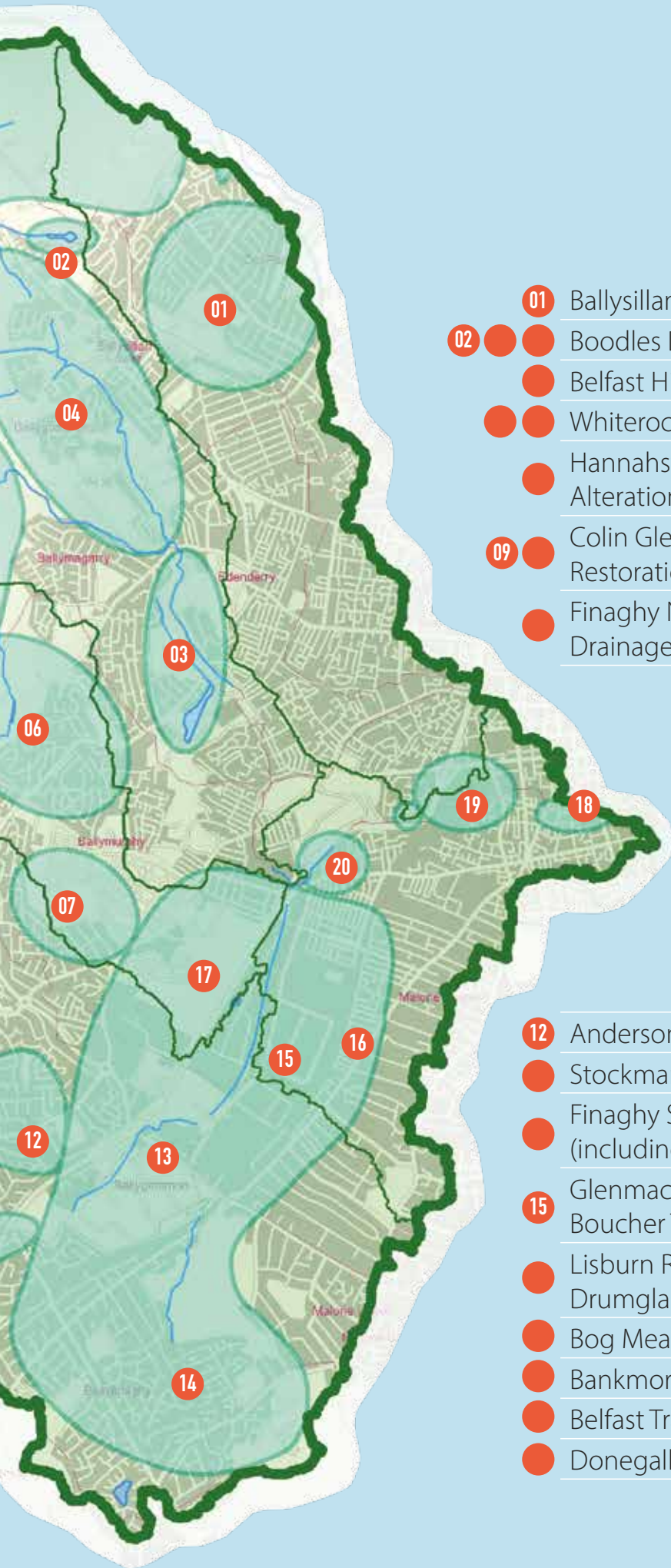
Linking to Blackstaff opportunities, there is the potential to carry out drainage network alterations to intercept and re-direct the surface water flow by providing capacity within the Ladybrook River.



COLIN GLEN CORRIDOR

River and floodplain restoration works are possible along the Colin Glen River in partnership with the Colin Glen Trust. Works could include instream structures (e.g. leaky dams), river re-meandering and small storage / detention areas.

Opportunities also exist for further storage areas along the Colin Glen River and Suffolk Playing Fields areas. There is also additional storage potential in the upper areas of this catchment by utilising existing waste management sites. The Kinnegar Road Stream runs along the perimeter of Wedderburn Park and there is potential to provide storm water attenuation within the park by carrying out river meandering works and providing instream structures.



- 01 Ballysillan Playing Fields Redevelopment
- 02 Boodles Dam/Forth River Restoration & Storage
- 03 Belfast Hills- Upper Catchment Management
- 04 Whiterock/Falls Park River Restoration & Storage
- 06 Hannahstown Area - Drainage Network Alterations
- 07 Colin Glen Corridor - River and Floodplain Restoration
- 09 Finaghy North – Possible River Restoration and Drainage Network Alterations

- 12 Andersonstown -River Restoration & Storage
- 13 Stockmans/Boucher – Blackstaff River Storage
- 14 Finaghy South Sewerage Improvements (including Sicily Park / Marguerite Park)
- 15 Glenmachan Phase 2 Sewerage Project (inc Boucher Tunnel)
- 16 Lisburn Road – Storage opportunities in Drumglass Park
- 17 Bog Meadows – Storm Storage
- 18 Bankmore Square SuDS
- 19 Belfast Transport Hub
- 20 Donegall Road – Possible Storage Ponds

CHAPTER 08

CONNSWATER & LAGAN EMBANKMENT STUDY AREA

CATCHMENT BASED SOLUTIONS

INTRODUCTION

- 8.1 As set out in Chapter 5, the Living With Water approach involves the development of catchment based solutions which are focused on managing rain water more naturally by controlling run-off, reducing peak flows in the drainage systems and providing areas for flood storage. This chapter identifies the strategic drainage pressures and issues within the Connswater and Lagan Embankment study area and includes potential opportunities for integrated catchment based solutions to address these. Solutions include a combination of potential blue/green infrastructure such as river restoration works and conventional hard engineered measures such as sewerage network improvements.
- 8.2 This study area extends from the city centre in the west of the catchment towards Crawfordsburn in the north east. It covers the areas of Malone and Stranmillis in the south west, Cregagh and Castlereagh in the south east and Dundonald in the east. An overview of the catchment is provided at figure 8.5.

PRESSURES AND ISSUES

- 8.3 The main pressures and issues identified by the Technical Working Group are:
- Flood risk in various areas attributed to a number of sources including tidal risk from the Lagan Estuary, surface water that is unable to enter the drainage network and flood risk from rivers and sewerage networks that are overwhelmed during storm events;
 - Water quality issues arising from unsatisfactory combined sewer overflows due to lack of capacity within sewerage networks, misconnections to the network

(wastewater drains connected to storm only drains) and invasive species along some rivers; and

- Development issues throughout the area due to sewerage network capacity constraints.

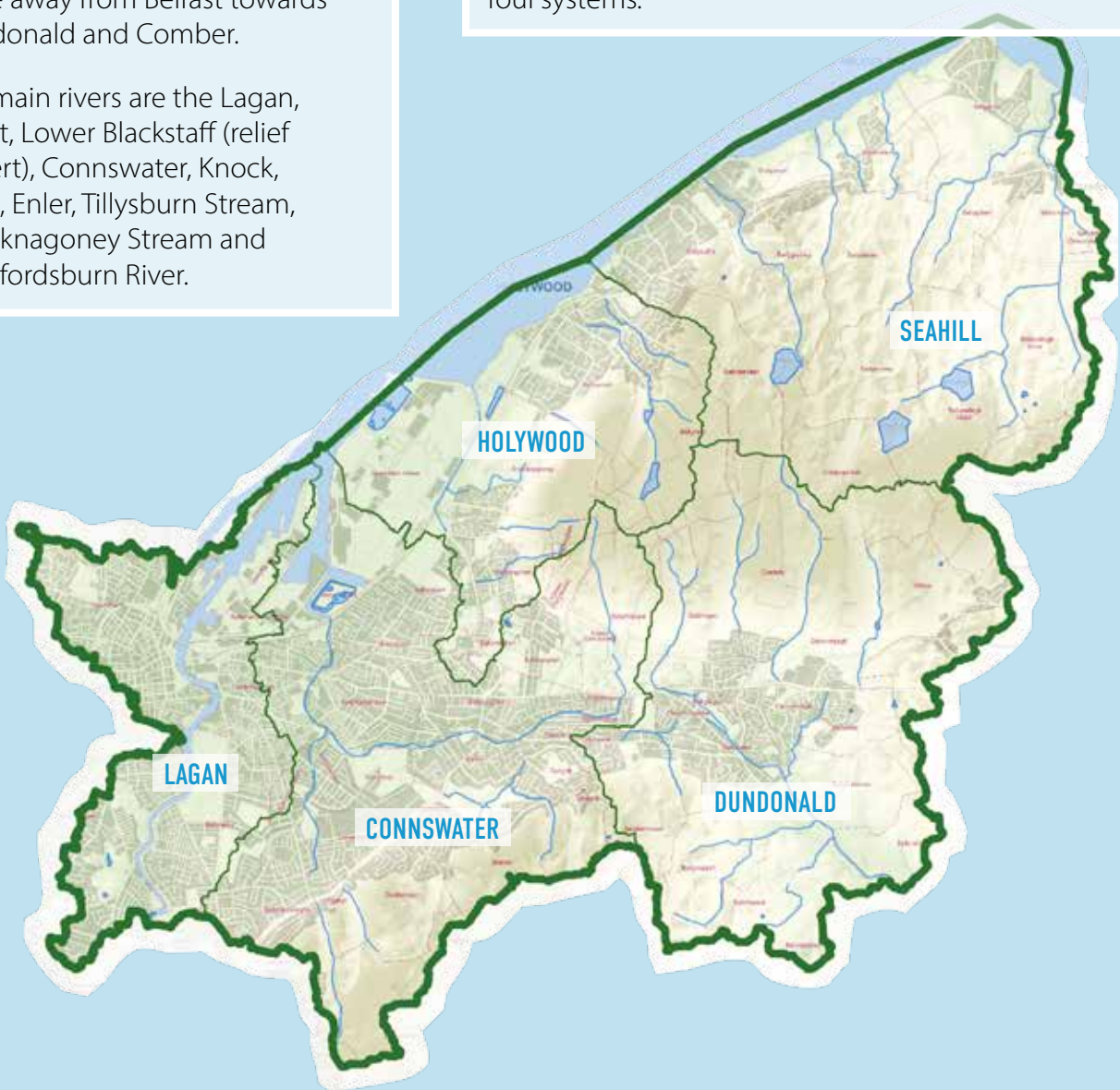
OPPORTUNITIES FOR INTEGRATED CATCHMENT BASED SOLUTIONS

- 8.4 A series of opportunity sites for potential blue/green infrastructure were identified across the study area along with a number of planned capital projects that could be extended to cover integrated drainage. These are outlined in this chapter and include the surrounding Castlereagh, Craigantlet and Holywood Hills where upper catchment management and NFM schemes could be implemented to reduce run-off and increase water retention to slow the flow of surface water from the hills. These opportunities also include existing capital projects such as the Belfast Tidal Scheme, York Street Interchange and proposed NI Water sewerage network improvements.
- 8.5 It is emphasised that while these identified opportunities have been subject to an initial high-level feasibility, they are conceptual indicative proposals that seek to identify and highlight how we may optimise our existing environment, enabling us to better manage and live with water. However, further opportunities exist within the various catchments to work with other government departments and public bodies such as the Northern Ireland Housing Executive. The LWWP team will continue to work with partners to explore opportunities. Progression to a programme of capital investment is dependent on the successful outcome of public engagement / consultation, detailed appraisal and design work and securing the necessary funding and approvals (e.g. business case, planning).

The terrain generally slopes from the Craigantlet Hills to Belfast Lough and the Castlereagh Hills and Malone to the River Lagan. The eastern part of Craigantlet Hills and the eastern Castlereagh Hills slope away from Belfast towards Dundonald and Comber.

The main rivers are the Lagan, Farset, Lower Blackstaff (relief culvert), Connswater, Knock, Loop, Enler, Tillysburn Stream, Knocknagoney Stream and Crawfordsburn River.

The sewer network within the study area drains to the Belfast WwTW at Dargan Road, the Kinnegar WwTW at Airport Road West and the Seahill WwTW near Helens Bay. Sewers are predominantly combined, with the newer developments, typically located towards the outer extents, comprising separate surface water and foul systems.



The Connswater & Lagan Embankment study area was further divided into 5 smaller sub-catchments based on river flow and the location of pressures. The locations of the strategic pressures and issues, along with the strategic objectives and the strategic opportunity based solutions for each of the sub-catchments, can be seen on the following maps.

LAGAN CATCHMENT

01

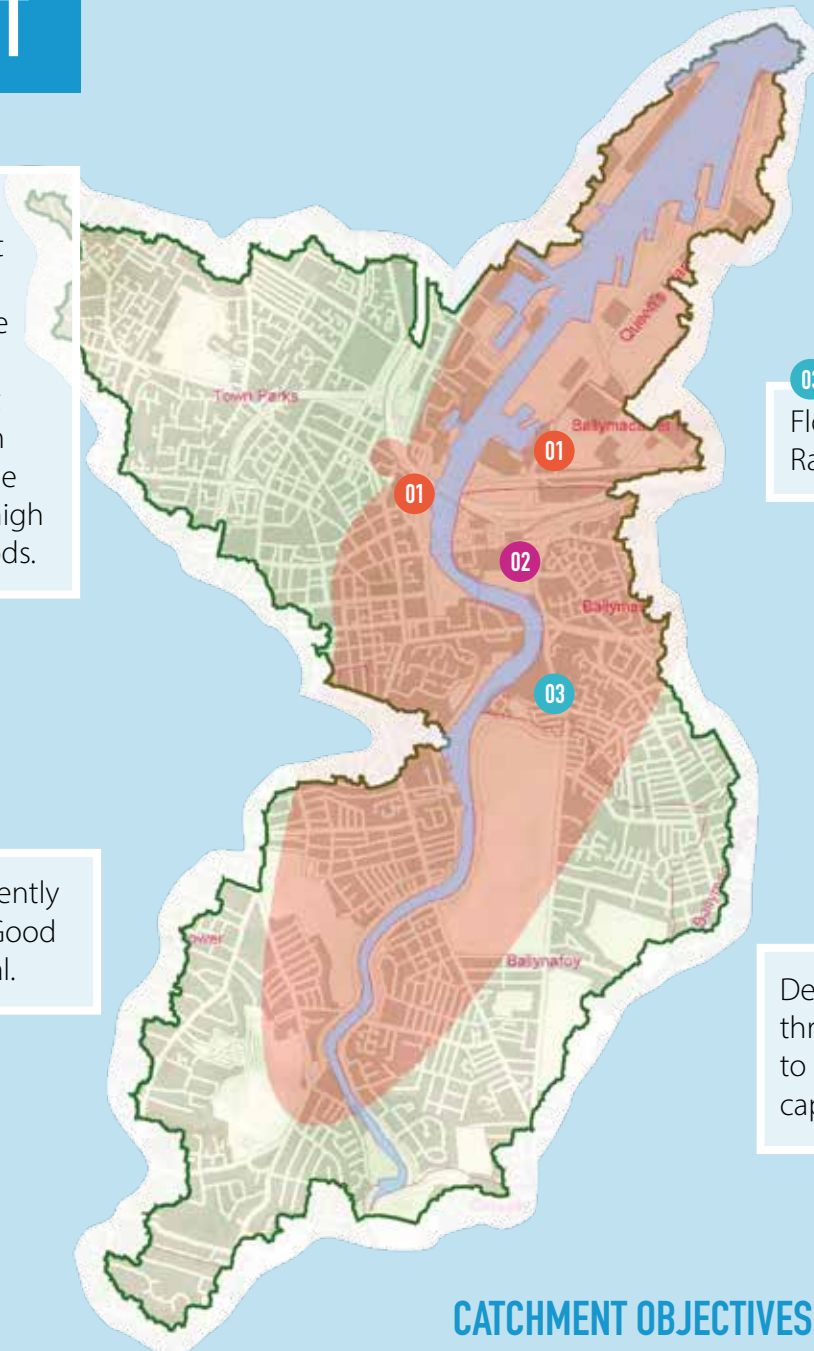
Tidal flood risk throughout Belfast City Centre along with back drainage issues in the Corporation Street area resulting from water that is unable to recede during high tides and tidal floods.

02

Lagan Estuary currently failing to achieve Good Ecological Potential.

03

Flood risk in the Ravenhill area.



Development issues throughout the area due to sewerage network capacity constraints.

CATCHMENT OBJECTIVES

- Reduce the number of people and properties at risk of coastal flooding from the Lagan Estuary and Belfast Lough.
- Reduce the number of people and properties at risk of flooding within the Ravenhill area.
- Contribute to achieving Good Ecological Potential in the Lagan Estuary and downstream to Belfast Harbour, and Good Ecological Status in Belfast Lough.
- Facilitate sustainable development in Belfast City Centre.

01

YORK STREET INTERCHANGE

Building on the proposals being taken forward by DfI Roads to redevelop the York Street interchange, there is an opportunity to increase run-off attenuation and work with NI Water to increase the amount of storm water separation as part of the proposals.

02

RAVENHILL FLOOD ALLEVIATION SCHEME

NI Water is progressing a capital improvement project to reduce the risk of out of sewer flooding.



BELFAST TIDAL SCHEME

The proposed scheme extends from Belfast Harbour to Stranmillis Weir and will comprise a number of different forms of both permanent and temporary flood defences. Maps showing the line of the flood defences can be viewed at <https://www.infrastructure-ni.gov.uk/topics/rivers-and-flooding/rivers-and-flooding-projects>.

SEWERAGE NETWORK IMPROVEMENTS

NI Water has identified a number of sewerage network improvements that will include CSO screening and the provision of additional storage. Works will be dependent on the completion of further appraisals.

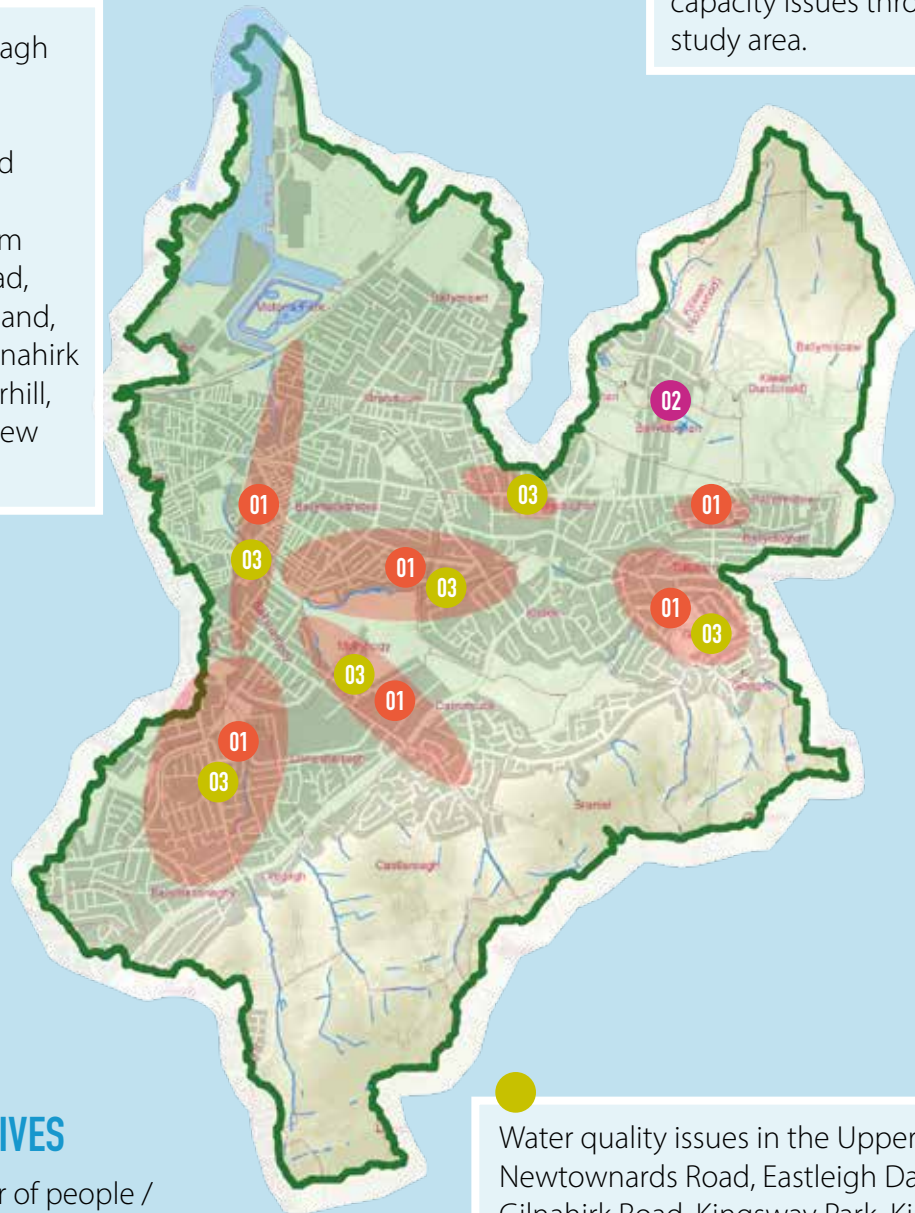
CONNSWATER CATCHMENT

01

Flood risk in the Cregagh Road, Mount Merrion Avenue, Ladas Drive, Sandown Road, Grand Parade, Castlereagh Road to the Sydenham By-pass, Gilnahirk Road, Kingsway Park, Kingsland, Kingsdale areas of Gilnahirk / Tullycarnet, Summerhill, Cloghan and Castlevue areas of Stormont.

02

Development pressure at Castlehill Manor area along with sewerage network capacity issues throughout the study area.



CATCHMENT OBJECTIVES

- Reduce the number of people / properties and infrastructure at risk of flooding in the areas noted above.
- Contribute to achieving Good Ecological Potential in the Connswater downstream to Belfast Harbour, and Good Ecological Status in Belfast Lough.
- Facilitate sustainable development in the sub-catchment area.

Water quality issues in the Upper Newtownards Road, Eastleigh Dale, Gilnahirk Road, Kingsway Park, Kingsland, Kingsdale, Cregagh Road, Mount Merrion Avenue and Ladas Drive areas as well as along the Connswater and Knock Rivers and the Orangefield stream.

01

CONNSWATER RIVER CORRIDOR

Potential for stormwater run-off reduction, including Avoniel Leisure Centre re-development, Ballymacarrett Walkway, the King George V Playing Fields linked into Glentoran FC's plans for the re-development of the Oval Stadium and NI Water's replacement of Sydenham WwPS. BCC and NI Water have already amended the timing of some schemes to help facilitate these works.

02

KNOCK RIVER CORRIDOR

Potential river restoration in the grounds of Stormont Estate. Opportunities also exist along the Knock River near Cherryvalley, Gilnahirk Stream and Kingsway Stream including Gilnahirk Park and Tullycarnet Park.

In addition, NI Water has identified a number of sewerage network improvements that will include CSO screening and the provision of additional storage.

03

ORANGEFIELD STREAM CORRIDOR:

Land in the Dixon Park, Greenville Park area that could complement the work carried out on the Connswater Greenway.



06

UPPER NEWTOWNARDS ROAD

NI Water sewerage network improvements.

05

LOOP RIVER CORRIDOR

Working in partnership with the National Trust to create a wetland in the Lisnabreeny area, there is potential to provide further storm water storage as part of the scheme.

This could be linked to the potential within the Cregagh Glen and areas along the Loop River to help store storm water and reduce surface water run-off. These areas include Cregagh Green and Playground, Loop River Park and Cherryvale Park.

NI Water has also identified a number of sewerage network improvements that will include CSO screening and the provision of additional storage. Works will be dependent on the completion of further appraisals.

06

CASTLEREAGH AND CRAIGANTLET HILLS

Managing the upper most parts of the river catchments to reduce surface water run-off and increase water attenuation and retention. Woodland creation, riparian buffer strips and drain blocking to store and slow surface water flows. Given that most of the surrounding hillside is in private ownership, any potential works may need to be carried out in partnership with DAERA and linked to an Agri-Environmental scheme.

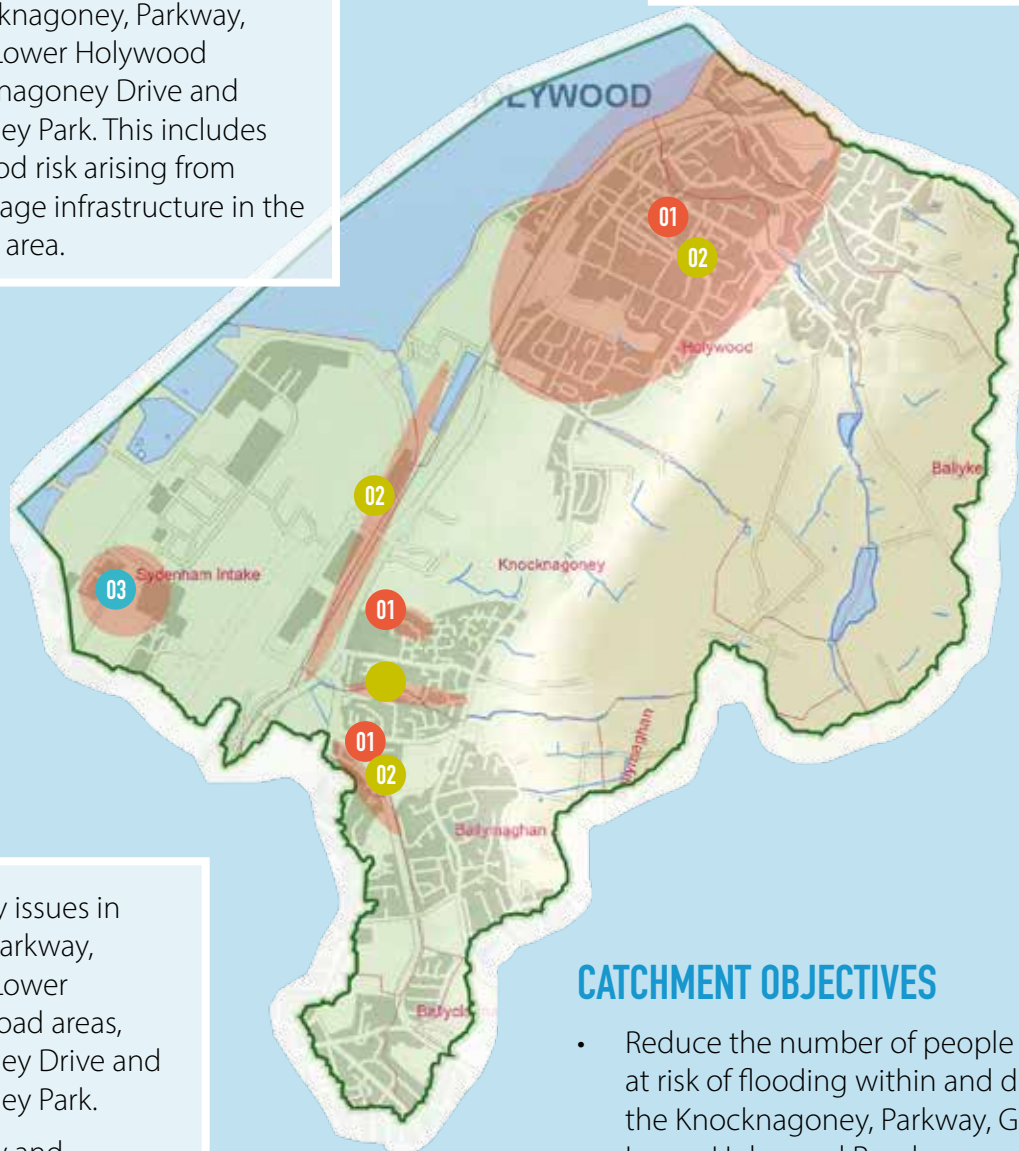
HOLYWOOD CATCHMENT

01

Flood risk in Hollywood, Glendarragh area of Knocknagoney, Parkway, Garnerville, Lower Hollywood Road, Knocknagoney Drive and Knocknagoney Park. This includes potential flood risk arising from private drainage infrastructure in the Glendarragh area.

03

Development pressure of a new power station within Belfast Harbour Estate along with sewerage network capacity issues throughout the study area.



02

Water quality issues in Hollywood, Parkway, Garnerville, Lower Hollywood Road areas, Knocknagoney Drive and Knocknagoney Park.

Water quality and odour issues believed to be associated with unsatisfactory discharges from combined sewer overflows to the lagoons alongside the Sydenham Bypass and their contributing rivers.

CATCHMENT OBJECTIVES

- Reduce the number of people and properties at risk of flooding within and downstream of the Knocknagoney, Parkway, Garnerville and Lower Hollywood Road areas.
- Contribute to achieving Good Ecological Status in Belfast Lough.
- Facilitate sustainable development in the sub-catchment area including Belfast Harbour.

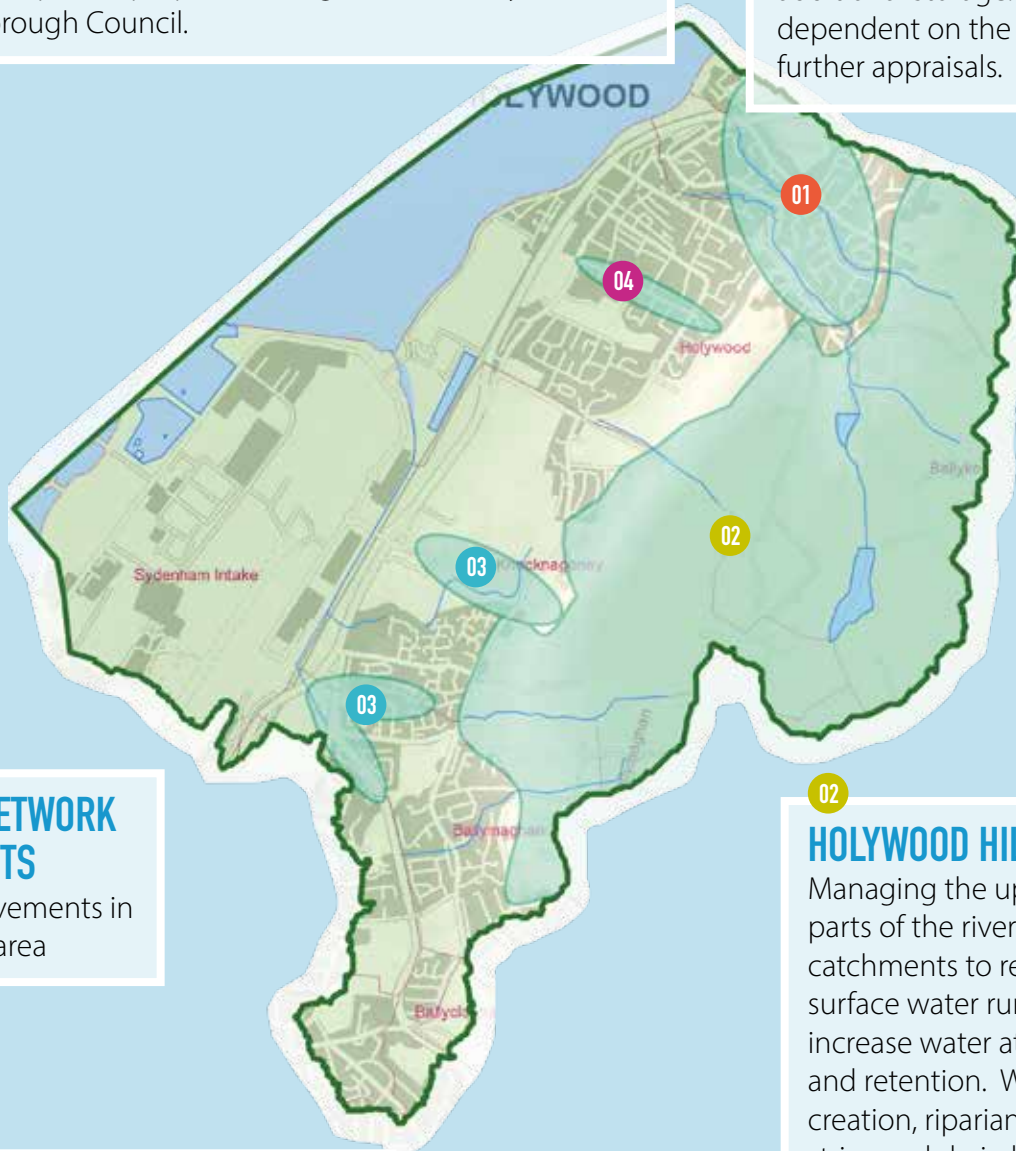
01

GOLF COURSE STREAM CORRIDOR

Potential for floodplain restoration works to help slow the flow of water through the catchment including Glenlyon Park and along the Croft Burn and Woodlands Stream. Potential opportunities in DAERA owned lands at Redburn Park in the form of NFM and areas of engineered storage. These works could be complemented by increased attenuation potential in the Loughview development proposals being considered by Ards and North Down Borough Council.

SEWERAGE NETWORK IMPROVEMENTS

Improvements in the Knocknagoney, Kinnegar and Hollywood areas that include increasing capacity, CSO screening and the provision of additional storage. Works will be dependent on the completion of further appraisals.



04

SEWERAGE NETWORK IMPROVEMENTS

NI Water improvements in My Lady's Mile area

02

HOLLYWOOD HILLS

Managing the uppermost parts of the river catchments to reduce surface water run-off and to increase water attenuation and retention. Woodland creation, riparian buffer strips and drain blocking to store and slow surface water flows. Given that most of the surrounding hillside is in private ownership, any potential works may need to be carried out in partnership with DAERA and linked to an Agri-Environmental scheme.

TILLYSBURN STREAM CORRIDOR

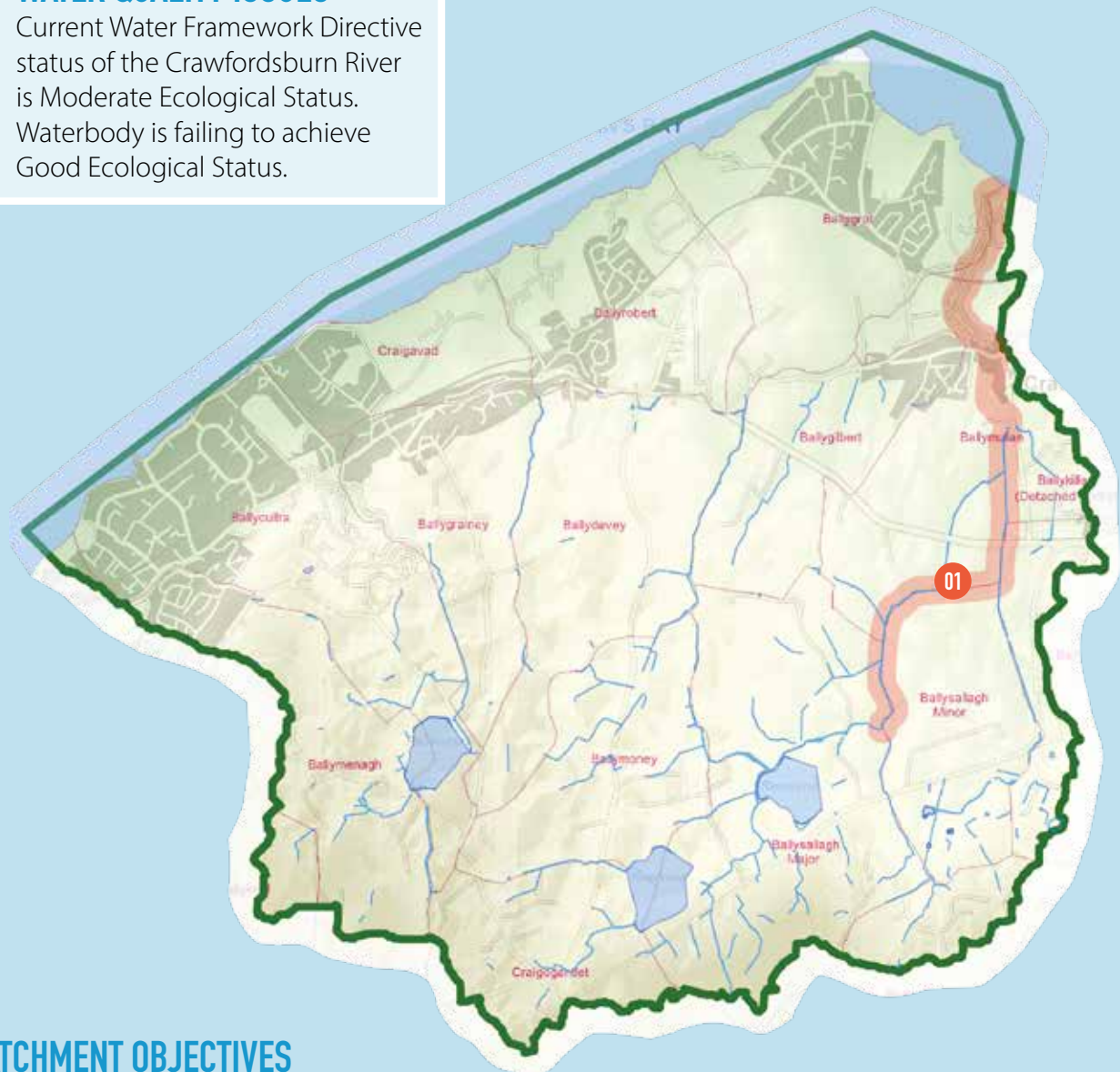
Working with various organisations, including DfI Roads and BCC, there is the potential to allow surface water into storage areas within the proposed park and ride site at Tillysburn and Knocknagoney Linear Park. Works to nearby watercourses in the form of floodplain restoration or instream structures also have the potential to increase capacity.

SEAHILL CATCHMENT

01

WATER QUALITY ISSUES

Current Water Framework Directive status of the Crawfordsburn River is Moderate Ecological Status. Waterbody is failing to achieve Good Ecological Status.



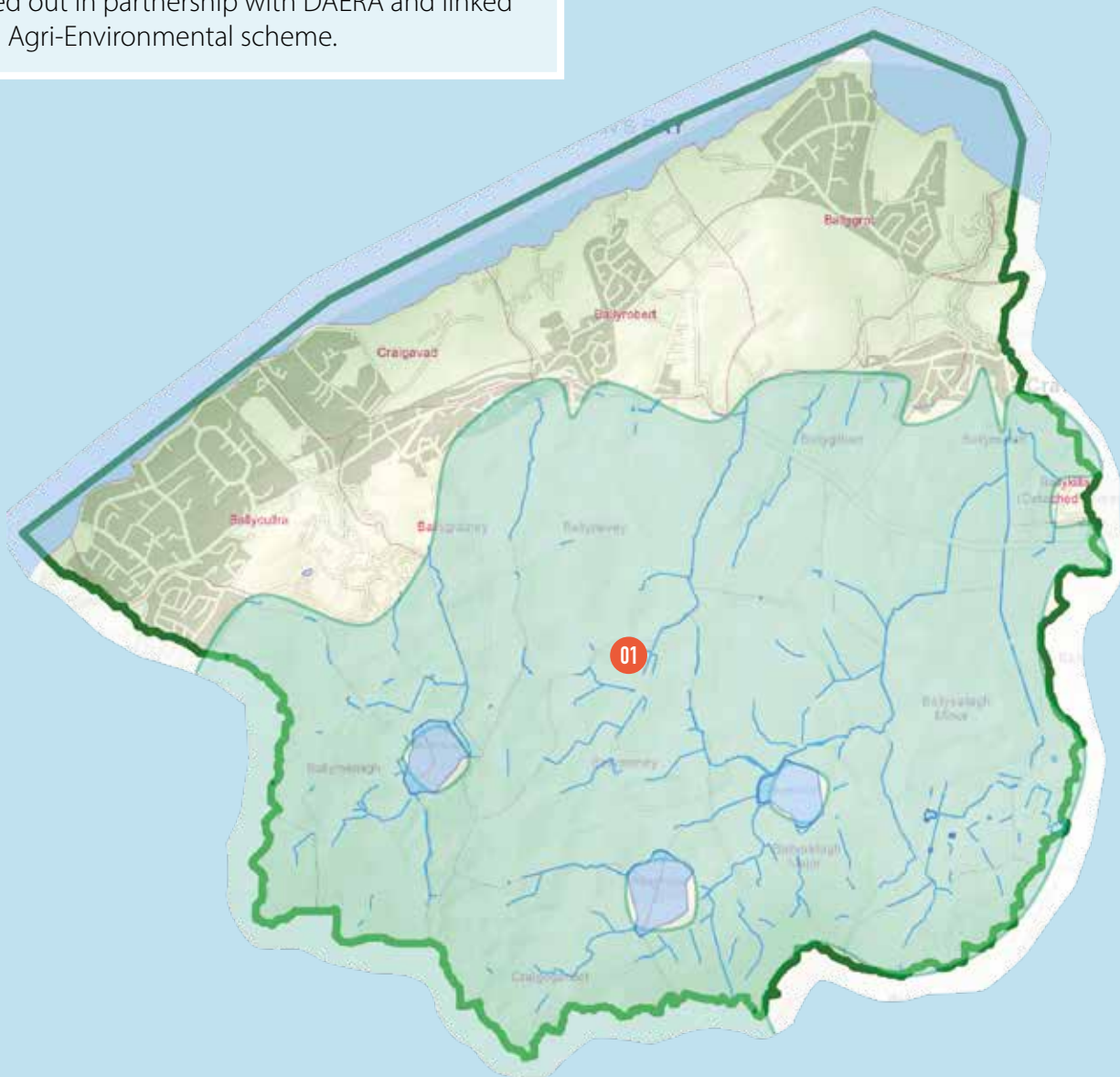
CATCHMENT OBJECTIVES

- Contribute to achieving Good Ecological Status in the Crawfordsburn River surface waterbody.
- Facilitate sustainable development in the sub-catchment area.

01

CRAIGANTLET AND HOLYWOOD HILLS

This study area is surrounded by hills and there is potential to manage the uppermost parts of the river catchments to increase water attenuation and retention and reduce run-off. Woodland creation, riparian buffer strips and drain blocking would help to store and slow the surface water flows and reduce diffuse pollution. Given that most of the surrounding hillside is in private ownership, any potential works may need to be carried out in partnership with DAERA and linked to an Agri-Environmental scheme.



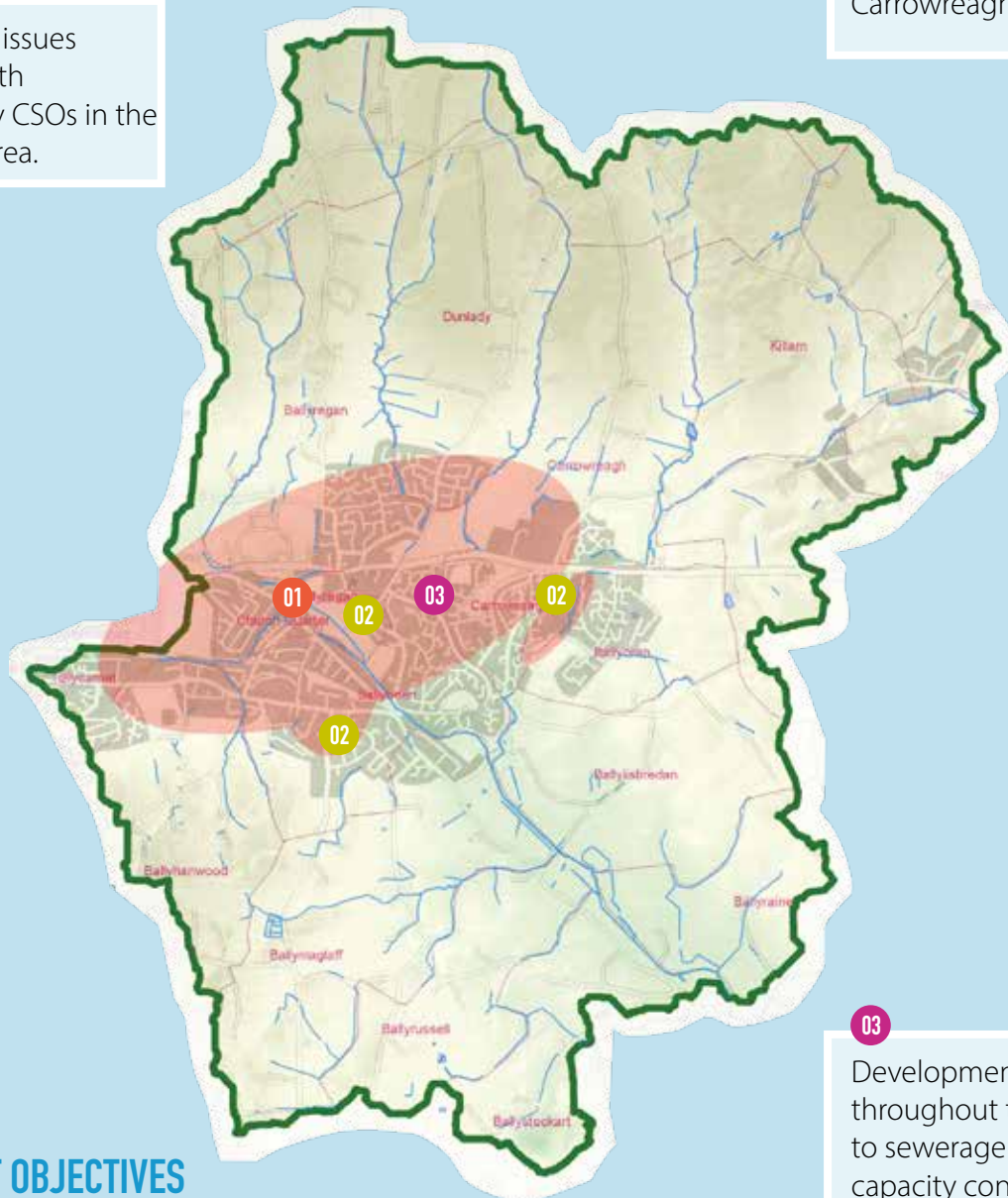
DUNDONALD CATCHMENT

01

Water quality issues associated with unsatisfactory CSOs in the Dundonald area.

02

Flood risk in the Comber Road, Old Dundonald Road, East Link Road, Dunlady Road, Upper Newtownards Road, Ballyoran and Carrowreagh areas.



03

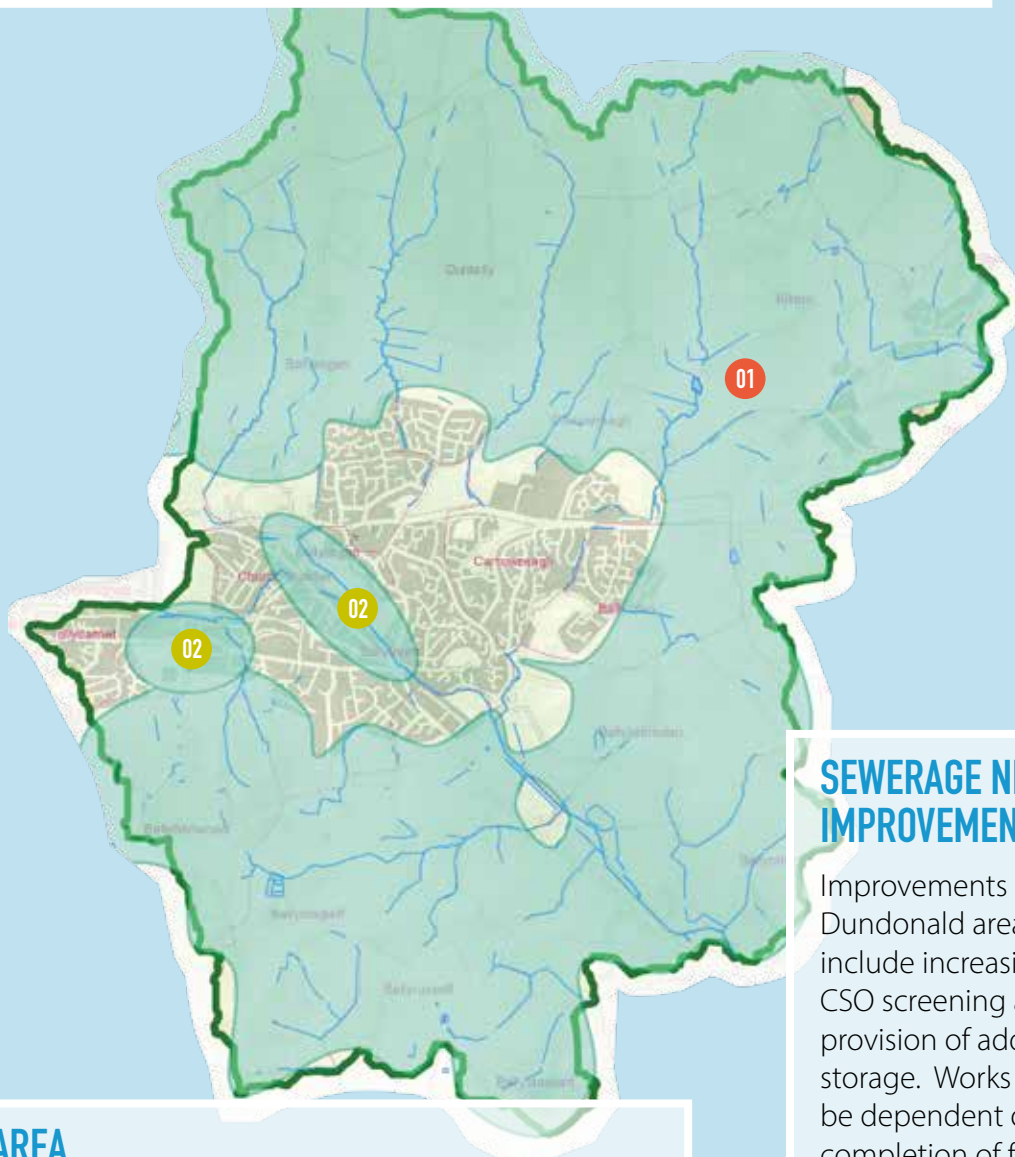
Development issues throughout the area due to sewerage network capacity constraints.

CATCHMENT OBJECTIVES

- Reduce the number of people and properties at risk of flooding within and downstream of the Comber Road, Dundonald Road, Dunlady Road, Upper Newtownards Road, Ballyoran, Carrowreagh, Dundonald Village area and East Link Road. Also downstream in the Comber area.
- Contribute to achieving Good Ecological Potential in the Enler River and Good Ecological Status downstream in Strangford Lough.
- Facilitate sustainable development in the sub-catchment area and downstream in Comber.

CRAIGANTLET AND CASTLEREAGH HILLS

This study area is surrounded by hills and there is potential to manage the uppermost parts of the river catchments to reduce surface water run-off, increase water attenuation and retention and reduce diffuse pollution. Woodland creation, riparian buffer strips and drain blocking would help to store and slow the surface water flows and reduce diffuse pollution. Given that most of the surrounding hillside is in private ownership, any potential works may need to be carried out in partnership with DAERA and linked to an Agri-Environmental scheme.



SEWERAGE NETWORK IMPROVEMENTS

Improvements in the Dundonald area that include increasing capacity, CSO screening and the provision of additional storage. Works will be dependent on the completion of further appraisals.

DUNDONALD AREA

Working in partnership with LCCC to help deliver the Castlereagh Urban Integrated Development Framework (CUIDF). LCCC proposals for developments at Dundonald Leisure Park, within Dundonald Village and along the Enler River at Moat Park could be extended to introduce blue/green infrastructure to help solve flooding issues. River restoration works along the Enler River and various tributaries, including leaky dams, for example, as well as NFM work at the Billy Neill Soccer Centre of Excellence, could all contribute to solving issues. BCC land along the Comber Greenway also has potential.

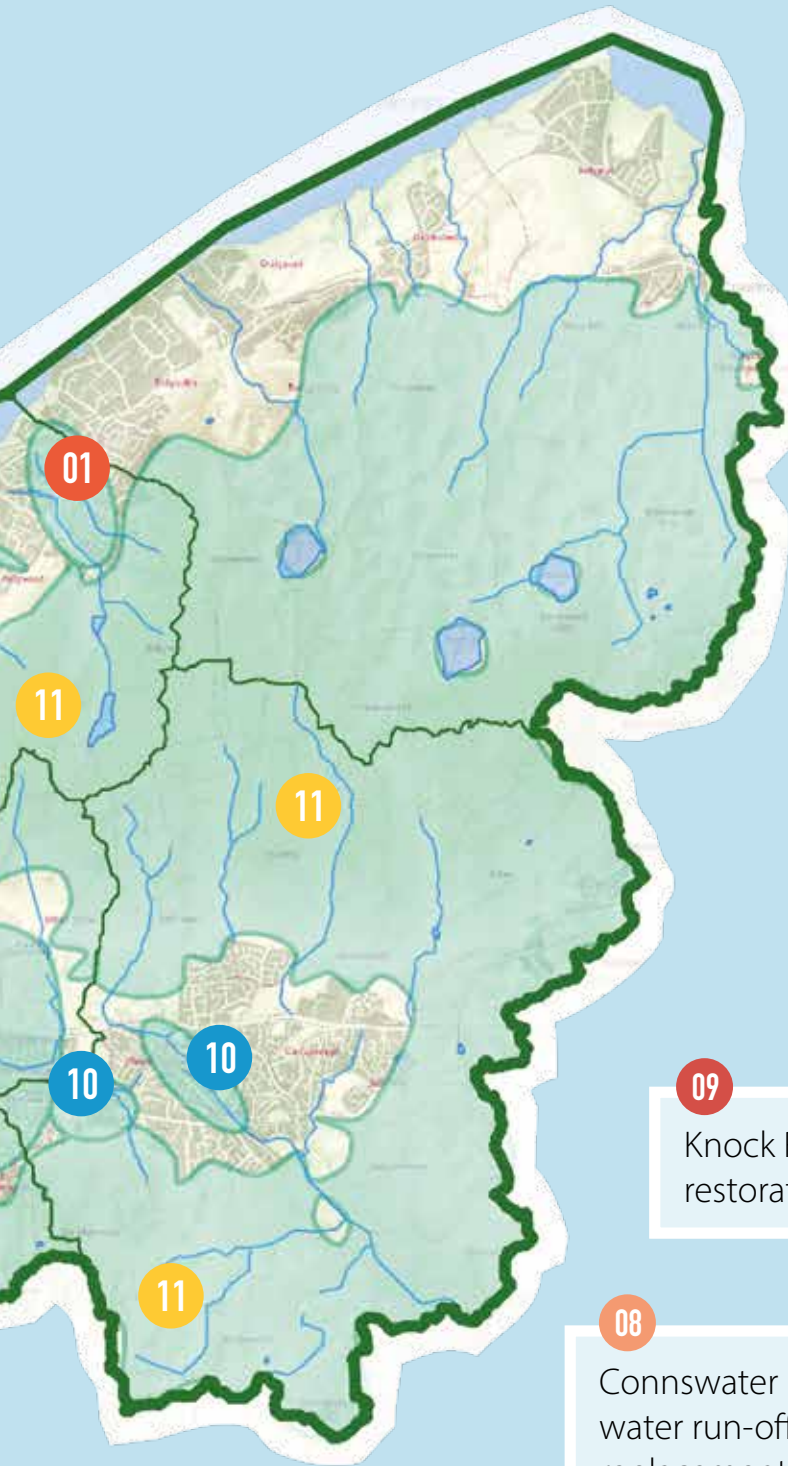
CONNSWATER & LAGAN EMBANKMENT STUDY AREA

OVERVIEW OF OPPORTUNITY BASED SOLUTIONS

This map provides an overview of the opportunity based solutions identified from all five sub-catchments which will be taken forward for more detailed assessment as part of the delivery of the Plan.

Sewerage network improvements throughout the area including increased capacity, CSO screening and storage.





12

NI Water sewerage network improvements at My Lady's Mile and Upper Newtownards Road

11

Upper Catchment Management in Craigantlet, Holywood and Castlereagh Hills

10

Blue/green infrastructure and river restoration works in Dundonald Area

09

Knock River Corridor - river restoration & storage

08

Connswater River Corridor - storm water run-off reduction and replacement of Sydenham WwPS

07

Orangefield Stream Corridor – river restoration & storage

INTRODUCTION

- 9.1 As set out in Chapter 5, the Living With Water approach involves the development of catchment based solutions which are focused on managing rain water more naturally by controlling run-off, reducing peak flows in the drainage systems and providing areas for flood storage. This chapter identifies the strategic drainage pressures and issues within the North Foreshore study area and includes potential opportunities for integrated catchment based solutions to address these. Solutions include a combination of potential blue/green infrastructure such as river restoration works and conventional hard engineered measures such as sewerage network improvements.
- 9.2 This North Foreshore study area extends from Duncairn and Fortwilliam in the south to Newtownabbey in the west and Carrickfergus in the north. An overview of the catchment is provided at figure 9.5.

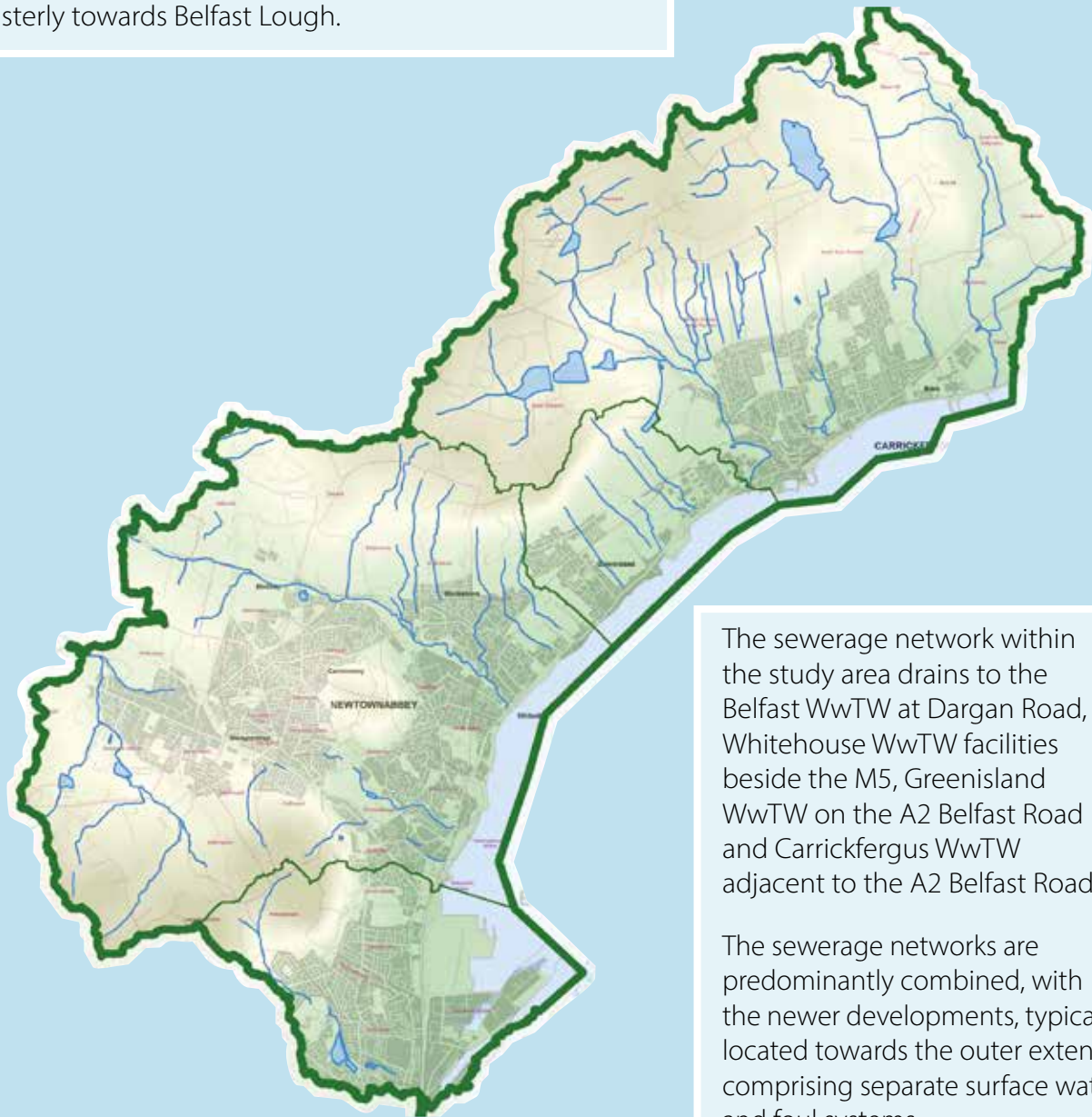
PRESSURES AND ISSUES

- 9.3 The main pressures and issues identified by the Technical Working Group (TWG) can be summarised as follows:
- Flood risk in various areas attributed to a number of sources, including capacity issues in the sewerage networks;
 - Water quality issues arising from unsatisfactory combined sewer overflows due to lack of capacity within sewerage networks, misconnections to the network (wastewater drains connected to storm only drains) and invasive species along some rivers; and
 - Development issues throughout the area due to sewerage network capacity constraints.

OPPORTUNITIES FOR INTEGRATED CATCHMENT BASED SOLUTIONS

- 9.4 A series of opportunity sites for potential blue/green infrastructure were identified across the study area along with a number of planned capital projects that could be extended to cover integrated drainage. These are outlined in this chapter and include the surrounding hills and existing blue/green spaces such as Belfast Waterworks where upper catchment management and NFM schemes could be implemented to reduce run-off and increase water retention to slow the flow of surface water from the hills. These opportunities also include existing capital projects such as the NI Water sewerage network improvements.
- 9.5 It is emphasised that while identified opportunities have been subject to an initial high-level feasibility, they are conceptual indicative proposals that seek to identify and highlight how we may optimise our existing environment, enabling us to better manage and live with water. However, further opportunities exist within the various catchments to work with other government departments and public bodies such as the Northern Ireland Housing Executive. The LWWP will continue to work with these partners to explore these opportunities. Progression to a programme of capital investment is dependent on the successful outcome of public engagement / consultation, detailed appraisal and design work, and securing the necessary funding and approvals (e.g. business case, planning).

The main rivers are the Ballymartin Water, Mile Water, Three Mile Water, Lisnalinchy Burn, Woodburn River, Copeland Water and Kilroot River, all of which discharge into Belfast Lough. The terrain generally slopes south easterly towards Belfast Lough.



The sewerage network within the study area drains to the Belfast WwTW at Dargan Road, Whitehouse WwTW facilities beside the M5, Greenisland WwTW on the A2 Belfast Road and Carrickfergus WwTW adjacent to the A2 Belfast Road.

The sewerage networks are predominantly combined, with the newer developments, typically located towards the outer extents, comprising separate surface water and foul systems.

The North Foreshore study area was further divided into 4 smaller sub-catchments based on river flow and the location of pressures. The locations of the strategic pressures and issues, along with the strategic objectives and the strategic opportunity based solutions for each of the sub-catchments, can be seen on the following maps.

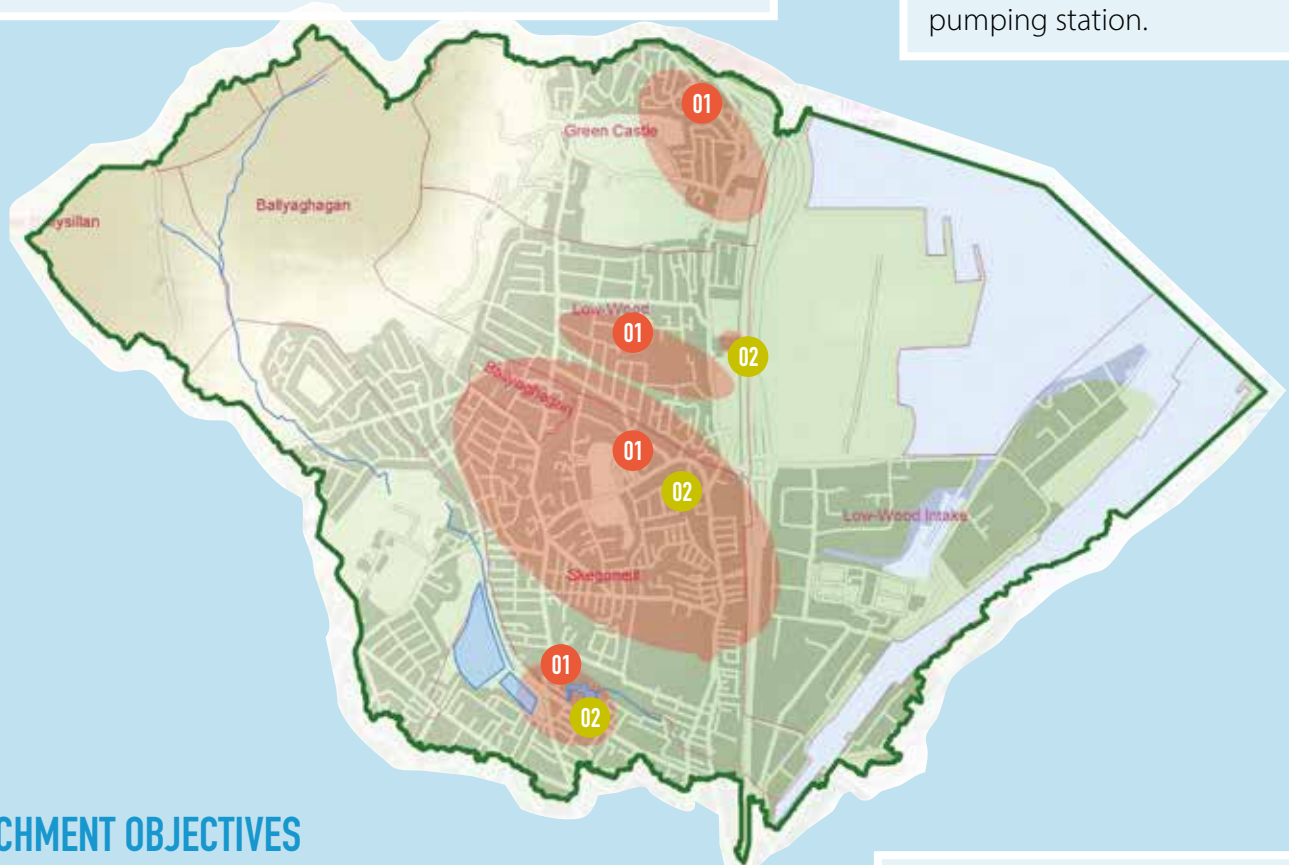
FORTWILLIAM CATCHMENT

01

Flood risk in the Mount Vernon, Parkmount Road, Shore Road, Loughside Recreational Centre, Graymount, Whitewell, Limestone Road, Fortwilliam, Antrim Road, Alexandra Gardens, Cave Hill Road, York Road and Shore Road areas. Flood risk associated with capacity, operation and asset condition of wastewater system in Fortwilliam Pumping Station and Grove Leisure Centre areas.

02

Water quality issues in the Limestone Road, Grove Leisure Centre, Fortwilliam, Antrim Road, Alexandra Gardens, North Circular Road, York Road and Shore Road areas associated with unsatisfactory CSOs including condition and performance of a strategic wastewater pumping station.



CATCHMENT OBJECTIVES

- Reduce the number of people / properties at risk of flooding within and downstream of the Mount Vernon, Parkmount Road, Shore Road, Loughside Recreational Centre, Graymount, Whitewell, Fortwilliam, Antrim Road, Alexandra Gardens, Cave Hill Road, Grove Leisure Centre and York Road areas.
- Contribute to achieving Good Ecological Potential downstream to Belfast Harbour.
- Facilitate sustainable development in the sub-catchment area.

Development issues throughout the area due to sewerage network capacity constraints.

01

CAVEHILL COUNTRY PARK / BELFAST CASTLE / BELFAST ZOO

Opportunities with Belfast Hills Partnership and BCC to manage upper catchments to reduce run-off and increase water attenuation and retention. Woodland creation, riparian buffer strips and drain blocking to slow and store surface water.

02

FORTWILLIAM STREAM CORRIDOR

Building on any potential NFM works in the Cavehill / Belfast Castle area there may be opportunities for online storage along the Fortwilliam Stream corridor.

03

PREMIER DRIVE STREAM CORRIDOR

Upper catchment management and opportunities at existing BCC owned green space at Northwood Linear Park and Loughside Recreation Centre and Playing Fields to divert and attenuate storm water to help address flood risk in the area.

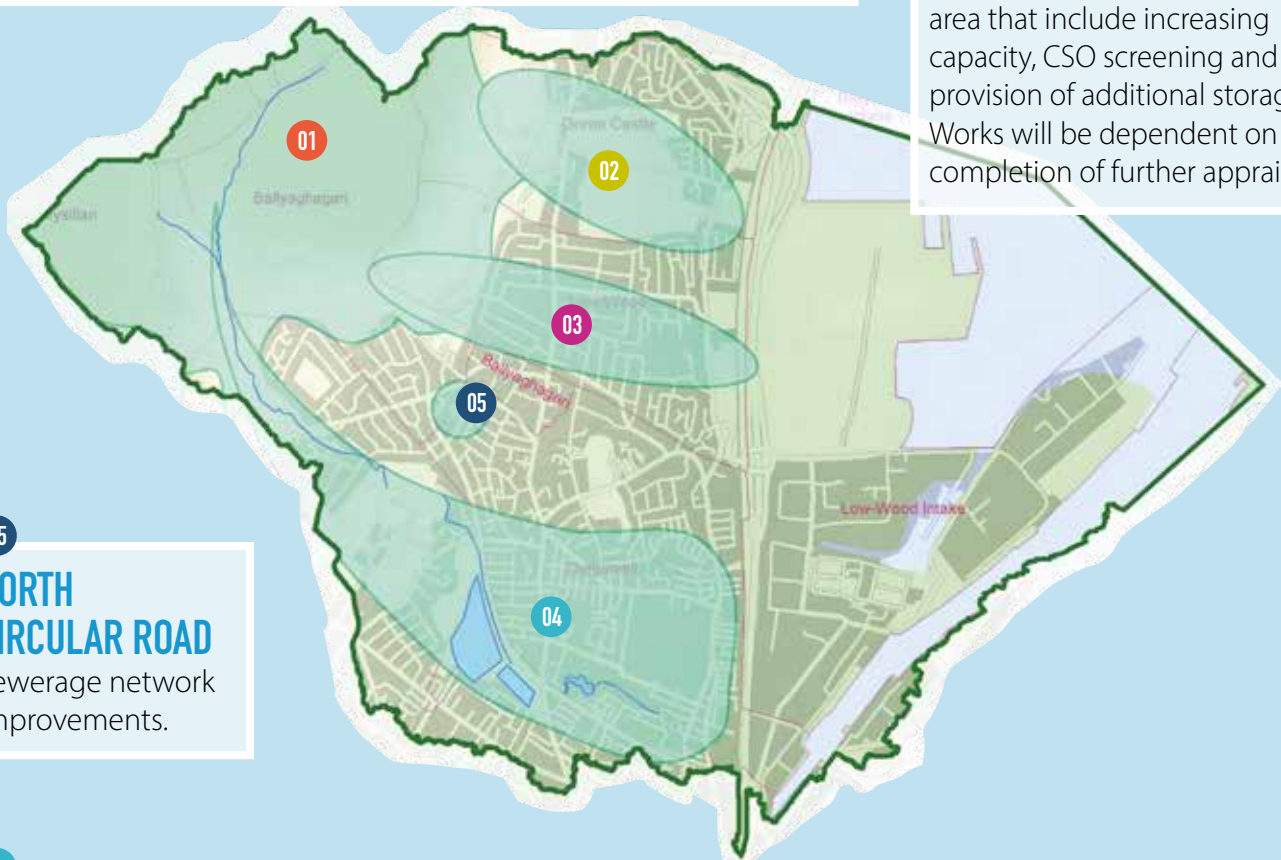
SEWERAGE NETWORK IMPROVEMENTS

Improvements in the Fortwilliam area that include increasing capacity, CSO screening and the provision of additional storage. Works will be dependent on the completion of further appraisals.

05

NORTH CIRCULAR ROAD

Sewerage network improvements.



CARR'S GLEN RIVER CORRIDOR

Opportunities at watercourses, reservoirs and dams that have connections back to Belfast's historic linen industry.

Opportunities to work with BCC along this river corridor to optimise these reservoirs (Waterworks and Alexandra Park) to store storm water and reduce peak flows along the river.

Opportunities for re-development of the former Carr's Glen Reservoir near NI Water's offices at Westland Road. These works along with the potential to use existing green space in areas like Grove Playing Fields for storm attenuation and the potential for NFM in the upper areas of Cave Hill could significantly reduce flood risk in the area.

WHITEHOUSE / MALLUSK CATCHMENT

01

Flood risk in the Carnmoney Industrial Estate to the Shore Road area as well as the Mallusk and Ballyhenry areas.

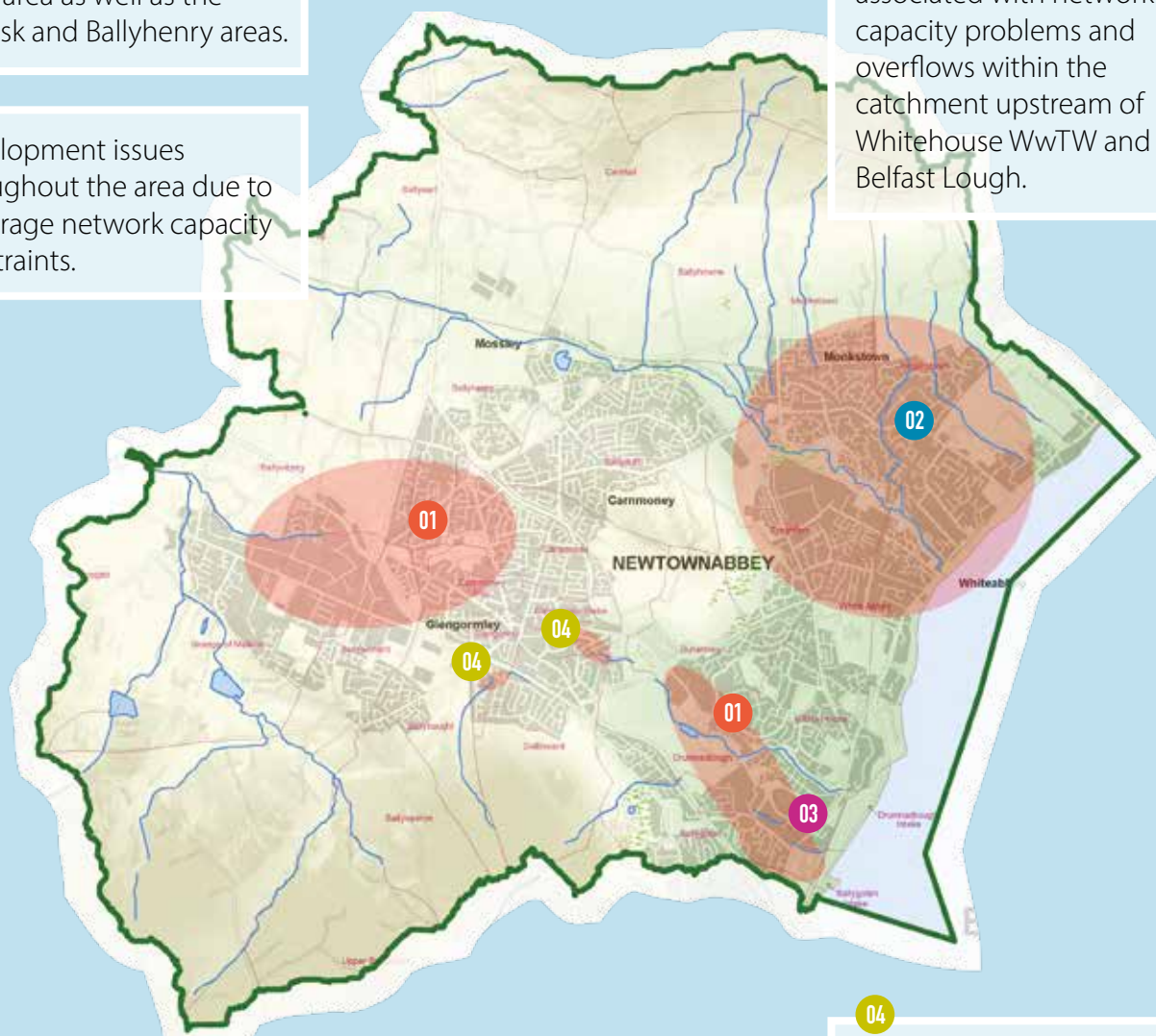
Development issues throughout the area due to sewerage network capacity constraints.

02

Flood risk in the Monkstown and Whiteabbey areas.

03

Water quality issues associated with network capacity problems and overflows within the catchment upstream of Whitehouse WwTW and in Belfast Lough.



04

Flood risk in the Hightown area of Glengormley and Collinward area of Carnmoney.

CATCHMENT OBJECTIVES

- Reduce the number of people / properties and infrastructure at risk of flooding in the Carnmoney Industrial Estate, Shore Road, Mallusk, Ballyhenry, Monkstown, Whiteabbey, Hightown and Collinward areas.
- Contribute to achieving Good Ecological Status in the Three Mile Water and Ballymartin Water and downstream in Inner Belfast Lough.
- Facilitate sustainable development in the sub-catchment area.

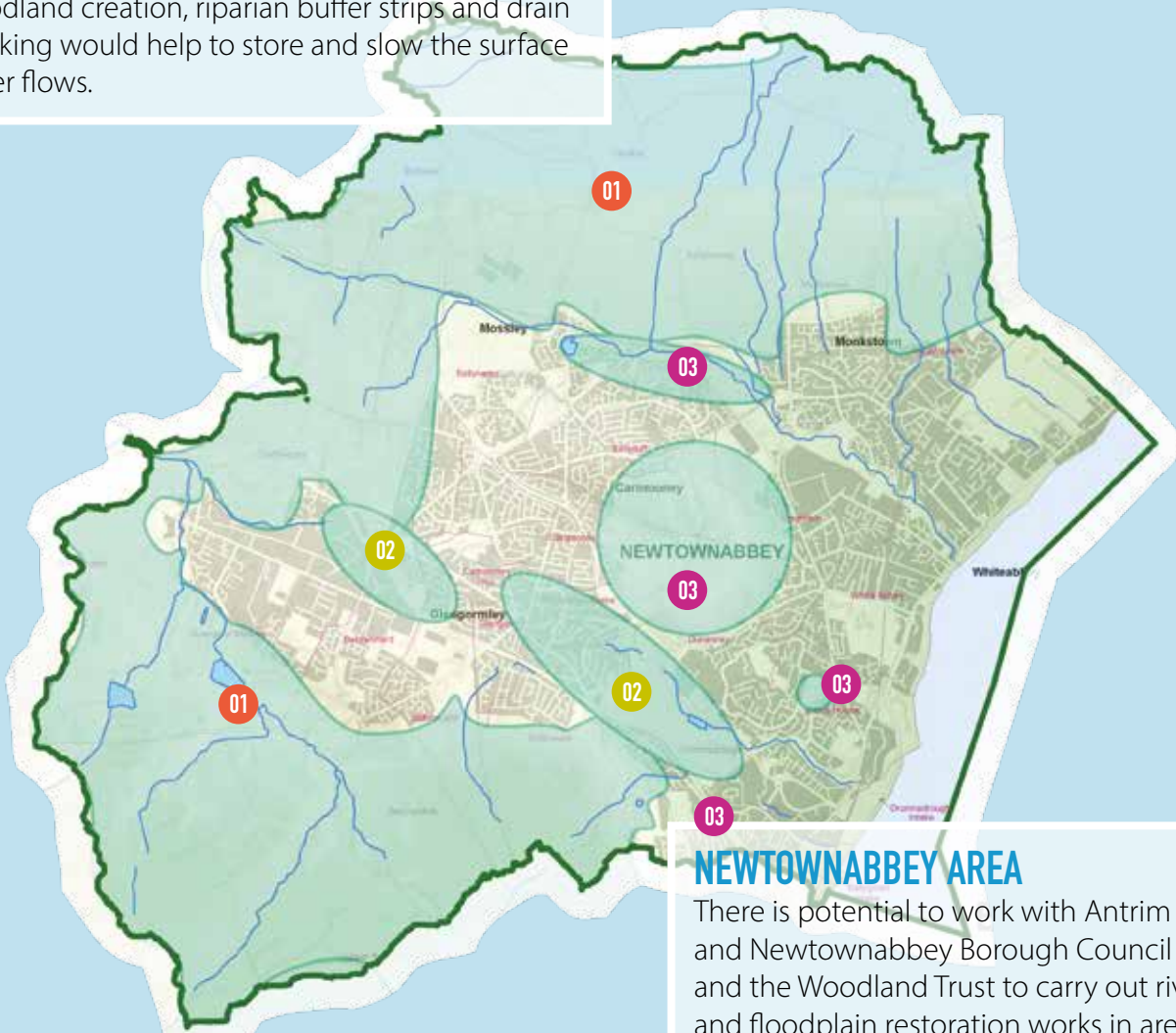
01

CAVEHILL COUNTRY PARK / BELFAST CASTLE / BELFAST ZOO / CARMONEY HILL / COLLINWARD / SQUIRES HILL / MOSSLEY

This study area is surrounded by hills and there is potential to work with Belfast Hills Partnership, BCC and Antrim and Newtownabbey Borough Council to manage the uppermost parts of the river catchments to reduce surface water run-off and to increase water attenuation and retention. Woodland creation, riparian buffer strips and drain blocking would help to store and slow the surface water flows.

SEWERAGE NETWORK IMPROVEMENTS

Improvements in the Whitehouse / Mallusk area include increasing capacity, CSO screening and the provision of additional storage. Works will be dependent on the completion of further appraisals.



GLENGORMLEY AREA

Potential to build on any upper catchment management works in the surrounding hills by working in partnership with Antrim and Newtownabbey Borough Council to use existing green space like NI Water’s land at Valley Leisure Centre, to help attenuate storm water. These works could be tied in with the council’s existing development plans.

NEWTOWNABBEY AREA

There is potential to work with Antrim and Newtownabbey Borough Council and the Woodland Trust to carry out river and floodplain restoration works in areas like Three Mile Water Conservation Park, Monkstown Wood and Glen Park. There is also the potential to include stormwater attenuation within the site of the old UJJ campus as part of any future re-development plans. Opportunities should be taken to make full use of existing features like the former Mill Pond at Mossley Mill beside Antrim and Newtownabbey Borough Council offices

GREENISLAND CATCHMENT

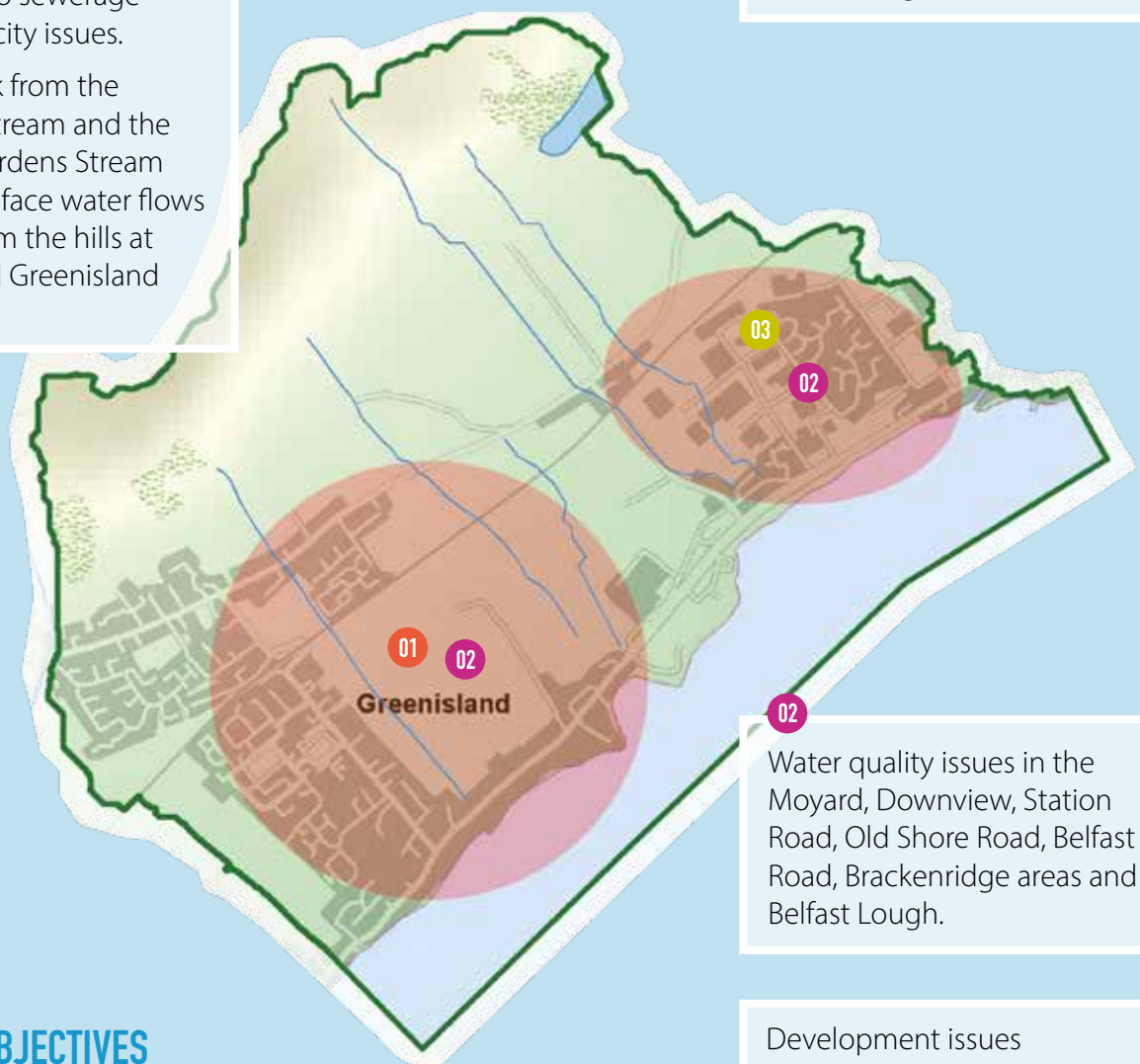
01

Flood risk in Moyard, Downview and Station Road areas as a result of surface water and river flood risk all contributing to sewerage network capacity issues.

River flood risk from the Greenisland Stream and the Downview Gardens Stream along with surface water flows generated from the hills at Knockagh and Greenisland Golf Club.

03

Flood risk in Old Shore Road, Belfast Road and Brackenridge Areas.



02

Water quality issues in the Moyard, Downview, Station Road, Old Shore Road, Belfast Road, Brackenridge areas and Belfast Lough.

Development issues throughout the area due to sewerage network capacity constraints.

CATCHMENT OBJECTIVES

- Reduce the number of people / properties at risk of flooding within and downstream of the Moyard, Downview, Station Road, Old Shore Road, Belfast Road and Brackenridge areas.
- Contribute to achieving Good Ecological Status downstream in Inner Belfast Lough.
- Facilitate sustainable development in the sub-catchment area.

01

KNOCKAGH, TROOPERSLANE:

This study area is surrounded by hills and there is potential to manage the uppermost parts of the river catchments to reduce surface water run-off and to increase water attenuation and retention. Woodland creation, riparian buffer strips and drain blocking would help to store and slow surface water flows. Given that some of the surrounding hillside is in private ownership, any potential works may need to be carried out in partnership with DAERA and linked to an Agri-Environmental scheme.

03

SEWERAGE NETWORK IMPROVEMENTS

Improvements in the Greenisland area include increasing capacity, CSO screening and the provision of additional storage. Works will be dependent on the completion of further appraisals.



GREENISLAND CATCHMENT

There is potential to work with Mid and East Antrim Borough Council and DfI Rivers on a number of areas within this catchment to help attenuate flows and build on any upper catchment management works that are developed.

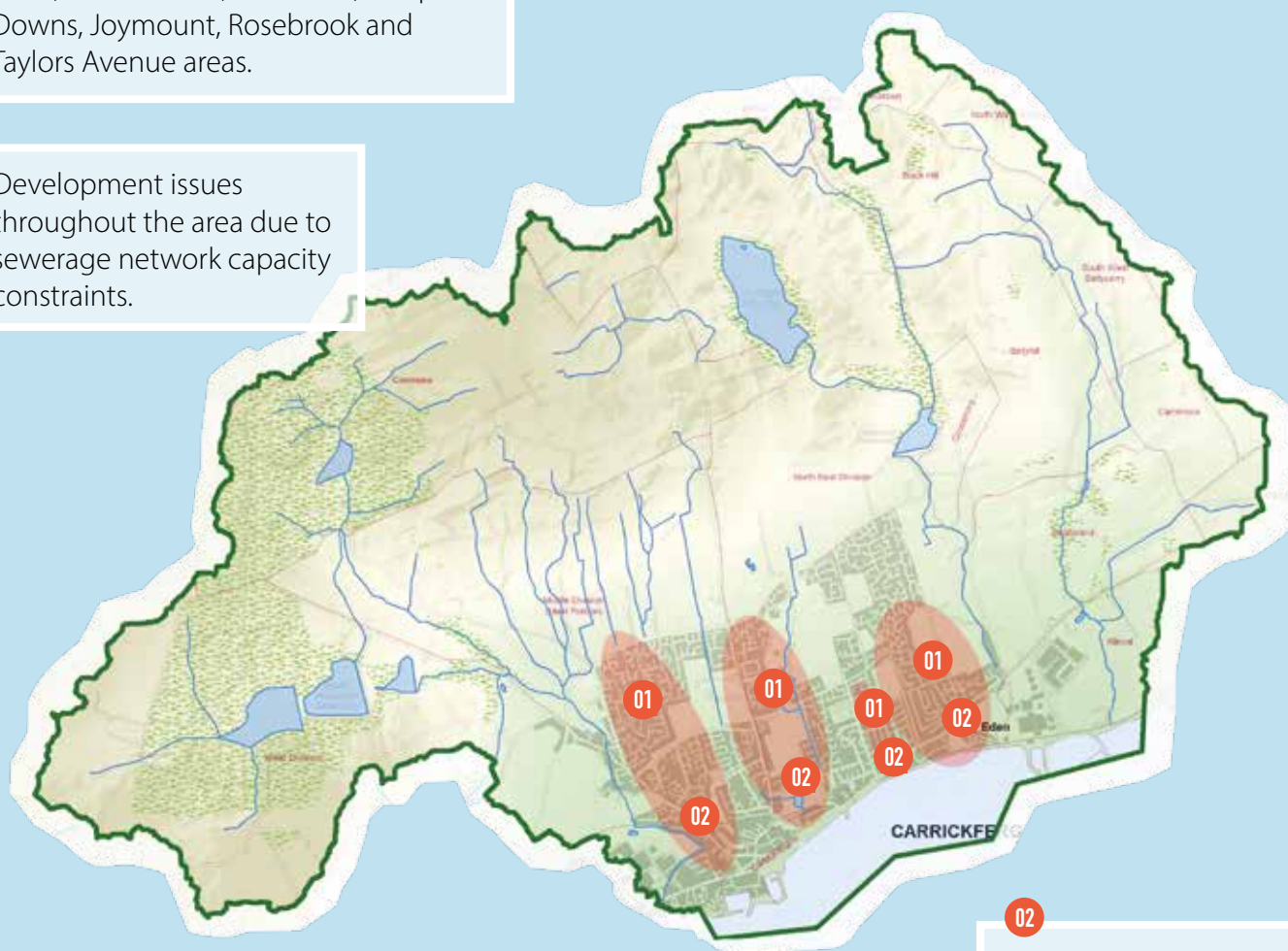
Potential opportunities include attenuation in Knockleigh Walk parkland as well as instream structures along the Ashbourne Stream, Trooperslane Stream and Greenisland Golf Course streams. These could help improve and link to Mid and East Antrim Borough Council's Greenisland Greenway.

CARRICKFERGUS CATCHMENT

01

Flood risk in the Castle Road, Downshire Road, Cloughlands, Lennox, Woodburn Road, Meadow Hill, Windslow, Prospect Downs, Joymount, Rosebrook and Taylors Avenue areas.

Development issues throughout the area due to sewerage network capacity constraints.



02

Water quality issues in local watercourses and Belfast Lough linked to unsatisfactory CSOs.

CATCHMENT OBJECTIVES

- Reduce the number of people / properties at risk of flooding within and downstream of the Joymount, Rosebrook, Taylors Avenue, Castle Road, Downshire Road, Cloughlands, Lennox, Woodburn Road, Meadowhill, Windslow and Prospect Downs areas.
- Contribute to achieving Good Ecological Status in the Kilroot River and Good Ecological Potential in the Woodburn River, the Copeland Water and in Lough Mourne. Also Good Ecological Status downstream in Outer Belfast Lough and Good Ecological Potential downstream in Inner Belfast Lough.
- Facilitate sustainable development in the sub-catchment area.

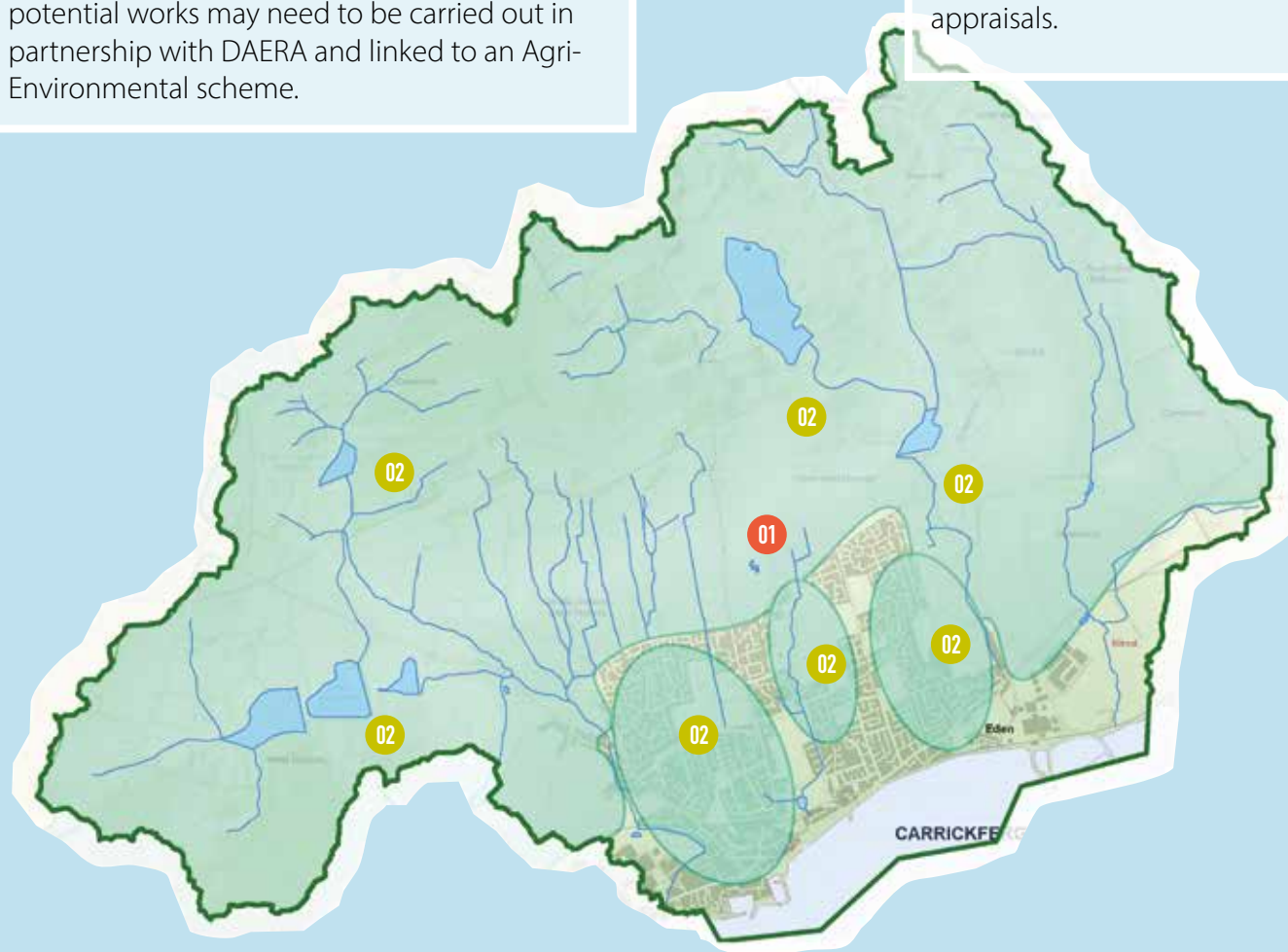
01

WOODBURN TO LOUGH MOURNE

This study area is surrounded by hills and there is potential to manage the uppermost parts of the river catchments to reduce surface water run-off and to increase water attenuation and retention. Woodland creation, riparian buffer strips and drain blocking would help to store and slow the surface water flows. Given that some of the surrounding hillside is in private ownership, any potential works may need to be carried out in partnership with DAERA and linked to an Agri-Environmental scheme.

SEWERAGE NETWORK IMPROVEMENTS

Improvements in the Carrickfergus area include increasing capacity, CSO screening and the provision of additional storage. Works will be dependent on the completion of further appraisals.



CARRICKFERGUS CATCHMENT

Carrickfergus is classified as one of the 12 Areas of Potential Significant Flood Risk (APSF) identified in the 2018 Flood Risk Assessment. Working in partnership with a number of organisations, like Mid and East Antrim Borough Council, the Woodlands Trust, DfI Rivers and NI Water, there is potential for river and floodplain restoration works to help store storm water in existing green spaces. These include NI Water’s reservoirs at South and North Woodburn, Lough Mourne and Copeland Reservoir, Mid and East Antrim Borough Council parkland at Woodburn Playing Fields, land near Prospect Steam and Salthill Park.

Potential for further extension to this by including land at Ulidia Integrated College as well as road alterations in the Hawthorn Avenue area to transfer excess surface water into Salthill Park.

NORTH FORESHORE STUDY AREA

OVERVIEW OF OPPORTUNITY BASED SOLUTIONS

01

Upper Catchment Management/Natural Flood Management.

02

Carrickfergus Catchment-
Natural Flood Management,
River Restoration & Storage

03

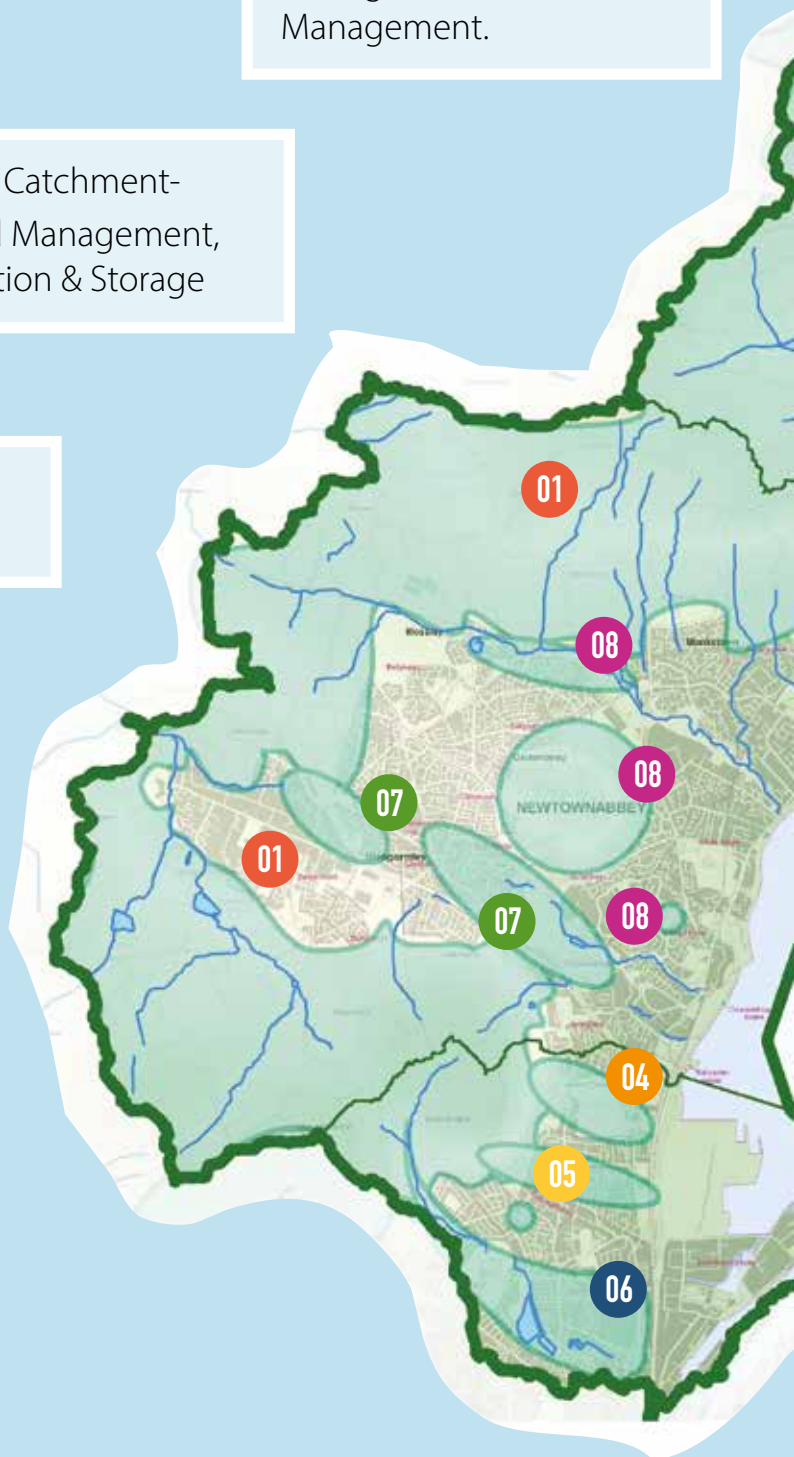
Greenisland Catchment-
River Restoration & Storage

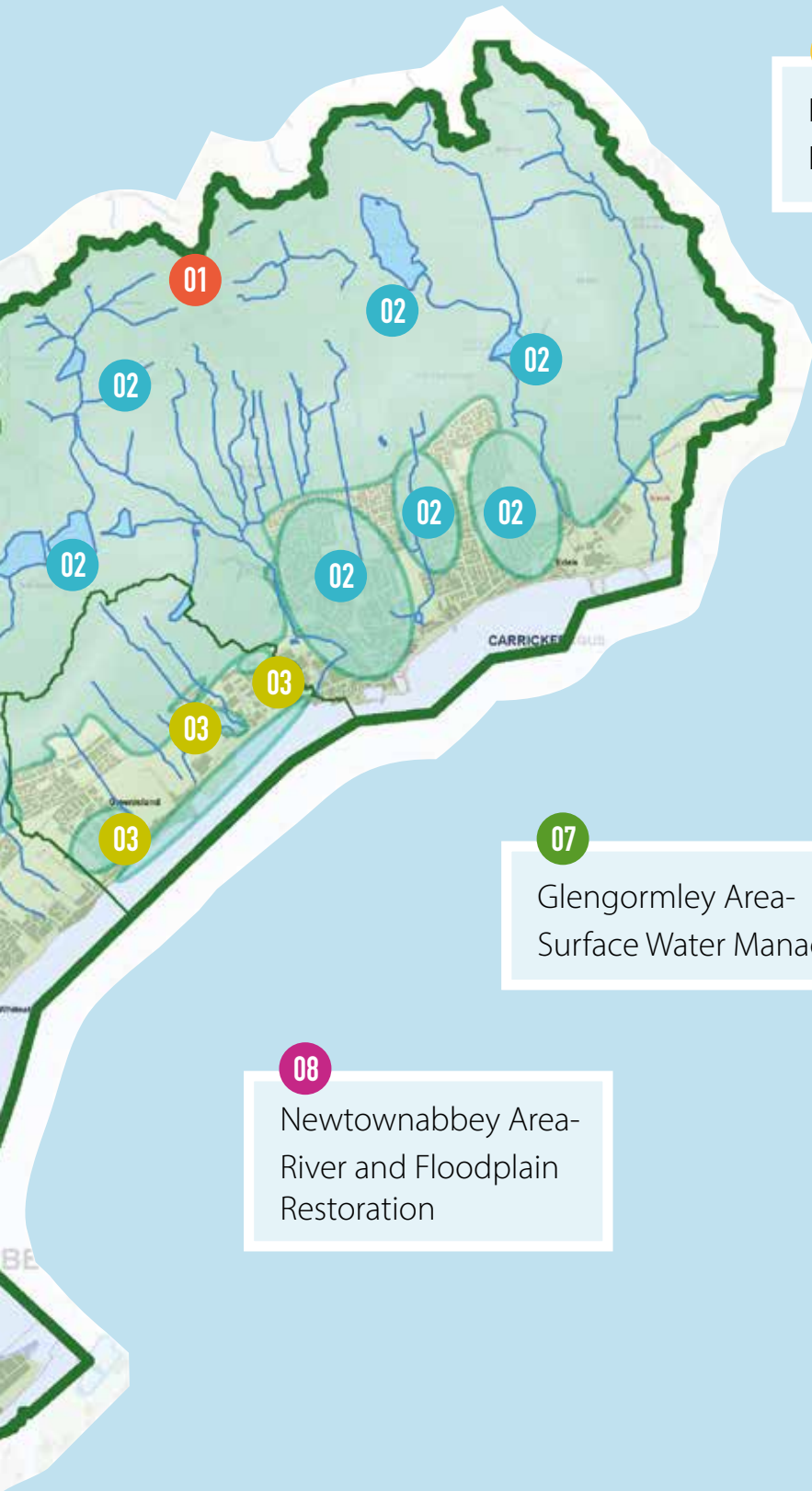
04

Fortwilliam Stream Corridor-
River Restoration & Storage

This map provides an overview of the opportunity based solutions identified from all four sub-catchments which will be taken forward for more detailed assessment as part of the delivery of the Plan.

Sewerage network improvements throughout the area including increased capacity, CSO screening and storage.





05

Premier Drive Stream Corridor -
River Restoration & Storage

06

Carr's Glen River Corridor-
River Restoration & Storage

07

Glengormley Area-
Surface Water Management / Storage

08

Newtownabbey Area-
River and Floodplain
Restoration

CHAPTER 10

INNER BELFAST LOUGH STUDY AREA–WASTEWATER TREATMENT SOLUTIONS

INTRODUCTION

- 10.1 As set out in Chapter 5, the Living With Water approach involves the development of catchment based solutions to address the drainage and wastewater problems across greater Belfast. This approach is focused on managing rain water more naturally through the catchment by controlling run-off, reducing peak flows in the drainage systems and providing areas for flood storage.
- 10.2 Chapters 7, 8 and 9 outline potential opportunities for integrated catchment based solutions which include a combination of both blue/green infrastructure and conventional hard engineered measures. However, no amount of catchment based solutions will remove the need for the efficient and effective treatment of the wastewater that we produce. This chapter identifies the pressures and issues across the six WwTW that discharge into Belfast Lough and includes potential opportunities for integrated catchment based solutions to meet the future wastewater treatment needs of greater Belfast. Figure 10.3 shows the location of the six WwTW.

PRESSURES AND ISSUES

- 10.3 The main pressures and issues identified by the Technical Working Group (TWG) are:
- Risk of out of sewer flooding in the networks upstream of all of the WwTW and coastal flooding at Whitehouse and Greenisland WwTW;
 - Water quality issues arising from unsatisfactory discharges from combined sewer overflows;

- The need to provide enhanced levels of final effluent treatment at WwTW, in line with regulatory standards;
- The need to extend sea outfalls at four WwTW in line with regulatory standards; and
- The need to increase the capacity at WwTW to meet current requirements and allow for future growth (as set out in Section 2, Belfast WwTW has no capacity to complete routine maintenance or cope with unexpected shocks. Significant capacity problems also exist at Kinnegar, Whitehouse, Greenisland and Carrickfergus WwTW).



Figure 10.3 – Location of WwTW in Belfast Lough

WASTEWATER TREATMENT OBJECTIVES

10.4 The main objectives identified by the TWG are:

- Reduce risk of coastal flooding impacting performance of Greenisland and Whitehouse WwTW;
- Reduce the number of people / properties at risk of internal out of sewer flooding across the six sewerage networks;
- Reduce the risk of external out of sewer flooding across the six sewerage networks;
- Facilitate sustainable development by increasing capacity within WwTW and sewerage networks to support new connections; and
- Contribute to water quality improvements and achieving Good Ecological Potential and Good Ecological Status in catchment watercourses, in Belfast Harbour and the Inner Lough.

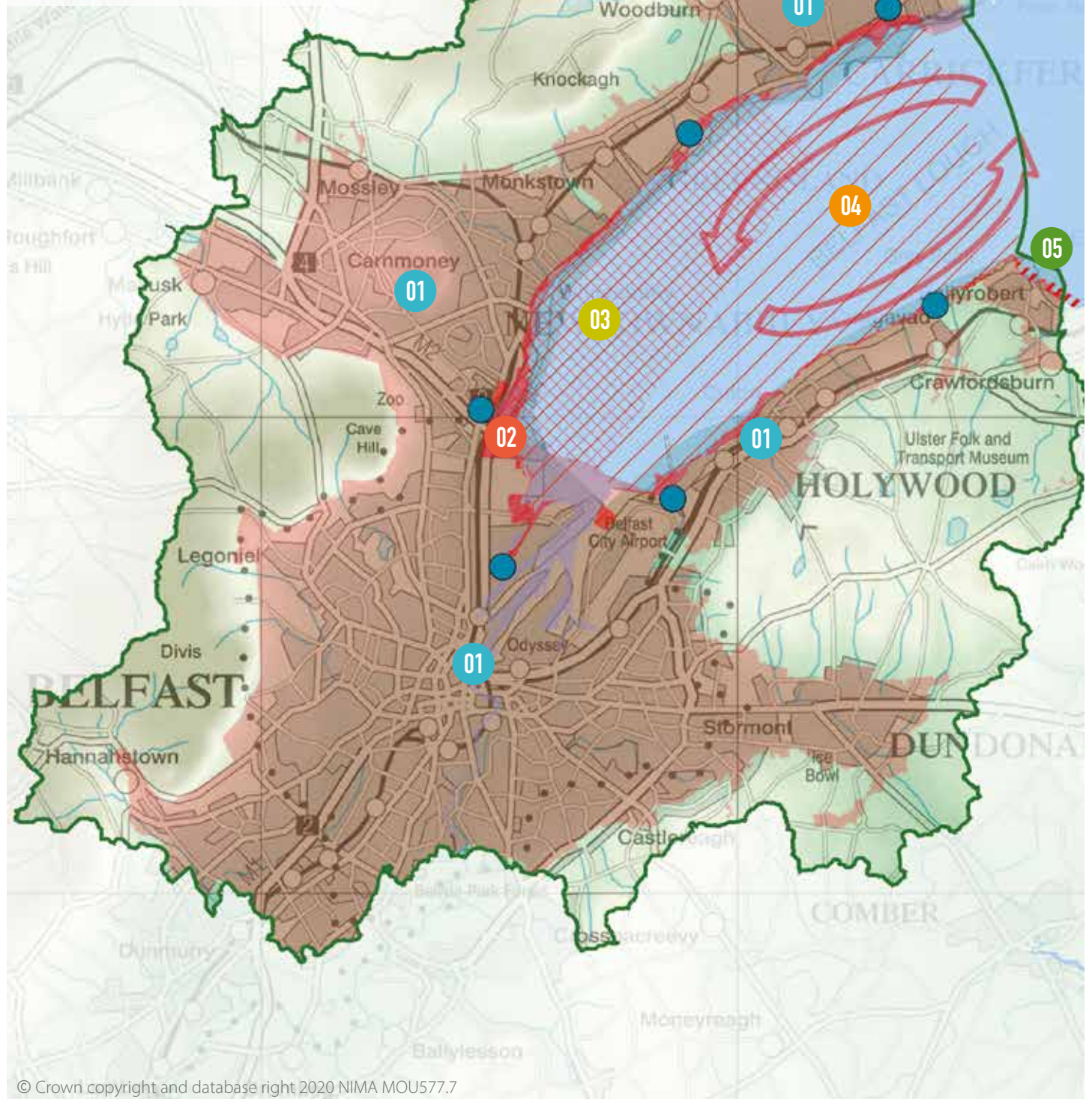
OPPORTUNITIES FOR CATCHMENT BASED SOLUTIONS

- 10.5 A major long term programme of sewerage network transfers and WwTW upgrades have been identified for the Plan. These improvements are outlined in this chapter and include providing combined wastewater storage both within the network and at WwTW, enhancing wastewater treatment capacity and standards. The improvements also include extending the sea outfalls of four WwTW to improve dilution and dispersion of treated effluent.
- 10.6 The scale of these works will be dependent on the delivery of the catchment based solutions identified in chapters 7, 8 and 9 and the amount of rain water removed from the sewerage networks. Progression is dependent on the successful outcome of public engagement / consultation, detailed appraisal and design work and securing the necessary funding and approvals (e.g. business case, planning).

WASTEWATER TREATMENT

PRESSURES AND ISSUES

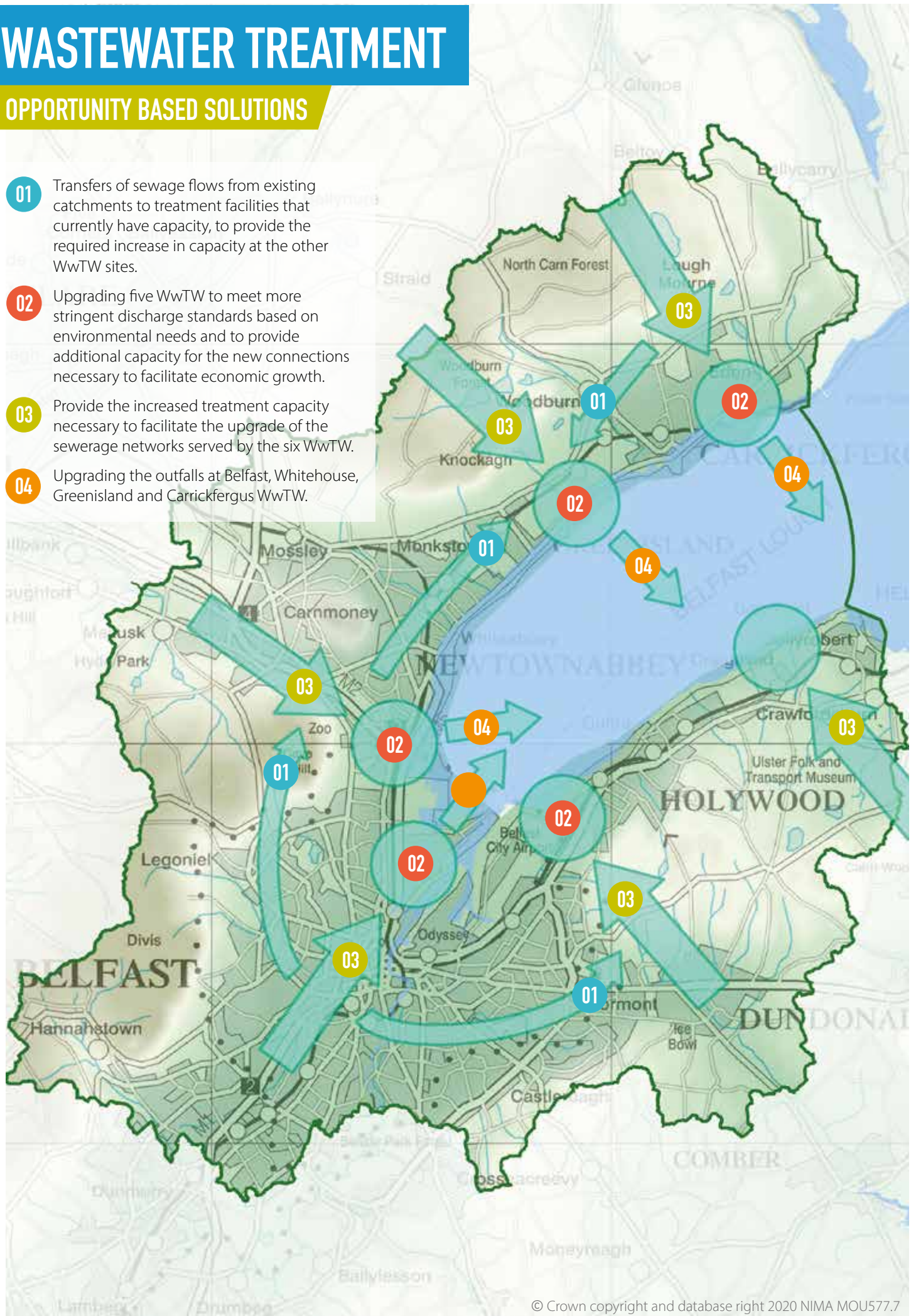
- 01 Sewerage network capacity issues throughout the Study Area that feed into the various WwTW.
- Environmental Designations (e.g. RAMSAR sites).
- 03 Designated Shellfish Waters.
- Water quality within Belfast Lough and counter clockwise gyre.
- Designated Bathing Waters.



WASTEWATER TREATMENT

OPPORTUNITY BASED SOLUTIONS

- 01** Transfers of sewage flows from existing catchments to treatment facilities that currently have capacity, to provide the required increase in capacity at the other WwTW sites.
- 02** Upgrading five WwTW to meet more stringent discharge standards based on environmental needs and to provide additional capacity for the new connections necessary to facilitate economic growth.
- 03** Provide the increased treatment capacity necessary to facilitate the upgrade of the sewerage networks served by the six WwTW.
- 04** Upgrading the outfalls at Belfast, Whitehouse, Greenisland and Carrickfergus WwTW.



CHAPTER 10

INNER BELFAST LOUGH STUDY AREA–WASTEWATER TREATMENT SOLUTIONS

WASTEWATER TREATMENT

OVERVIEW OF OPPORTUNITY BASED SOLUTIONS

10.7 A review has been completed of the wastewater treatment and collection proposals and these provide a blueprint to meet the strategic objectives of the Plan and provide multiple benefits for the community. An overview of the proposals which can be carried forward for more detailed assessment is provided in Table 10.7 below.

Table 10.7 – Wastewater Treatment Proposals

WwTW	Description
Whitehouse	An upgrade is required to cater for growth in the catchment which will see the WwTW cross certain thresholds that will necessitate a more stringent treatment standard. The envisaged proposals will see a number of sub-catchment transfers both to and from Whitehouse WwTW to help manage capacity constraints within the catchments along with the provision of an additional treatment stage and increased storage provision.
Belfast	It is proposed that the upgrade needed to meet the objectives detailed above will be taken forward in phases; the first of which is due to commence in 2020: <ul style="list-style-type: none">• Phase 0 will see the treatment capacity of the WwTW increased in the short term to permit new connections to the sewerage network, where there are no other constraints, until Phase 1 is operational.• Phase 1 will provide a further increase in capacity to cater for longer term growth projections and will allow the WwTW to meet enhanced environmental standards required to meet water quality objectives within Belfast Lough.• Phase 2 will include provision of an additional treatment stage to help meet water quality requirements specifically relating to aquaculture and shellfish along with the provision of additional storage to meet water quality requirements and any odour control measures required.
Greenisland	Greenisland WwTW has been identified as a site with land available allowing for a possible significant increase in treatment capacity. An opportunity exists to transfer some of the sewage loads from both Whitehouse WwTW and Carrickfergus WwTW catchments to Greenisland WwTW to free up capacity at both these facilities. A new treatment process is required to cater for the increased flow. As with the other sites, the WwTW will also require the provision of an additional treatment stage and increased storage provision.

WwTW	Description
Carrickfergus	Whilst there is expected to be no increase in treatment capacity required as a result of the catchment transfers, as with the other sites, the WwTW will require the provision of an additional treatment stage and increased storage provision.
Kinnegar	Due to the age of the existing facilities, current population growth projections and the proposals to transfer some wastewater flow to the works, the WwTW requires a major upgrade. The WwTW will also require the provision of an additional treatment stage and increased storage provision.
Seahill	No major upgrade is anticipated at Seahill with any future work being routine maintenance.
Sea Outfalls	<p>To better satisfy water quality objectives a new extended outfall is proposed for the treated wastewater discharging from Belfast WwTW. Under the existing proposals the current outfall will be retained and refurbished for discharge of storm water.</p> <p>Flows from Whitehouse WwTW currently discharge onto the shoreline and into the Shellfish Water Protected Area (SWPA). Two new outfalls are proposed: one for storm and one for final effluent. It is anticipated that the final effluent outfall will need to extend to the shipping channel beyond the SWPA.</p> <p>The outfall at Greenisland WwTW is undersized and causes flooding of the site during periods of intense rainfall. The proposal is to provide separate new storm and final effluent outfalls. Carrickfergus WwTW has two outfalls of different lengths which both discharge above mean low water at spring tide (MLWS) and are on the surface of the shore and seabed. These are to be replaced by new separate storm and final effluent outfalls which will be buried and discharge further into Belfast Lough.</p>

CHAPTER 10

INNER BELFAST LOUGH STUDY AREA–WASTEWATER TREATMENT SOLUTIONS

10.8 It is recognised that the timing of the sewerage network improvements and WwTW will need to be carefully managed to ensure that no downstream area is detrimentally affected by upstream improvements. For example, the capacity of the WwTW may need to be increased before sewerage networks are improved upstream to ensure the additional sewage loads can be safely treated.

10.9 The type and scale of solutions employed to deliver these improvements will also be informed by the ongoing integrated drainage and environmental modelling work (set out in Chapter 5) and delivery of the catchment based solutions set out in chapters 7, 8 and 9. This will require careful phasing of works to ensure solutions of optimum scale are delivered,

particularly downstream at the WwTW. For example, improvements to upstream blue/green infrastructure, such as rivers, could enable storm separation to be completed removing rain water from the combined sewerage network. This not only potentially reduces the scale of the sewerage network upgrades but also impacts on the scale of the improvements needed at the WwTW. Chapter 12 provides more information on the phasing of works.



CHAPTER 11

ENVIRONMENTAL ASSESSMENT

STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA)

- 11.1 The SEA Directive (2001/42/EC) has been implemented⁹ 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.
- 11.2 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.
- 11.3 An SEA Screening Report was completed in March 2017 and sent to the Department of Agriculture, Environment and Rural Affairs (DAERA), as the statutory consultee for SEA in Northern Ireland. It was concluded that the Plan would require SEA.
- 11.4 SEA Scoping and scoping consultations were undertaken between April 2017 and May 2019. Due to minor amendments to the scope of the Plan, DAERA were consulted again in March 2020.
- 11.5 An integrated environmental assessment of options took place as part of the Plan assessment process. An HRA was also undertaken as part of the environmental assessment process and the outcomes were incorporated into the SEA Environmental Report.

HABITATS REGULATIONS ASSESSMENT (HRA)

- 11.6 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. 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.



- 11.7 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)¹⁰.

9 Environmental Assessment of Plans and Programmes Regulations (Northern Ireland) 2004 (S.R. 280/2004)
10 Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995

INTEGRATION OF ENVIRONMENTAL ASSESSMENT

11.8 The environmental assessment process has formed an integral part of the development and assessment of this Plan. The key stages when environmental assessment was included in development of this Plan are outlined in Figure 11.8. Having the environmental assessments integrated with the Plan assessment process was to encourage the

selection of the most sustainable solutions for long term drainage and wastewater management.

11.9 The SEA objectives were integrated within the Plan development Multi Criteria Analysis (MCA) to promote the selection of sustainable integrated water management solutions. These SEA objectives are given in Table 11.9. The sub-objectives highlighted in green are within the scoring criteria used within objectives of the MCA.



Figure 11.8 - Environmental Assessment Stages of Plan

CHAPTER 11

ENVIRONMENTAL ASSESSMENT

Table 11.9 - SEA Objectives

Criteria	Objective	Sub-Objective	Indicators	Target
Biodiversity, Flora & Fauna	1 Support International and National Environmental Designations for flora and fauna and avoid damage to natural habitats and species.	A Preserve, protect, maintain and where possible enhance internationally protected species and their key habitats, through integrated water management.	Status, condition, area and number of International and European sites and species. SACs, SPAs, Ramsar sites	Potential to maintain or enhance internationally protected species and their key habitats, in line with conservation objectives.
		B Preserve, protect, maintain and where possible enhance national and local nature conservation sites and protected species, or other known species of conservation concern, through integrated water management.	Status, condition, area and number of ASSI, SLNCL, NRs, LNRs and local conservation designations and their species.	Potential to maintain or enhance national and local conservation sites and their species, in line with conservation objectives.
Population & Human Health	2 Support sustainable economic growth and social inclusion in Belfast.	A Support the growth of the Belfast Economy, through integrated water management.	Potential cost/contribution to the Belfast economy. Benefit-cost ratio of proposals. Natural environment capital.	Potential to contribute to the Belfast economy, generating income, providing employment, with multi-benefit integrated water management schemes.

Table 11.9 - SEA Objectives

Criteria	Objective	Sub-Objective	Indicators	Target
Population & Human Health	2 Support sustainable economic growth and social inclusion in Belfast.	B Support social inclusion through the provision of amenity / recreation facilities, through integrated water management.	Incorporation of amenity and recreation benefits (e.g. parks, bathing waters, landscape visual improvements) into planned development. Provision of amenity / recreational areas in socially sensitive areas (e.g. NRAs and Peace Lines).	Potential to provide amenity and recreational areas, with multi-benefit integrated water management schemes.
Geology, Soils and Land Use	3 Minimise damage or loss of soil resources and land use.	A Minimise damage to the function and quality of the soil resource in the study area and ensure compatibility with existing or proposed land uses in development and operation of water management infrastructure.	Area and zoning of land. Loss or damage to sensitive soils and land uses e.g. peatlands and productive agricultural land.	Minimal potential for disruption to and loss of sensitive soil and land resources, with potential for enhancement of land uses.

CHAPTER 11

ENVIRONMENTAL

ASSESSMENT

Table 11.9 - SEA Objectives

Criteria	Objective	Sub-Objective	Indicators	Target
Water	4 Support the Water Framework Directive (WFD) and the Floods Directive.	A Support the WFD by contributing to improvements in water quality and water status through integrated water management.	Status of surface and groundwater's hydromorphology. NI Water data – CSO spills & UIDs.	No deterioration in water body status and potential to contribute to the achievement of water body objectives under the WFD.
		B Support the Floods Directive by contributing to flood risk management through integrated water management.	Dfl Rivers flood extents and receptor data – Fluvial, Coastal, Pluvial. NI Water Data – DG5.	No increase in flood risk and potential to contribute towards managing flood risk.
Air	5 Minimise impacts on air quality.	A Minimise impacts on air quality in the development and operation of water management infrastructure.	Estimated construction and operation emissions. Noise and odour complaints.	No increase in and potential to reduce emissions from construction and operation of water management infrastructure.
Climatic Factors	6 Support sustainable development that is adaptable to climatic change.	A Development of water management infrastructure that is adaptable to potential future climatic change and can be safely exceeded.	Dfl Rivers climate change flood extents and receptor data – Fluvial, Coastal, Pluvial. Potential for the development of water management infrastructure that can be designed to be safely exceeded.	Potential to provide adaptability to future climatic change and safe exceedance with water management infrastructure.

Table 11.9 - SEA Objectives

Criteria	Objective	Sub-Objective	Indicators	Target
Material Assets & Infrastructure	7 Support sustainable growth of material assets and infrastructure in Belfast.	A Support the sustainable growth of Belfast, through integrated water management.	Population / infrastructure vulnerable to / at risk of flooding. River / network capacity.	Potential to enable development in Belfast through provision of river and drainage network capacity and management of flood risk to infrastructure.
Cultural, Architectural & Archaeological Heritage	8 Conserve, protect, and where possible enhance the built, archaeological and cultural heritage.	A Conserve, protect, and where possible enhance the built, archaeological and cultural heritage.	Potential for impacts on known archaeological or architectural heritage features or their settings. Potential for heritage features/ trails to be incorporated into water management solutions. Potential for heritage features to be restored due to Plan activities.	Potential to protect, and where possible enhance, heritage features in development and operation of multi-benefit water management infrastructure.

CHAPTER 11 ENVIRONMENTAL ASSESSMENT

Table 11.9 - SEA Objectives

Criteria	Objective	Sub-Objective	Indicators	Target
Landscape & Visual Amenity	9 Minimise impacts on landscape and townscape.	A Minimise impacts on landscape and townscape.	Landscape sensitivity to infrastructure development. Potential for impacts on visually sensitive areas (e.g. LCAs, country parks). Provision of amenity / recreational areas in socially sensitive areas (e.g. NRAs and Peace Lines).	Potential to protect and, where possible, enhance landscape and visual amenities with the development and operation of multi-benefit water management infrastructure.

11.10 As part of the Plan assessment process, all available options to the Plan were subject to environmental screening as part of the initial short listing process and then environmentally assessed via the MCA. Within the SEA process the preferred set of options for each Study Area have been fully assessed. Any likely short, medium and long term effects have been described, as well as how significant these effects are likely to be, and whether they are positive or negative. The assessment of potential impacts is based on comparison with the SEA objectives. The potential for the following effects and how they relate to each other was also assessed:

- secondary effects (those that happen because of primary effects);
- cumulative effects (an increased impact from more than one effect combined);

- synergistic effects (two or more effects having a greater overall effect than expected); and
- temporary and permanent effects.

The same method was used to assess the 'Do Nothing' scenario, or what effects are expected if the Plan does not go ahead.

SEA SUMMARY CONCLUSIONS

11.11 The full outcomes of the environmental assessments of the Do Nothing Scenario and the preferred options for all four Study Areas can be found in Section 8 of the SEA Environmental Report. The outcomes of the MCAs for all options considered in each Study Area can be found in Appendix F of the SEA Environmental Report.

11.12 Generally the assessment of the preferred options found there to be the potential for construction phase disturbances on biodiversity, flora and fauna, people, water quality, air quality, material assets and infrastructure, cultural heritage features and landscape and visual amenity within each of the Study Areas.

11.13 In the medium to long term, there is potential for positive impacts on people, soils, landscape, water, climatic factors, air, material assets and infrastructure, heritage, biodiversity and flora and fauna in the Blackstaff, North Foreshore and Connswater and Lagan Study Areas. These positive impacts particularly arise from multi-benefit schemes, i.e. ones that can protect people, features and assets from flood risk, which can also be adjusted to protect against the likely future risks from climate change. The options that can keep and store water have the potential to create new amenity areas, new habitats and improve water quality, while also providing extra capacity in the water network that is needed so that new properties and infrastructure can be built to support growth.

11.14 In the Belfast Lough Study Area, positive impacts are expected for material assets, which could be significant in the long term. This comes from proposed upgrades to the WwTW, which can lead to a greater volume of wastewater that can be collected and treated to a higher standard, supporting the planned population growth of Belfast. There is also potential for positive impacts on biodiversity, flora and fauna, water quality, air quality and climate in the medium to long term, following the planned WwTW upgrades. Water quality and status of the coastal waters in Belfast Lough, as well as the Shellfish Water Protected Area, are expected to improve, supporting the objectives of the Water Framework Directive.

This should lead to improvements in the condition of habitats in the International and National protected sites in Belfast Lough. Upgrading the WwTW is expected to increase the volume of wastewater and storm water that can be treated, making them more adaptable to future climate change effects.

11.15 The assessment process has taken the assumption that the LWWP approach will be followed during implementation of the Plan, i.e. that the first step will be to look at the wider catchment and possible blue/green solutions rather than hard engineered infrastructure, with potential to provide the benefits discussed above. Should this approach not be followed, it would not be in line with the Plan objectives and the outcomes are likely to be closer to those discussed in the 'Do Nothing' scenario.

HRA SUMMARY CONCLUSIONS

11.16 The HRA considered three broad impact themes and focused on the following possible likely significant effects:

- The possibility of likely significant habitat loss effects cannot 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 these sites.
- The possibility of likely significant Water Quality and Habitat Deterioration effects cannot 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.

- The possibility of likely significant Disturbance and Displacement effects cannot 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.

11.17 Having conducted further investigation and analysis it was concluded in the HRA that implementation of the Plan will not adversely affect the integrity of any European site.

MITIGATION

11.18 SEA and HRA mitigation measures have been recommended and provided in Section 9.1 of the SEA Environmental Report where there is a risk of potential negative impacts from developing or implementing the Plan. These mitigation measures aim to prevent, reduce and as fully as possible offset any significant adverse effects on the environment due to the implementation of the preferred options within the Plan.

11.19 The overarching potential negative impacts associated with the Plan are related to the risk of failure to follow the integrated process and fully achieve the LWWP objectives. It is a vision of the LWWP to develop a Plan for Belfast in order to protect against flood risk, enhance the environment and support economic growth, in accordance with the principles set out in the Long Term Water Strategy.

11.20 The current approach (i.e. the Do Nothing Scenario) for water management has seen the majority of investment aimed at hard engineered infrastructure. The LWWP promotes a more integrated and sustainable approach to water management through the

implementation of blue/green infrastructure as a primary solution for water management and hard engineered infrastructure as a latter stage, where necessary. In order to mitigate against the potential risk of failure to fully meet the LWWP objectives, it is imperative that blue/green solutions are considered in the first instance, where applicable, before or in combination with hard engineered infrastructure. In the absence of undertaking these catchment based solutions, in line with LWWP objectives, there is a risk that the drainage and wastewater management options will be undertaken in a non-integrated way, i.e. the Do Nothing Scenario.

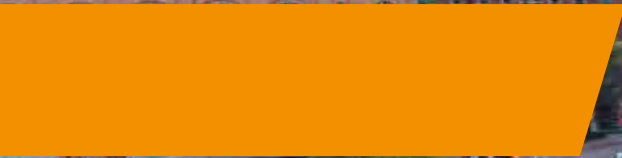
11.21 This mitigation will be fully taken into consideration and utilised, where appropriate, at the next stages of planning for the proposed integrated drainage and wastewater management schemes and projects that come from the Plan.

MONITORING

11.22 A recommended environmental monitoring programme is provided in Section 9.2 of the SEA Environmental Report. This wider environmental monitoring will be undertaken before the development stage of the next cycle of the Plan. 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.

SECTION 3 SYNOPSIS

- The greater Belfast area was divided into four separate Study Areas based on the natural drainage of the area and the wastewater network which sometimes is pumped against gravity.
- Each area was assessed by a Technical Working Group made up of representatives from DfI Roads and Rivers, NI Water, NIEA and other key stakeholders including the relevant Councils and Belfast Hills Partnership.
- These groups helped identify the strategic drainage pressures and issues within the four Study Areas along with potential opportunities such as existing green spaces that could be used to help control the flow of water or planned capital schemes that could be modified to incorporate integrated drainage.
- A series of potential integrated drainage proposals were then developed for the four areas focussed on achieving the overarching objectives of Protect, Enhance and Grow which fell into four categories.
 - (i) Policy Measures - New policies and procedures to encourage greener drainage solutions and a collaborative approach to drainage and wastewater management.
 - (ii) Catchment based & Blue/Green Infrastructure Measures - Sustainable drainage systems and river restoration works that are aimed at managing water on the surface and, where possible, at source. Storing and attenuating surface water and building storage within the river network will allow storm separation to be carried out within the sewerage network and ultimately reduce the amount of water needing to be treated at the Wastewater Treatment Works.
 - (iii) Hard Engineered Drainage & Flood Alleviation Measures - Sewerage network improvements and flood defences that are needed to complement any catchment based and blue/green solutions. In some circumstances hard engineered solutions may be the only viable option that will address the objectives identified within a catchment.
 - (iv) Upgrades to Wastewater Treatment Works - No amount of catchment based and blue/green solutions will remove the need for the efficient treatment of the wastewater that we produce. Upgrades to WwTW within the Plan area are needed in terms of the volume of wastewater they can treat and the standard to which it is treated.
- Although all of these proposals have been subjected to initial high-level feasibility studies and environmental assessment and some have been progressed to outline design, many are still at conceptual stage.
- Progression to a programme of actual schemes on the ground is dependent on the successful outcome of further public engagement / consultation, detailed appraisal and design work and securing the necessary funding and approvals.
- These short and longer term proposals do however form the blueprint for integrated water management within the study area that can help to meet the strategic objectives and provide multiple benefits for the community.
- SEA and HRA mitigation measures have been recommended where there is a risk of potential negative impacts from developing or implementing the Plan.



THE DELIVERY FRAMEWORK





CHAPTER 12

THE WORK PROGRAMME

OVERVIEW OF PROGRAMME

- 12.1 Living With Water in Belfast is a long term plan that promotes partnership working to develop and deliver integrated sustainable solutions for the benefit of society. Figure 12.1 below sets out the strategic programme for implementation of the Plan over the next 12 years.
- 12.2 Since 2015, stakeholders have been working together to understand common risks, the scale of interdependencies between the various types of drainage and wastewater systems and to identify opportunities for

integrated sustainable solutions. Innovative modelling and planning approaches have been initiated and these will continue to progress over the Plan period alongside public engagement and detailed design work, to develop a programme of capital improvements. The timing and pace of implementation of the Plan will also be dependent on securing the necessary funding and approvals.

- 12.3 This chapter outlines the programme of work that is needed to progress these proposals from concept through to delivery.

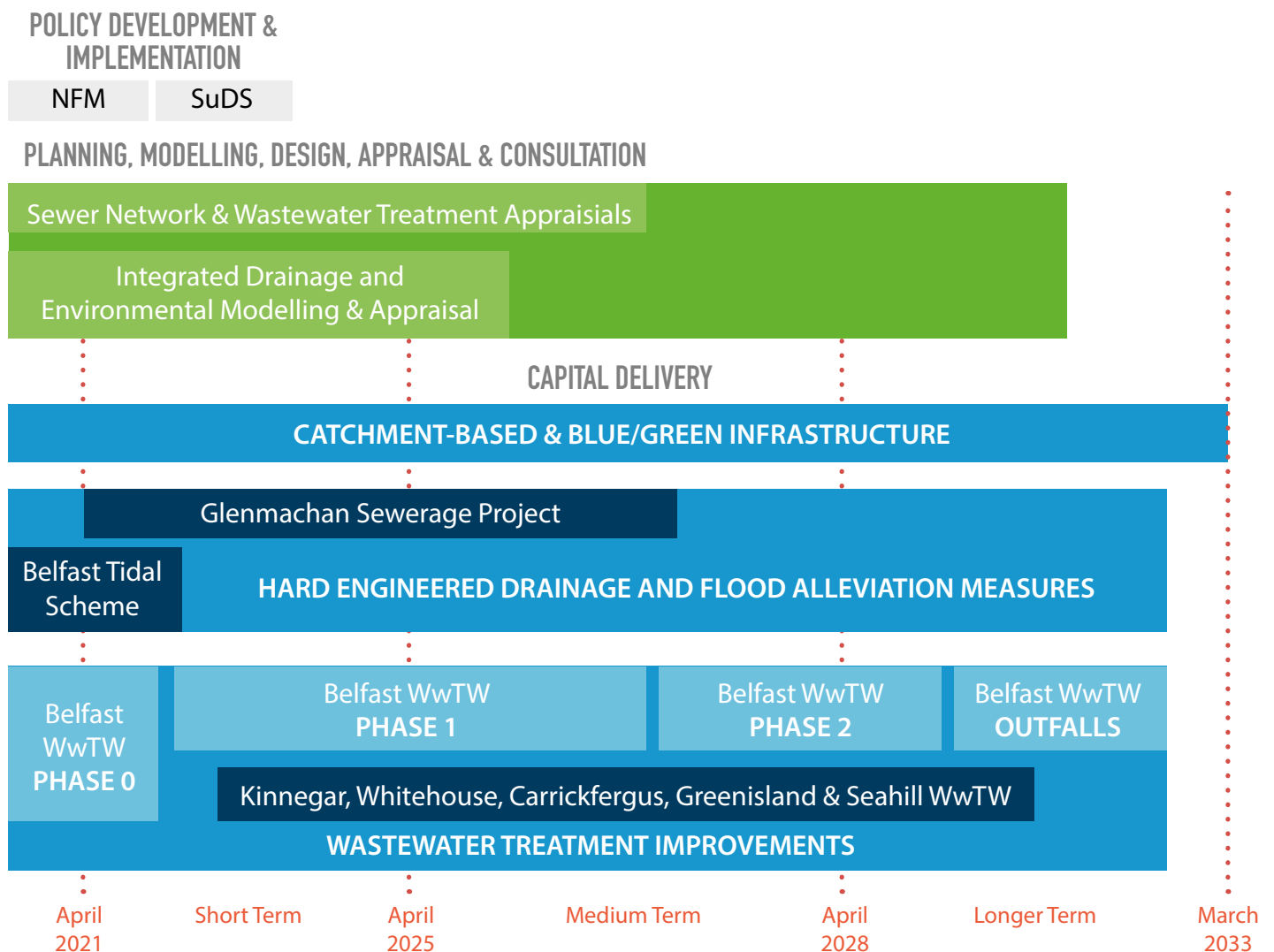
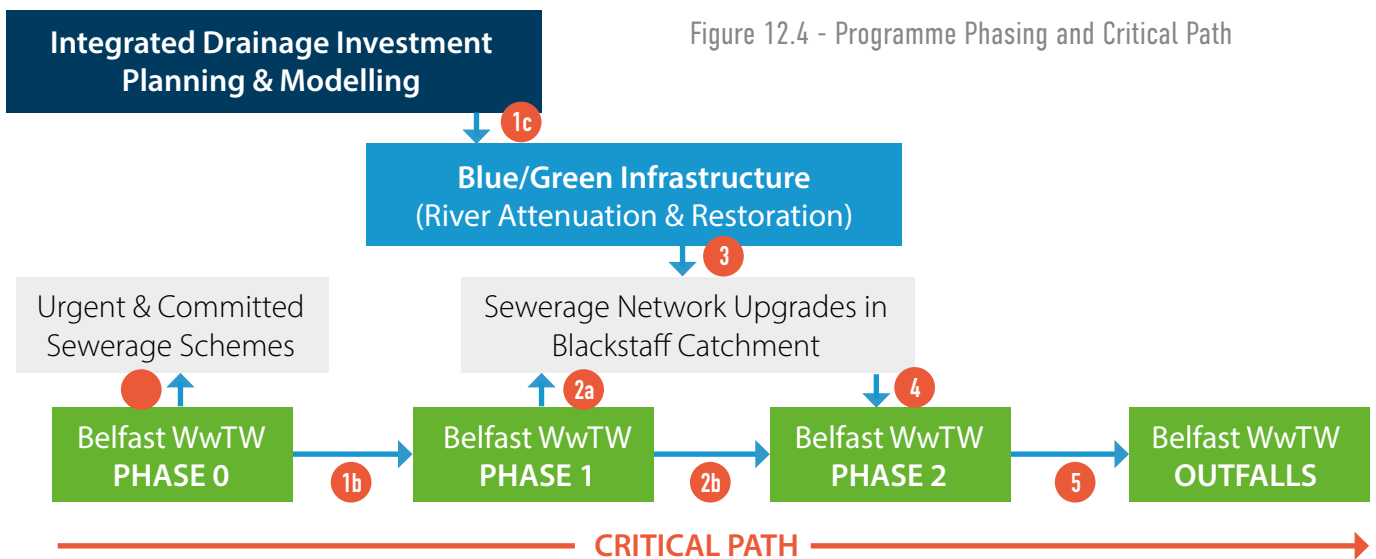


Figure 12.1 - Strategic Programme

PHASING OF PROGRAMME (CRITICAL PATH)

12.4 The integrated nature of drainage and wastewater systems, and delivery of sustainable integrated solutions, necessitates careful phasing of capital improvements such that no part of the system is detrimentally affected, either in the short or the long term. This is known as the 'critical path' and is why the programme must be delivered in a series of multiple phases. For example, the Sicily Park sewerage upgrades

cannot be completed until the proposed Boucher Road Sewerage Tunnel extension has been completed to provide the necessary additional capacity downstream. Figure 12.4 below provides an overview of the programme phasing and critical path needed between the planning and modelling work, delivery of blue/green infrastructure, sewerage improvements and upgrades to Belfast WwTW. This phasing approach has been used to develop the short, medium and long term programmes outlined in the following paragraphs.



- 1a/1b/1c** Interim works to provide additional treatment capacity at Belfast WwTW must be completed to facilitate approved development and urgent sewerage schemes (1a) and provide time for the full upgrade of the facilities to be completed (1b). Integrated drainage investment planning and modelling must be completed to inform delivery of the blue/green infrastructure (1c).
- 2a/2b** Belfast WwTW Phase 1 will provide additional treatment capacity to meet current sewage load and future growth and must be completed in advance of sewerage network improvements which will increase sewage load (less spills means more sewage load carried through to the treatment works). Belfast WwTW Phase 1 must also be completed in advance of Phase 2 which will provide enhanced treatment processes and increased storm storage.
- 3** Blue/green infrastructure improvements such as river floodplain attenuation must be completed before any storm separation of the combined sewer network can be carried out, which will impact on the scale of the sewerage network improvements.
- 4** Storm separation of the combined sewer network must be completed before required hydraulic capacity of Belfast WwTW can be determined and the necessary upgrades constructed.
- 5** Hydraulic and sewage capacity of WwTW must be upgraded before the design of the outfall pipe can be finalised and construction can begin.

CHAPTER 12

THE WORK PROGRAMME

SHORT AND MEDIUM TERM PROGRAMME (2021/22-2026/27)

12.5 This covers the first 6 years of the programme, from April 2021 to March 2027. It also covers the 6 year PC21 investment period for water and sewerage services.

Delivery of Committed / Urgent Projects

12.6 The short term profile includes committed projects or schemes that have already commenced, or urgent works that must proceed, to either facilitate new development or address urgent pollution or flooding issues. These include:

- the Belfast Tidal Flood Alleviation Scheme;
- investment needed within the Whitehouse area to address unsatisfactory spills from sewer overflows impacting on the Shellfish Water at Belfast Lough;
- Belfast WwTW Phase 0, which is intended to provide an initial increase in capacity to permit positive responses to planning application consultations and trade effluent applications in those instances where WwTW capacity is the limiting factor (network capacity constraints may remain a limiting factor) until Phase 1 is operational; and
- Refurbishment of Stranmillis Weir and flood alleviation schemes along the Glenbrook River, at Riverdale Park East.

Development and Implementation of Policy Measures

12.7 The proposed policy measures set out in Chapter 6 will be developed and implemented during the early part of the programme. A number of these policy measures such as Sustainable Drainage Systems (SuDS) and Natural Flood Management (NFM) will need to be developed and implemented to facilitate delivery of the proposed blue/green infrastructure measures set out in Chapters 7 - 9.

Development & Delivery of Pilot Projects

- 12.8 Stakeholders are seeking to progress the following pilot projects to demonstrate how integrated blue/green infrastructure can provide NFM across a catchment. These projects include:
- Ballysillan Playing Fields – DfI is working with the Executive Office and BCC to examine the possibility of extending the river floodplain through the park as part of an Urban Villages Regeneration Scheme. Attenuating the rivers should not only reduce flood risk in the immediate area and further downstream but will also provide environmental and aesthetic benefits. NI Water is also examining opportunities to separate out surface water from combined sewers potentially storing this within the park, reducing the extent to which combined sewer overflows operate within the area improving local water quality.
 - Forth River Attenuation - as part of the proposals for the Blackstaff Study Area, the LWWP team has identified a number of small flood management measures, including leaky dams, which could be provided along the Forth River in Belfast. These measures are excellent examples of the LWWP approach to drainage and will

help to raise awareness of the need for NFM across Belfast. As with the Ballysillan pilot this should not only reduce flood risk in the immediate area and further downstream but will also provide environmental and aesthetic benefits.

- Belfast Castle NFM / SuDS - as part of the proposals for the North Foreshore Study Area, an opportunity has been identified to provide some small scale flood risk management measures to attenuate surface water alongside the access road within the grounds of Belfast Castle, including a swale and a leaky dam. This project would assess the methods for constructing and maintaining such measures and help raise awareness of flood risk, SuDS and NFM and provide an education tool for local schools; and
- Distillery Street SuDS Scheme - The Department is working in partnership with BCC, NIHE, NI Water, Department of Justice, Department for Communities, NIEA and the Roden Street Community Development Group to develop and progress proposals for a SuDS scheme, to attenuate surface water and raise the visual quality of the area with new green and blue spaces. The project will also serve as a SuDS demonstration project and provide opportunities to educate stakeholders on the many benefits of sustainable drainage and utilising blue / green spaces to manage surface water.

Planning, Modelling, Design and Appraisal Work for New Proposals

- 12.9 The programme includes a significant amount of further planning, modelling, design and appraisal work to further develop the Plan Outputs set out in chapters 7 - 10 into 'shovel-ready' projects. This includes completing the Integrated Drainage Modelling (IDM), Integrated Environmental Modelling (IEM) and sewer network and wastewater treatment appraisals. Enabling works are also needed to progress the new proposals including survey work, catchment monitoring, site investigations and land requisition.

Delivery of New Proposals

- 12.10 Subject to funding and approvals, an investment programme of integrated drainage and wastewater management projects is to commence during this period. This will be informed by the IDM and IEM mentioned above and is likely to include:
- Upgrades of Greenisland WwTW, Kinnegar WwTW, Whitehouse WwTW, Carrickfergus WwTW and Belfast WwTW (Phase 1);
 - Commencing the Glenmachan Sewerage Project - (including extending the Belfast Sewers Tunnel along Boucher Road) and completing sewerage network improvements in the area;
 - Carrickfergus sewerage network improvements; and
 - Replacement of Sydenham Wastewater Pumping Station (WwPS);
 - Feasibility work with regards to flood alleviation schemes along the Knock River and the Merok Burn Tributaries (East Belfast), Premier Drive Stream (Fortwilliam), Ballymartin River (Mallusk); and

CHAPTER 12

THE WORK PROGRAMME

- Feasibility work with regards to a flood alleviation scheme for the Carrickfergus & Kilroot Power Station, North West and North East Diversions and associated watercourses.

12.11 A number of integrated drainage and environmental improvement projects could also be taken forward to address localised flooding issues, reduce pollution and provide capacity for new surface water connections. The exact locations and details of these projects will be determined through IDM. However, it is likely to include upper catchment management (e.g. drain blocking and planting), river attenuation and floodplain reconnection works across all three Study Areas - Blackstaff, Connswater & Lagan Embankment and North Foreshore.

LONGER TERM PROGRAMME (2027/28-2032/33)

12.12 The longer term programme covers the period from April 2027 to March 2033, which covers the 6 year PC27 investment period for water and sewerage services.

12.13 The longer term programme will continue to include further planning, modelling, design and appraisal to develop the new proposals into 'shovel-ready' projects for delivery during this 6 year period and beyond. The programme of new integrated drainage, sewerage and wastewater management projects will also continue during this period. This could include:

- completing a number of 'live' projects carried over from earlier years, such as Greenisland WwTW, Kinnegar WwTW, Carrickfergus WwTW, Belfast WwTW Phase 1, the Glenmachan Project and Sydenham WwPS;
- a programme of new sewerage network and WwTW projects, such as Belfast WwTW Phases 2 and 3 and Greenisland sewerage improvements;
- constructing new sea outfalls to serve Belfast WwTW, Greenisland WwTW, Whitehouse WwTW and Carrickfergus WwTW and refurbishing other sea outfalls;
- feasibility work with regards to flood alleviation schemes for the Three Mile Water, Jointure Bay Stream and Greenisland Stream; and
- a programme of integrated drainage and environmental improvement projects across all three Study Areas including upper catchment management and river restoration works to address localised flooding issues, reduce pollution and provide capacity for new connections.



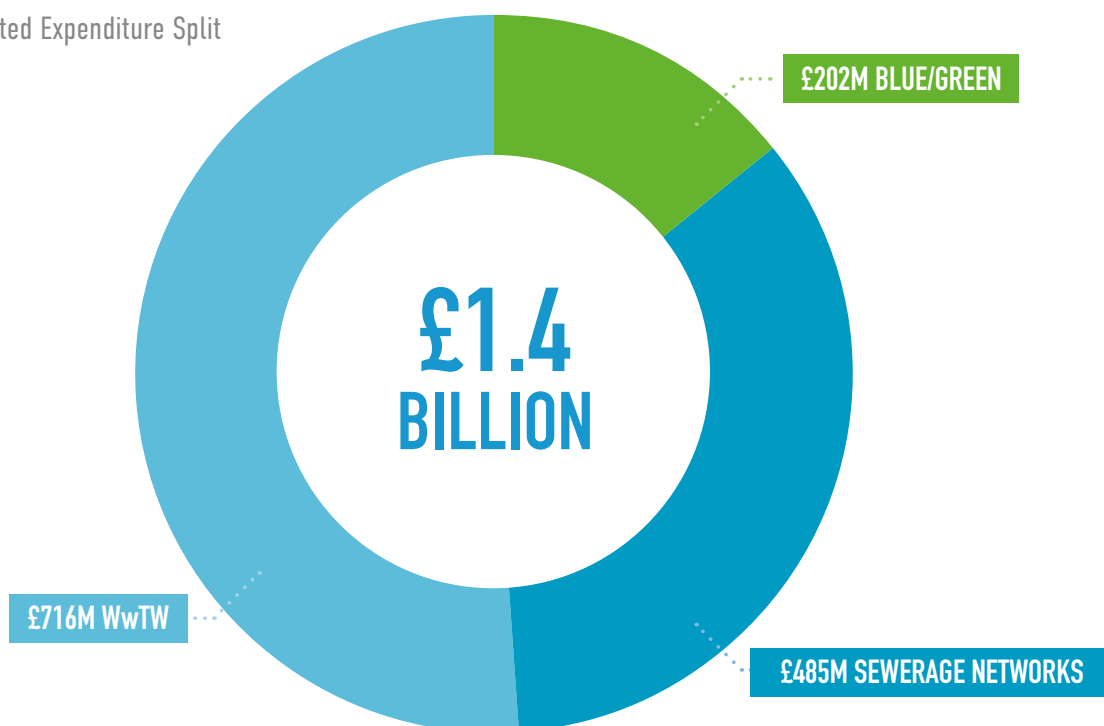
CHAPTER 13 FINANCING AND DELIVERY

ESTIMATED COSTS

13.1 It is currently estimated that around £1.4 billion could be needed to deliver the integrated drainage proposals in all four Study Areas over the next 12 years. Although most of this funding is likely to be on hard engineered measures such as sewerage upgrades, as shown in figure 13.1 below, £202m (14%) is currently needed for blue/green infrastructure, including river restoration and storage ponds.

13.2 This estimate is based on developing all of the potential infrastructure projects identified in the Plan but does not include whole life costs (e.g. operational and maintenance costs). However, it is hoped that the investment in blue/green infrastructure will not only reduce the need for some of the hard engineered infrastructure but will also reduce whole life costs. The cost estimates do not include cross-departmental cost savings, such as the savings from spreading construction and maintenance costs across several delivery partners.

Figure 13.1 - Estimated Expenditure Split



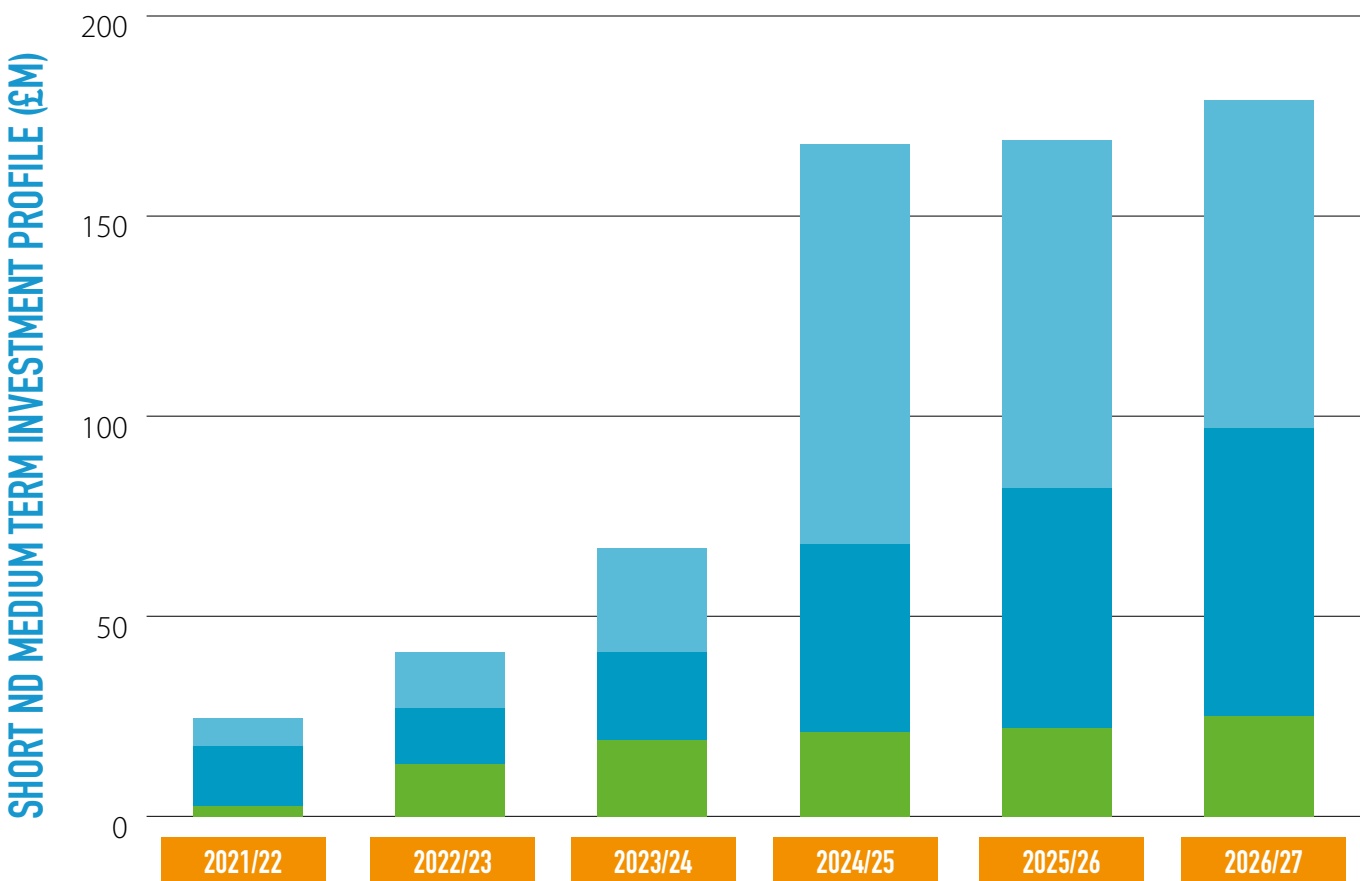
Notes on Investment Profile: ref. figures 13.3 and 13.4

1. The proposals in this Plan are to be delivered through a series of Catchment Delivery Plans. These are key to defining the scope and the cost of individual projects. When these are developed and approved by the LWWP Board, the investment profile will be amended accordingly.
2. Modelling work completed since NI Water's PC21 Business Plan estimate was prepared in 2019 indicates an increase in the number of unsatisfactory intermittent discharges from the combined sewerage networks across Belfast. The levels of investment necessary to address these will only be known when the Catchment Delivery Plans are developed.
3. Since receipt of the Utility Regulator's PC21 Final Determination, NI Water has commenced a review of the profile for the rest of the PC21 period. This may result in further changes.
4. Figures do include inflation but will vary over the lifetime of the programme due to changes in RPI figures. Brexit and Covid may result in further cost pressures.

SHORT AND MEDIUM TERM INVESTMENT NEEDS

13.3 Figure 13.3 below provides a profile of the current projected investment needs for the first six years of this Plan (2021/22 – 2026/27). This is based on the out workings of the Utility Regulator’s PC21 Final Determination of NI Water’s investment needs for this period and is likely to be adjusted and re-profiled to take account of budget settlements and changes in project scope.

Figure 13.3 - Short and Medium Term Investment Needs (£m)



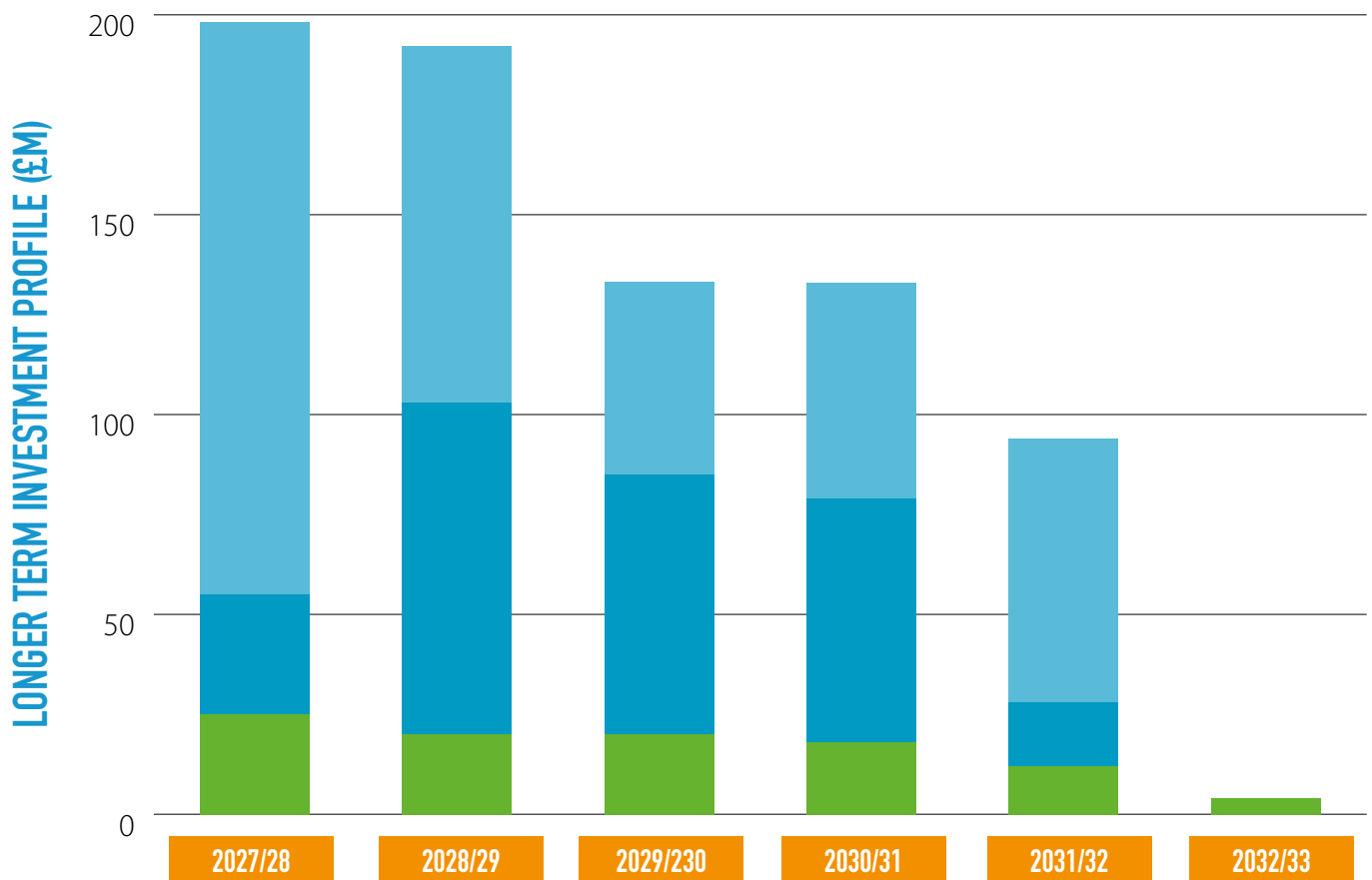
Year	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	Total
Blue/Green	2.5	13	19	21	22	25	102.5
Sewers	15	14	22	47	60	72	230
WwTW	7	14	26	100	87	82	316
Total	24.5	41	67	168	169	179	648.5

CHAPTER 13 FINANCING AND DELIVERY

LONGER TERM INVESTMENT NEEDS

13.4 Figure 13.4 below provides a profile of the current projected investment requirements for the longer term period from 2027/28 to 2032/33. Given how far in the future this is, the longer term investment profile will inevitably change and will therefore be kept under review.

Figure 13.4 - Longer Term Investment Needs (£m)



Year	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	Total
Blue / Green	25	20	20	18	12	4	99
Sewers	30	83	65	61	16	0	255
WwTW	143	89	48	54	66	0	400
Total	198	192	133	133	94	4	754

FINANCING THE PLAN

- 13.5 As stated initial estimates indicate that implementation of the Plan could cost approximately £1.4 billion, with around £200m needed for investment in blue/green infrastructure.
- 13.6 Over £1.2 billion of investment is needed to upgrade WwTW and sewerage systems across the greater Belfast area. With NI Water continuing to receive around 70% of its funding from public expenditure, it will be a significant challenge to fund delivery of the Plan in the current financial climate, particularly given the impact that the COVID-19 pandemic is having on our economy. However, without this investment, flooding and pollution will intensify and future development of the area covered by the Plan may be constrained. We all live with water so we all have a stake in delivering a long term, integrated solution for our drainage and

wastewater management needs. The drainage of surface water and the effective treatment and management of sewage are essential for good public health, economic growth and a healthy, natural environment.

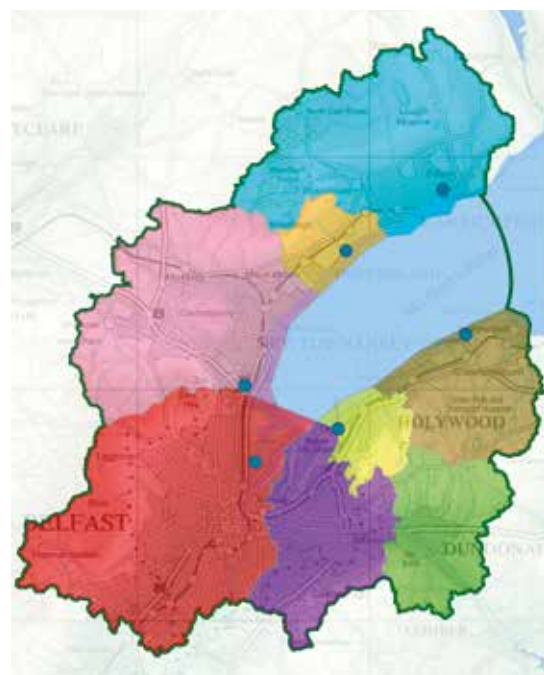
CATCHMENT DELIVERY PLANS

- 13.7 To facilitate the management of such a significant programme, the four Study Areas have been divided into nine smaller catchment areas as shown in Figure 13.7. Integrated Catchment Delivery Plans (CDPs) will be developed and implemented for each of the 9 areas. The CDPs will include river flood alleviation projects, upgrades to sewerage networks and WwTW and integrated blue/green initiatives. Development and delivery of the CDPs will be taken forward by four Catchment Delivery Groups made up of officials from DfI, NI Water, NIEA and other delivery partners.

Figure 13.7: Catchment Delivery Plans

Catchment Delivery Plans

1	Belfast NSW	}	CDP Group A
2	Whitehouse		
3	Greenisland	}	CDP Group C
4	Carrickfergus		
5	Seahill		
6	Dundonald	}	CDP Group B
7	Hollywood		
8	Connswater	}	CDP Group D
9	WwTW Masterplan		



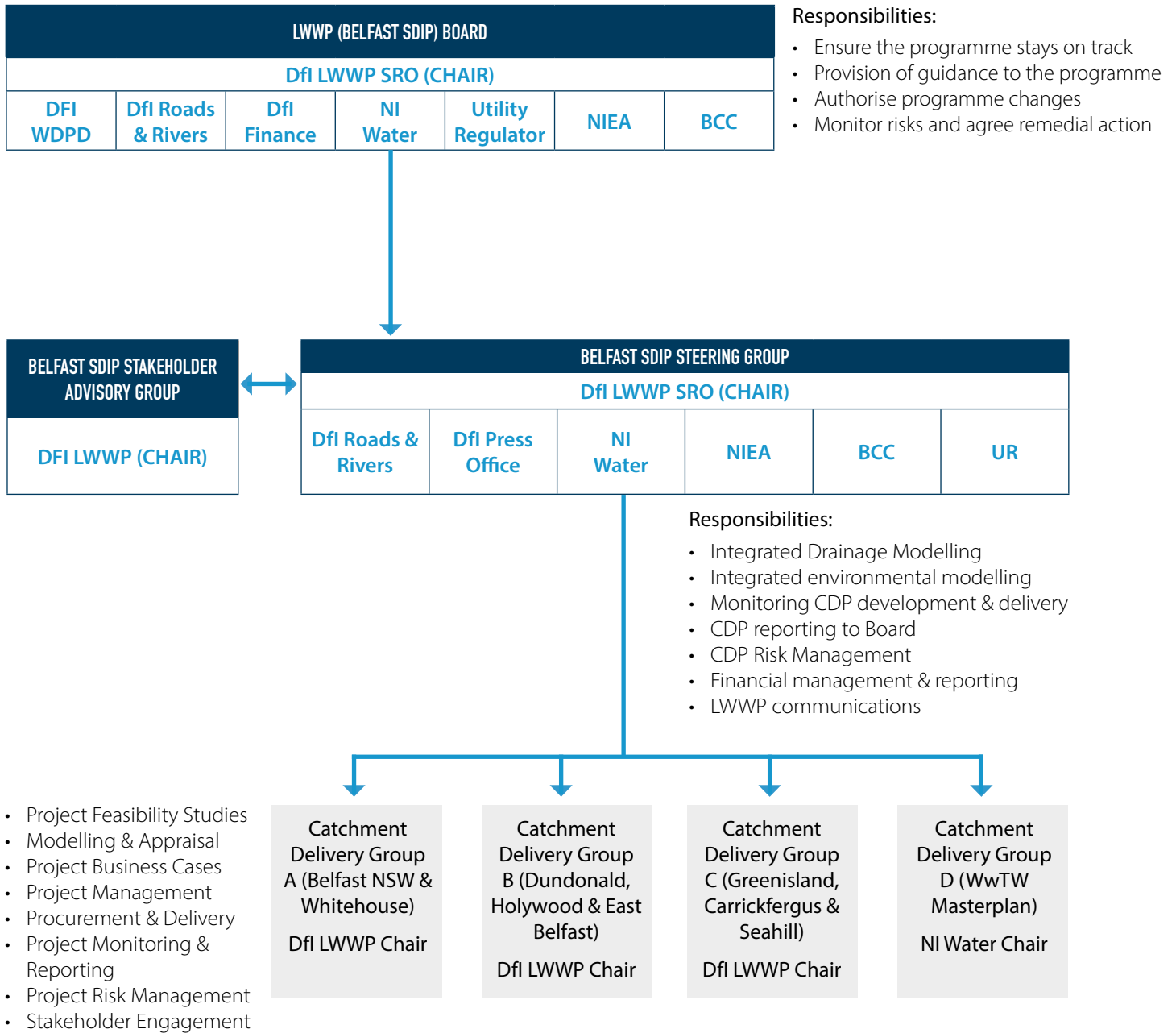
CHAPTER 13

FINANCING AND DELIVERY

OVERSIGHT AND GOVERNANCE

13.8 DfI's Living With Water Programme (LWWP) Division will be responsible for managing delivery of the Plan through the governance and delivery structures outlined in Figure 13.8. Oversight of the programme delivery will be carried out by the LWWP Board which is chaired by DfI. The Board is supported by a Steering Group, made up of the drainage providers NIEA, Belfast City Council (BCC) and DfI LWWP which will oversee delivery of the integrated programme and report to the Programme Board. The LWWP Steering Group will oversee development and delivery of the nine CDPs.

Figure 13.8: LWWP Governance & Delivery Structures



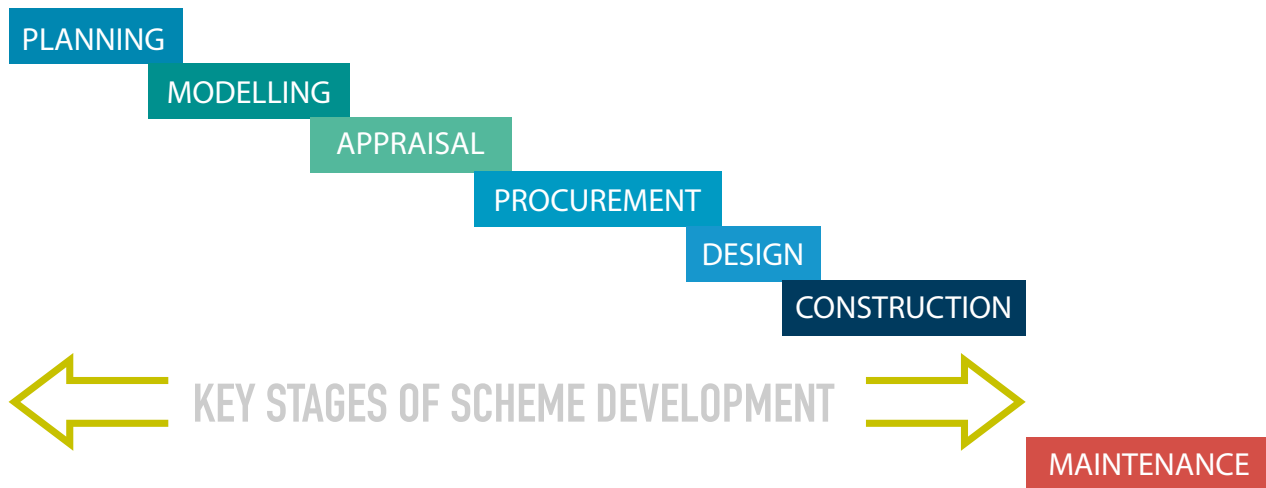
CHAPTER 13 FINANCING AND DELIVERY

NEW ARRANGEMENTS FOR DELIVERING INTEGRATED DRAINAGE

13.9 In order to progress development and delivery of the integrated drainage and wastewater management projects in CDPs, new arrangements are needed for the various key stages of scheme development, from initial planning through to construction and long term maintenance, as illustrated in figure 13.9 below. The new planning, modelling and appraisal process is described in Chapter 5,

with the potential projects identified being set out in Chapters 7 to 10. In order to progress detailed appraisals of integrated drainage schemes that focus on LWWP objectives rather than those of any single participant, new appraisal guidance and business case templates are being developed. Development of this appraisal guidance is being overseen by the LWWP Steering Group.

Figure 13.9 – Key Stages of Project Development



PROCUREMENT, DESIGN, CONSTRUCTION & MAINTENANCE

13.10 Each of the drainage providers have well established and proven arrangements for procuring, designing and constructing upgrades and carrying out maintenance to their own assets. In order to efficiently implement this Plan, NI Water's new framework contract, for the delivery of projects with a capital cost of up to £10m, has been developed so that it can also be used by DfI for the detailed design and delivery of drainage type projects within the LWWP. NI Water and DfI are currently working together to establish a Major Projects Framework so that this can be used for the detailed design and delivery of projects with a capital cost of over £10m from the spring of 2022. A key role of DfI's LWWP Division will be to determine the procurement strategy for each element of the Plan in consultation with the LWWP stakeholders so they can be delivered efficiently and with least disruption.

This will include agreeing:

- which elements will be bundled up to make larger packages of work for delivery as a project under a contract or disaggregated into smaller packages that can be delivered under separate contracts or in phases;
- which procurement method should be used (options include partners' own arrangements, frameworks or stand-alone competitions); and
- which partner should act as a lead client and contract manager.

13.11 It may be decided that a project in one small geographical area will include works to improve drains owned by DfI Roads, carry out storm separation to remove surface water from a NI Water combined sewer, develop a SuDS attenuation pond in a council park, and restore a previously culverted watercourse managed by DfI into an attractive open river. DfI's LWWP Division may then decide that this be bundled up to make a project greater than £10m to be efficiently delivered by NI Water's Major Project Framework, with DfI Rivers fulfilling the role of client. DfI's LWWP Division will also determine:

- when each Plan project should ideally take place, taking account of the critical path and phasing arrangements as set out in Chapter 12; and
- any new asset ownership and related long term maintenance responsibilities.

STAFFING AND RESOURCES

13.12 In terms of delivery of this Plan and the nine CDPs, the proposed investment in hard engineered measures, such as sewerage networks and WwTW, will be taken forward by NI Water using the resources available through the PC21 and PC27 Price Controls. DfI's LWWP team will provide the central coordination and management for development of the policy issues identified in this Plan, along with the appraisal, design, procurement and delivery of the blue/green infrastructure measures, and coordinate delivery with hard engineered elements of the programme.

13.13 Small dedicated LWWP teams have been established within both DfI and NI Water to manage the development and subsequent implementation of the Plan. This has included providing additional staff resources and funding to carry out ongoing modelling and appraisal work. However, most of the current staffing and support for the LWWP is being provided from within the existing resources of the organisations involved. Additional staff resources will be needed within DfI and NI Water:

- progress delivery of the blue/green measures within the Plan where no existing delivery mechanism exists;
- fulfil the proposed coordination role for the future delivery of catchment based solutions set out in Chapters 7-9 including determining the procurement strategy for each element of the Plan;

- continue to develop partnerships with key stakeholders including large landowners, other government departments, councils and other public bodies; and
- ensure integrated drainage and wastewater management becomes a key consideration in future land use planning decisions.

MONITORING AND REVIEW

13.14 With a programme of this scale and nature it is imperative that options are reviewed and assessed on a continuous basis as new evidence, modelling data and opportunities are identified. This will ensure the programme is delivered on the basis of the most up to date information available and not based on data that may be 10 or 12 years old.

13.15 As detailed in Chapter 11 of this Plan, the wider environmental monitoring recommended in Section 9.2 of the SEA Environmental Report will be undertaken before the development stage of the next cycle of this Plan. 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.

13.16 In terms of benefits realisation, a benefits realisation plan will be developed for each of the nine CDPs which will be monitored annually as part of DfI's reporting processes. A full review of the Plan is to be completed in advance of the next Price Control period for water and sewerage services (PC27). The LWWP will also be subject to the Department of Finance's NI Gateway Review process for NI capital investment projects and will have a series of independent peer reviews at key stages.

SECTION 4

SYNOPSIS

- Delivery of sustainable integrated solutions necessitates careful phasing of capital improvements such that no part of the system is detrimentally affected, either in the short or the long term. This critical path has informed the strategic programme for implementation of the Plan over the next 12 years, which is currently estimated at around £1.4 billion.
- Over £1.2 billion of this funding is needed for hard engineered measures, such as sewerage networks and WwTW. With NI Water continuing to receive around 70% of its funding from public expenditure, it will be a significant challenge to fund delivery of the Plan in the current financial climate.
- However, without investment there may be development constraints in the wastewater treatment system in many areas across Belfast, which may have implications for economic development, housing and the environment.
- It is currently estimated that a further £200m of public funding could be needed for blue/green infrastructure measures such as river restoration. However, to progress delivery of these measures, new arrangements are needed for the various key stages of scheme development, from planning through to construction and for long term maintenance.
- Frameworks are being established whereby capital drainage projects can be jointly procured and commissioned under the LWWP.
- DfI's LWWP team will be responsible for overseeing delivery of the Plan through nine Catchment Delivery Plans. The CDPs will include river flood alleviation projects, upgrades to sewerage networks and WwTW and integrated blue/green initiatives.
- In terms of benefits realisation, the Plan will be monitored annually as part of DfI's reporting processes, with a full review of the Plan to be completed in advance of the next Price Control period for water and sewerage services (PC27).

GLOSSARY OF TERMS

TERM	DEFINITION
Asset	An asset is a resource with economic value that an individual, company or country owns or controls with the expectation that it will provide a future benefit.
Attenuation tank	<p>A tank, drain or sewer that has been designed to hold back part of the peak flow caused by a rainfall event (otherwise known as a storm), therefore making the peak smaller and reducing the risk of flooding.</p> <p>An attenuation tank on either a NI Water foul or combined sewer is called a 'wastewater storm tank'.</p>
Blue/green infrastructure	A strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services. Some organisations, such as Belfast City Council, prefer to use 'green / blue' infrastructure; it means the same.
Blue/green spaces	Blue spaces cover all open water bodies such as rivers, canals, reservoirs, lakes and loughs. Green spaces cover all areas with natural porous surfaces such as grass and planting (e.g. parks, fields, gardens).
Catchment	The area of land, including the hills and mountains, woodlands, and buildings which water drains from, before flowing into a river, lake or lough.
Climate Change	The rising average temperature of Earth's climate system, called global warming, is driving changes in rainfall patterns, extreme weather, arrival of seasons and more. Collectively, global warming and its effects are known as climate change.
Climate Change Adaptation	The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities.
Climate Change Mitigation	Climate change mitigation consists of actions to limit the magnitude or rate of global warming and its related effects. This generally involves reductions in human emission of greenhouse gases and actions to absorb carbon dioxide, such as planting trees. Within the context of drainage and wastewater this term is typically used to describe anything manmade. However, natural features are also an asset, for example, a healthy peat bog provides storm attenuation.
Coastal Flooding	Flooding that has come onto land from the sea.

TERM	DEFINITION
Combined sewer overflows	Combined sewer overflows are pipes and pumps which allow excess flows of highly-diluted wastewater, which in many cases pass through screens to remove plastic and rags, to be returned into watercourses / rivers and the sea to help prevent homes and businesses from being flooded. Many of these overflows are designed to comply with national standards and any discharges are consented to by the NIEA.
Combined sewers	These pipes carry both wastewater, from homes and businesses, and rainwater, which runs off from roads, drives and roofs (impermeable surface areas), to wastewater treatment works. In NI most are owned by NI Water.
Culverted watercourse	A section of a watercourse that passes below the ground by means of a drain or culvert, where a "culvert" is used to describe any pipe or conduit through which a watercourse passes.
Designated Watercourse	A watercourse within NI that is designated by the Drainage Council under the Drainage (Northern Ireland) Order 1973. Designated watercourses are maintained (not owned) by DfI Rivers.
Drain	Pipes that convey surface water by gravity and are not classified as either a foul sewer or combined sewer. Within NI this term is typically used to describe the drainage pipes that are neither owned by NI Water nor are a designated watercourse.
Drainage Network	A collective term to cover a system of open channels, watercourses or pipes that convey surface water.
Drainage and Wastewater Management Plan	A plan which sets out how water and wastewater companies intend to extend, improve and maintain a robust and resilient drainage and wastewater system. The plan will take a long-term view, setting out a planning period that is appropriate to the risks faced by each company, but with a minimum period of 25 years.
Drainage Area Plan	An investment plan for a single sewerage network, generally combined, foul and connected networks. It is the output of a Drainage Area Study (DAS).
Drainage Infrastructure	A term used to collectively describe all the assets within a drainage system.
Drainage Scheme	This is typically used to describe a project that includes work on a watercourse in order to improve the drainage of an area.

GLOSSARY OF TERMS

TERM	DEFINITION
Drainage system	A term used to collectively describe all drains, watercourses and sewers that convey water from the land to a receiving water.
Flood Risk Management Plan	A plan that identifies flood hazards / risks and a range of measures to manage flood risk. Preparation of this is a requirement of the Floods Directive.
Foul water sewers	These carry wastewater from homes and businesses to a wastewater treatment works. In NI most are owned by NI Water.
Fluvial Flooding	Flooding from a river or watercourse.
Habitats Regulations Assessment (HRA)	This refers to the several distinct stages of Assessment which must be undertaken, to determine if a plan or project may affect the protected features of a habitats site, before deciding whether to undertake, permit or authorise it.
Hard Engineering	Hard engineering involves the construction of physical structures, typically involving concrete.
Gully	A gully is a drainage pit, covered by an open metal grating, located on the road edge. Its purpose is to drain rain water from the highway into a drain or sewer.
Integrated Drainage Investment Plan	A plan that sets out how the water quality issues and flooding risks within the selected Study Area covered by the plan will be addressed through changes and investment. These sit below the Plan.
Integrated Drainage Modelling	Catchment scale modelling that replicates the sources of water in order to replicate the flow paths and locations of flooding that occurs under existing conditions. It can then be used to assess how the risk of flooding could be mitigated by a range of interventions to determine the optimum solutions.
Integrated Drainage Scheme	A project that includes both works on a watercourse, to improve the drainage of an area, and foul and combined sewers.
Integrated Environmental Modelling	Catchment scale modelling that replicates the sources of pollution and natural processes (including ecosystem services) to replicate the water quality that occurs under existing conditions. It can then be used to assess how water quality can be improved by a range of interventions to determine the optimum solutions.

TERM	DEFINITION
Internal flooding	Where the inside of a house or an attached garage is flooded
Out of Sewer Flooding	Flooding caused by water that has come out of a foul or combined sewer.
Private Drainage Infrastructure	A term used to describe drainage pipes that are neither owned by a public body nor a designated watercourse. This could include privately owned sewers, drains and pumping stations.
Public sewers	Sewers that are owned and operated by NI Water.
Receiving water	The body of water that a drainage system ultimately discharges into. This could be a lake, a major river or the sea.
Rising main	A pipe that is used to convey sewage or surface water flow from a pumping station to a higher area. As its contents are being forced to rise it operates under pressure. Sometimes also called a pumping main.
River Attenuation	The slowing down or dampening of river flows through features such as weirs.
River Basin Management Plan	A plan that identifies water quality risks and how organisations and stakeholders can work together to deliver a range of measures in order to improve water quality. Preparation of this is a requirement of the Water Framework Directive.
River flooding	Flooding that has come onto land from a watercourse. Sometimes known as 'fluvial flooding'.
Road drain	A pipe used to convey surface water away from a road. In NI most are owned and operated by DfI Roads.
Sea outfall	A pipe that discharges treated effluent from a WwTW, flows from a CSO and / or flows from a wastewater storm tank overflow to the sea.
Sewage	The flow in foul and combined water that is produced by a community of people, for example, from toilets, sinks, washing machines, baths and showers. Typically used to describe the contents of foul and combined sewers, which can also be called 'wastewater'. Sewage is one of the main components of wastewater.
Sewage Related Debris (SRD)	This is inappropriate materials such as cotton buds, sanitary products, disposable nappies and other items that are flushed down public and private toilets and end up polluting our inland and coastal waterways.

GLOSSARY OF TERMS

TERM	DEFINITION
Sewerage network	This term is used to describe all of the NI Water sewers, overflows, storm tanks and pumping stations that convey flow to either a WWTW or to a receiving water.
Sewers	These are pipes that carry surface water, or wastewater.
Soft Engineering	Management practices that use sustainable ecological principles to restore shoreline stabilization and protect river habitats.
Stormwater Management	A term used to describe plans to reduce the risk of surface water flooding. This could include policy work, preparedness planning and capital works by a wide number of organisations.
Strategic Environmental Assessment (SEA)	A systematic process for evaluating the environmental implications of a proposed policy, plan or programme which provides the means to look at cumulative effects and appropriately address them at the earliest stage of decision making, alongside economic and social considerations.
Surface water	This is caused by rainwater that falls on the ground, roofs, roads, pavements and paths. It can either evaporate back into the air, infiltrate the ground, pond on the surface, or flow into a receiving water (such as a river, lake or the sea) via a wide range of flow paths.
Surface water flooding	This is sometimes known as 'pluvial flooding'.
Surface water sewers	These carry rainwater that falls on roads, drives and roofs directly to a local watercourse, river, soakaway or combined sewer. In NI most are owned by NI Water.
Sustainable Drainage Systems (SuDS)	Drainage systems designed to mimic nature and typically manage rainfall close to where it falls.
Unsatisfactory Combined Sewer Overflow	A combined sewer overflow that does not achieve minimum environmental standards, generally being CSOs that overflow too often or are not screened appropriately. Regulators call these 'Unsatisfactory Intermittent Discharges', with the word 'intermittent' reflecting that the discharge only occurs when it rains.
Urban creep	This term is used to describe changes to the urban environment due to home extensions, addition of conservatories and paving over front gardens for parking that can all add to the amount of water going into our sewers and drains.

TERM	DEFINITION
Wastewater	This is sewage plus other materials such as trade effluent (wastewater from commercial processes) and leachate (polluted water from landfill sites) that could also be discharged into sewers or directly to the WwTW by a tanker.
Wastewater Management	The collection, treatment and safe discharge of wastewater back to the environment.
Wastewater Pumping Stations	This is a structure to which foul and combined sewers discharge and includes pumps used to pump the sewage to another location, which could be to another sewer, pumping station or to a WwTW.
Wastewater Storm tank	A term used to describe a tank that is used to hold back part of the peak flow that occurs in a foul or combined sewer during a rainfall event. These can be located in the sewerage network or at a WwTW. After the peak flow the contents are typically either returned to the sewer or pumped to a WwTW for treatment.
Wastewater Treatment Works (WwTW)	WwTW have four main stages of treatment – preliminary, primary, secondary and tertiary. The number of stages depends on what quality the treated wastewater needs to reach before it can be safely returned back into rivers or the sea. Some smaller WwTW can be privately owned.
Watercourse	A channel or passage through which water flows.

ANNEX A

OVERVIEW OF BELFAST SEWERS PROJECT

INTRODUCTION

The £164m Belfast Sewers Project was completed in 2010 and provided a solid start to address the important drivers for investment in the sewerage networks and wastewater treatment facilities that serve Belfast.

By the late 1990s, the city's ageing sewerage network was suffering as a result of sustained periods of inadequate maintenance due to funding constraints, coupled with a lack of investment necessary to increase capacity to accommodate the city's continued growth.

There were excessive spills of dilute sewage from the old combined network causing pollution, and an increasing frequency of out of sewer flooding events due to blockages, collapses, and inadequate hydraulic capacity. To start addressing these issues NI Water undertook the Belfast Sewers Project. It was designed in the late 1990s, commenced on site in 2006, and successfully completed in 2010.



Figure 1: Belfast Storm Tunnel under Construction

The key objectives were to improve water quality in the Lagan and Blackstaff Rivers, whilst reducing the risk of flooding within inner city areas, such as the River Terrace area off the Ormeau Road. The main new assets delivered by the project are:

- 9.4km of storm tunnel ranging in diameter from 1.95m to 4m and at a depth of up to 40m;
- A large terminal storm water pumping station (41m deep x 37m diameter) with a pump capacity of 16.75 cubic meters (or tons) per second
- The location of the tunnel is illustrated in Figure 2 below.



Figure 2: Storm Tunnel Location and CSO Discharge Input Locations

ANNEX A

OVERVIEW OF BELFAST SEWERS PROJECT

The main tunnel starts at Cromac Street and ends at a new Terminal Pumping Station (TPS) at Belfast WwTW, which is within the Belfast Harbour estate. Tributary tunnels that commence at Glenmachan Street, Park Road and Queen's Quay discharge into the main tunnel. This tunnel was designed to intercept CSO discharges that were previously discharged into the River Lagan via either gravity outfalls or storm pumping stations. Each of the CSO pumping stations that the tunnel allowed to be decommissioned had become problematic and unreliable, resulting in flooding, pollution and odours.

The tunnel then attenuates and conveys this stormwater by gravity to the huge TPS, which is illustrated under construction in figure 3. The section of 4m diameter tunnel and the TPS provides around 80,000m³ of storage before it spills, which is equivalent to the volume within 32 Olympic sized swimming pools. Only when the total storage capacity of the tunnel and shaft is exceeded do storm pumps operate which then discharge the dilute sewage into Belfast Harbour. After the storm has passed the tunnel is emptied and prepared for the next storm by pumping its contents into Belfast WwTW, where it receives full treatment before being discharged to Inner Belfast Lough.



Figure 3: The Tunnel Pumping Station Shaft under construction

The project also incorporated the rehabilitation and upgrading of parts of the Duncrue sewerage network; however, the funding available at that time was not adequate to improve the vast majority of the sewerage networks that serve greater Belfast. This project resulted in sewage discharges to the River Lagan and its tributaries in the city centre area being significantly reduced, and protected over 300 properties from out of sewer flooding (from up to a 1:30 year return period rainfall event). Under Living With Water in Belfast, the Storm Tunnel will be extended by 3km under Boucher Road to Musgrave Park in order to make connections that will reduce the risk of flooding in additional areas and allow reductions in pollution from 20 CSOs.



LIVING WITH WATER IN BELFAST

An aerial photograph of Belfast, Northern Ireland, showing the city built on a peninsula and along the shores of the Lough Swilly. The harbor is filled with shipping containers and a large ship. In the foreground, there is a green grassy area. A circular graphic with a green and blue border is overlaid on the image, containing the text 'PROTECT ENHANCE GROW'.

**PROTECT
ENHANCE
GROW**

