



# **Portadown Flood Alleviation Scheme**

## Volume 2 Environmental Statement

## Document Control Sheet

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# 1. Introduction

## 1.1. Background to the Scheme

- 1.1.1 In 2020, the Department for Infrastructure (DfI) Rivers commissioned Amey Consulting to provide a range of engineering and environmental design services for a flood alleviation scheme located within Portadown, County Armagh in Northern Ireland. The scheme proposes the construction of flood defences at numerous sites throughout Portadown and the surrounding area in order to reduce the risk of flooding from the River Bann and its tributaries.
- 1.1.2 Part of the commission required the preparation of an Environmental Impact Assessment (EIA) Screening Report in order to determine whether a full EIA and subsequent Environmental Statement (ES) would be required. Under the Drainage (Environmental Impact Assessment) Regulations (Northern Ireland) 2017 (Ref 1.1), the DfI is the relevant authority to determine if a scheme is subject to the requirements of the EIA Directive. An EIA screening report was prepared by Amey and submitted to the DfI in July 2020.
- 1.1.3 The report concluded that the proposed flood alleviation works would likely result in significant effects on the environment and, as a consequence, an EIA would be required. The report determined that during construction, the works could potentially result in significant effects on local residents and biodiversity as a result of pollution, dust generation and increased noise and disturbance. During operation, visual changes to the local landscape as a result of new flood walls and embankments could result in significant effects, while permanent impacts on Brackagh Bog Area of Special Scientific Interest (ASSI) and Derryvore ASSI could also occur due to changes in hydrology.
- 1.1.4 While a robust mitigation strategy will minimise the risk of such adverse effects, the particular requirements (i.e. mitigation measures for protected species) could not be established without further investigation and assessment. On this basis, it was recommended that an EIA be undertaken, and an ES published.

## 1.2. Scheme Location

- 1.2.1 The scheme is located within and around the town of Portadown, County Armagh, as illustrated in **Figure 1.1, Volume 4**. Portadown town is located approximately 35km to the south west of Belfast in Northern Ireland. The town lies within the boundary of Armagh City, Banbridge and Craigavon Borough Council. This area of Northern Ireland is primarily rural where the land use outside of the minor towns is primarily agriculture. The settlements of Craigavon, Moyravety and Lurgan are situated to the immediate north east of Portadown, while Armagh lies approximately 12km to the south west.
- 1.2.2 The proposed flood defence sites are predominantly situated around the residential and commercial properties within Portadown which lie adjacent to the River Bann and its tributaries. A number of the proposed flood defence sites are also located on the outskirts of the town, where the River Bann flows adjacent to residential developments and agricultural dwellings. Each of the flood defence locations are illustrated in **Figures 1.2a – 1.2f, Volume 4** and further details are provided in Sections 5.2 and 6.2.
- 1.2.3 Portadown is located within the Neagh Bann River Basin and the River Bann is the main watercourse of the region. The River Bann is one of the longest rivers in Northern Ireland and it flows through the centre of Portadown before discharging into Lough Neagh approximately 10km to the north west of the town. Lough Neagh is designated as a Ramsar site, a Special Protection Area (SPA) and an Area of Special Scientific Interest (ASSI) and is the largest freshwater lake in the British Isles. Tributaries of the River Bann which discharge into the river as it flows through Portadown include Annagh River, Corcrair River, Ballybay River and Cushier River.

## 1.3. Need for the Scheme

### Flooding and its effects

- 1.3.1 Flooding is a natural phenomenon which can have a range of adverse impacts on the environment, the economy and human health. Typical effects of flooding can include loss of life, property and infrastructure damage and contamination and disease as a result of polluted water.



- 1.3.2 In recent years, flood events have increased on a global scale as a result of ongoing climate change and the subsequent disruption of weather patterns. In Europe, significant flood events in the early 2000s led the European Union to tackle the issue of flood risk through the creation of the European Floods Directive 2007/60/EC, which was implemented in 2007 (Ref 1.2). This Directive aims to protect communities from the risk and impact of flooding through the management of flood risk on a catchment wide scale.
- 1.3.3 The EU Floods Directive was transposed into Northern Ireland law in November 2009 through the introduction of The Water Environment (Floods Directive) Regulations (Northern Ireland) 2009 (Ref 1.3). The regulations set out the three main stages of flood risk management as outlined in the Directive, which must be repeated on a cyclical basis every six years. The stages are summarised below:
- Preliminary Flood Risk Assessment: Article 4 of the EU Directive required each Member State to undertake a Preliminary Flood Risk Assessment for their respective territories by 22nd December 2011.
  - Flood Hazard and Risk Mapping: Article 6 of the Directive required each Member State to prepare Flood Hazard and Flood Risk Maps for significant flood risk areas by December 2013.
  - Flood Risk Management Planning: Article 7 of the Directive required each Member State to prepare Flood Risk Management Plans (FRMPs) by December 2015.
- 1.3.4 In December 2011, the Preliminary Flood Risk Assessment (PFRA) for Northern Ireland was published by the Rivers Agency (now DfI Rivers) which assessed the potential adverse consequences of future flooding on human health, economic activity, cultural heritage and the environment taking into account long term developments such as climate change. It considered fluvial and coastal flood risk as well as surface water runoff. The PFRA report also provided the Rivers Agency with information to comply with Article 5 of the Directive which required each Member State to use the PFRA as the basis to 'identify those areas for which they conclude that potential significant flood risk exists or might be likely to occur' (Ref 1.4). These areas were termed Significant Flood Risk Areas (SFRA). The identification of the SFRA was a critical milestone in the implementation of the Directive as these were the only areas for which the later requirements to produce detailed flood maps and flood risk management plans apply.
- 1.3.5 A review of the PFRA took place in 2018 as part of the 2nd six year cycle of the Directive's processes and resulted in the publication of the Northern Ireland Flood Risk Assessment (NIFRA) in December 2018 (Ref 1.5). The NIFRA is a high-level analysis of the potential economic, social and environmental impacts which could result from flooding in Northern Ireland, developing the initial findings of the PFRA. It identifies the areas within Northern Ireland which are at greatest risk of flooding and classifies these as 'Areas of Potential Significant Flood Risk' (APSFR).

### **Portadown Flood Risk**

- 1.3.6 Within the 2018 NIFRA, Portadown and its neighbouring community of Craigavon are identified as 'Areas of Potential Significant Flood Risk'. The report identifies the areas as 'at risk of flooding from fluvial and pluvial sources which could adversely impact on people and property in the area'. The boundary of the Portadown and Craigavon APSFR is illustrated in **Figure 1.3, Volume 4**.
- 1.3.7 A number of flood events have taken place in Portadown over recent years, as summarised below:
- April 1986, October 1987 & August 2008: Flows of over 100m<sup>3</sup>/s were recorded in the River Bann which resulted in major flooding in and around Portadown.
  - October 2011: Out of bank flooding and the over-topping of flood defences (likely caused by a lack of capacity along the River Bann and Cushier River) resulted in the flooding of the north/south railway line in southern Portadown. An industrial estate along Tandragee Road and several public roads within the town were also impacted by flood waters.
  - November 2014: Several homes suffered flood damage along Woodgrove Road, Ashgrove Road and Park Road as a result of out of bank flooding from the Ballybay/Corcrain River. Flooding also occurred along Lurgan Road, Gilford Road and Bann Boulevard.

- December 2015/January 2016: Extreme flooding occurred along Market Hill Road, Gilford Road and Drumnacanvey Road as a result of out of bank flooding from the River Bann during three consecutive storms; Desmond, Eva and Frank.

1.3.8 Previous studies of flooding within Portadown by RPS (Ref 1.6) have shown that it is a complex issue as there are several flood mechanisms which contribute to flooding within the area. The dominant flooding mechanism originates from the River Bann, which flows throughout the centre of the town. During a 1% Annual Exceedance Probability (AEP) event, it has been modelled that out of bank flooding would occur along the length of the River Bann causing significant overland flow. In addition to this, Lough Neagh, located approximately 10km to the north of Portadown, also contributes to flooding within the town as it creates a backwater effect up the River Bann which extends into the town. The large volume of water carried in the River Bann also creates a backwater effect in three of the main tributaries of the river, Kilmoriarty Stream, Annagh River and Ballybay/Corcrair River, leading to further flooding.

1.3.9 Each flooding mechanism within Portadown can be separated into three flood cells, as identified within the previous study by RPS. Flood cell 1 encompasses all flooding originating from the River Bann and the majority of receptors within Portadown are located within this cell. Flood cell 2 contains all the receptors at risk from flooding from the Ballybay/Corcrair River, while flood cell 3 contains the receptors at risk from the Kilmoriarty Stream.

1.3.10 Table 1.1 summarises typical receptors at risk from flooding within and around Portadown during a 1% AEP event.

Table 1.1 Flood risk receptors within Portadown

Flood Risk Receptor Group	Receptor	At Risk (During a 1% AEP Event)
Social and Cultural Heritage	Public Buildings, Community Receptors, Areas of Special Archaeological Interest, Areas of Archaeological Potential, Historic Parks and Gardens, Listed Buildings, Industrial Heritage Buildings.	<ul style="list-style-type: none"> <li>Portadown Health and Care Centre</li> <li>Several industrial heritage assets, including bridges and factories.</li> </ul>
Environment	Salmonid rivers, Ancient woodland, Special Area of Conservation (SAC), Special Protection Area (SPA), Area of Natural Beauty, Area of Special Scientific Interest (ASSI)	<ul style="list-style-type: none"> <li>River Bann is designated as a Salmonid river.</li> <li>Areas of ASSI at risk to the north and south of Portadown.</li> <li>Small area of ancient woodland to the south east of Portadown</li> </ul>
Economic	Residential and commercial properties	<ul style="list-style-type: none"> <li>Over 200 residential properties</li> <li>Over 80 commercial properties</li> <li>Portadown Health and Care Centre</li> </ul>
	Road networks, rail networks	<ul style="list-style-type: none"> <li>North/South railway to south of Portadown</li> <li>Roads including Tandragee Road, Lurgan Road and Gilford Road.</li> </ul>

## Next Steps

- 1.3.11 Considering the historic nature of flood events in Portadown and the identification of the town as an APSFR, DfI Rivers commissioned RPS Consulting in 2018 to identify the flood risk associated with the local watercourse system and to assess options for the alleviation of future flooding.
- 1.3.12 Following their investigation in 2018, RPS produced a modelling report (Ref 1.7), feasibility study report and an economic appraisal (Ref 1.8) report for flood alleviation works in the town.
- 1.3.13 In 2019, Amey Consulting were then commissioned to review the reports prepared by RPS and the options proposed and to progress the scheme to detailed design and construction. Additional hydraulic modelling has also been undertaken by WaterCo, on Amey's behalf, to aid in the detailed design process and to further refine the options proposed by RPS.

## 1.4. Environmental Statement (ES) Structure

- 1.4.1 The Environmental Statement (ES) is the report which details the findings of the EIA process. Specifically, it summarises the environmental impacts of the proposed scheme which are likely to be significant and outlines mitigation measures in order to reduce or eliminate these impacts.
- 1.4.2 This ES consists of two parts, as detailed below:
  - The ES: A comprehensive, detailed report which outlines all of the relevant environmental information in relation to the proposed scheme;
  - A Non-Technical Summary (NTS); A brief summary of the ES, which summarises the main environmental impacts of the scheme in non-technical language which is accessible for all readers.
- 1.4.3 The ES is presented in four volumes:
  - Volume 1: Non-Technical Summary;
  - Volume 2: Main report;
  - Volume 3: Technical Appendices; and
  - Volume 4: Figures.
- 1.4.4 The main report is set out in the following structure:
  - Introduction: Sets out the scheme background, the need for the scheme and the structure of the ES.
  - Environmental Impact Assessment: Details the legislation and policy behind the EIA process and sets out the methodology to be followed for the EIA. The structure of each technical chapter is also discussed as well as the need for the assessment of cumulative effects.
  - Planning policy: Summarises the national and local planning policies which relate to the proposed scheme.
  - Consultation: Details the consultation process and the consultation that has taken place to date. It also provides a summary of the consultation events held and the feedback received.
  - Existing Environment: Provides an overview of the existing environment and summarises the baseline conditions at each of the 20 sites where work is proposed. This includes a site description and details of existing land use.
  - Description of Proposed Scheme: Provides an in-depth description of the proposed scheme. It also discusses the indicative construction methodology and the proposed embedded mitigation.

- Alternatives: Discusses the alternatives considered during the design process and any issues that occurred during this process.

1.4.5 The ES is then split into each technical chapter which provides an in-depth discussion on the topic specific environmental impacts as a result of the scheme. The technical chapters considered within the ES have been determined by the scoping stage, which is detailed further in Section 2.3. The ES technical chapters are as follows;

- Air Quality;
- Cultural Heritage;
- Landscape and Visual Effects;
- Terrestrial Biodiversity;
- Fisheries and Aquatic Ecology;
- Soil and Land Contamination;
- Noise and Vibration;
- Population and Human Health;
- Hydrology And Drainage; and
- Climate.

1.4.6 The concluding chapters of ES are as follows:

- Interactions and cumulative impacts: Summarises the cumulative environmental effects as a result of the proposed scheme.
- Schedule of environmental commitments: Details the environmental commitments that the project must follow in order to prevent adverse impacts and/or enhance.
- Assessment summary table: Provides a summary of the effects set out within the ES.

## 1.5. Statement of Authority

1.5.1 The ES has been prepared by a number of environmental specialists, as detailed in Table 1.2.

Table 1.2 Environmental Statement Authors

Chapter	Author	Relevant Experience	Reviewer	Relevant Experience
1-7 Introductory chapters	Craig Prentice Senior Environmentalist	<ul style="list-style-type: none"> <li>▪ MSc Sustainability and Environmental Studies</li> <li>▪ BA (Hons) Geography</li> <li>▪ Practitioner Member of the Institute of Environmental Management and Assessment</li> </ul>	Helen Craig Senior Environmentalist	<ul style="list-style-type: none"> <li>▪ BSc (Hons) Environmental Biology</li> <li>▪ MSc Applied Environmental Sciences</li> <li>▪ Member of Chartered Institute of Ecology and Environmental Management (MCIEEM)</li> </ul>

Chapter	Author	Relevant Experience	Reviewer	Relevant Experience
		<ul style="list-style-type: none"> <li>7 years experience working with Environmental Impact Assessment (EIA).</li> </ul>		<ul style="list-style-type: none"> <li>Chartered Environmentalist (CEnv)</li> </ul>
8	Air Quality Aamirah Essof Assistant Environmentalist	<ul style="list-style-type: none"> <li>Masters Degree Chemistry</li> <li>Associate member of Institute of Air Quality Management</li> <li>Associate member of Institution of Environmental Sciences</li> <li>3 years experience within EIA</li> </ul>	Justin Lingard Principal Environmentalist (Technical Lead Air Quality)	<ul style="list-style-type: none"> <li>PhD in Atmospheric Chemistry and Physics,</li> <li>MRes in the Built Environment,</li> <li>BSc (Hons) Environmental Science,</li> <li>Chartered Scientist (CSci)</li> </ul>
9	Cultural Heritage Christine Rennie Consultancy Project Manager (GUARD Archaeology)	<ul style="list-style-type: none"> <li>MA Hons</li> <li>20 years' experience</li> <li>Member of the Chartered Institute for Archaeologists</li> <li>Fellow of the Society of Antiquaries of Scotland</li> </ul>	Helen Craig Senior Environmentalist	As above
10	Landscape and Visual Effects Ross White Landscape Architect	<ul style="list-style-type: none"> <li>BA (Hons) Landscape Architecture</li> <li>Member of the Landscape Institute – Affiliate level</li> <li>7 years' experience</li> </ul>	Angela Assorto-McIlwaine Principal Landscape Architect	<ul style="list-style-type: none"> <li>Landscape Management BSc Hons</li> <li>Chartered Member of the Landscape Institute</li> <li>15 years' experience</li> </ul>
11	Terrestrial Biodiversity Mark Lang Ecology Lead, RSK	<ul style="list-style-type: none"> <li>BSc Hons</li> <li>Member of Chartered Institute of Ecology and Environmental Management</li> <li>Chartered Ecologist</li> <li>Chartered Environmentalist</li> </ul>	Andrew Warwick EIA Technical Lead	<ul style="list-style-type: none"> <li>BSc Hons Environmental Biology</li> <li>MSc Applied Environmental Sciences</li> <li>MSc Environmental Planning</li> <li>Full Member of the Chartered Institute</li> </ul>

Chapter	Author	Relevant Experience	Reviewer	Relevant Experience
				<ul style="list-style-type: none"> <li>of Ecology and Environmental Management (MCIEEM)</li> <li>▪ Chartered Environmentalist (CEnv) – 2014</li> <li>▪ Over 20 years' experience working within EIA.</li> </ul>
12	Fisheries and Aquatic Ecology Dr David Kelly Freshwater and fisheries ecologist	<ul style="list-style-type: none"> <li>▪ BSc Hons Zoology</li> <li>▪ DPhil Freshwater Ecology</li> <li>▪ Member of Chartered Institute of Ecology and Environmental Management</li> <li>▪ Member of Institute for Fisheries Management</li> </ul>	Dr Peter Walker	Associate Director RSK
13	Soil and Land Contamination Helen Craig Senior Environmentalist	As above	Andrew Warwick EIA Technical Lead	<ul style="list-style-type: none"> <li>▪ BSc Hons Environmental Biology</li> <li>▪ MSc Applied Environmental Sciences</li> <li>▪ MSc Environmental Planning</li> <li>▪ Full Member of the Chartered Institute of Ecology and Environmental Management (MCIEEM)</li> <li>▪ Chartered Environmentalist (CEnv) – 2014</li> <li>▪ Over 20 years' experience working within EIA.</li> </ul>
14	Noise and Vibration Kerith McClung Environmentalist	<ul style="list-style-type: none"> <li>▪ BSc Environmental Science DPP (2018)</li> <li>▪ Member of the Association for</li> </ul>	Malachy McAlister	<ul style="list-style-type: none"> <li>▪ BSc Hons in Music Technology (2008)</li> <li>▪ PGDip Acoustics &amp; Noise Control (2009)</li> </ul>

Chapter	Author	Relevant Experience	Reviewer	Relevant Experience	
		<ul style="list-style-type: none"> <li>Geographic Information</li> <li>6 years' EIA experience</li> </ul>		<ul style="list-style-type: none"> <li>Member of the Institute of Acoustics MIOA (2009)</li> </ul>	
15	Population and Human Health	Kerith McClung Environmentalist	As above	Helen Craig Senior Environmentalist	As above
		Craig Prentice Senior Environmentalist	As above		
16	Hydrology and Drainage	Isabel Keily-Atkin Environmentalist	<ul style="list-style-type: none"> <li>MSc River Environments</li> <li>BSc (Hons) Zoology</li> <li>Member of The Chartered Institute of Water and Environmental Management</li> <li>5 years' experience within EIA</li> </ul>	Helen Craig Senior Environmentalist	As above
17	Climate	Danielle King Principal Climate Change Consultant (RSK)	<ul style="list-style-type: none"> <li>Specialises in climate change risk and impact assessment, greenhouse gas assessment and verification, and the development of sustainability strategy and policy.</li> <li>Comprehensive knowledge of national and international climate change and environmental law and policy.</li> </ul>	Aisling McParland	<ul style="list-style-type: none"> <li>BSc (Hons) Environmental Science</li> <li>PDip Acoustic and Noise Control</li> <li>Affiliate member of IEMA</li> <li>Over 14 years' experience</li> </ul>
		Jamie Blunden Senior Environmental Consultant (RSK)	<ul style="list-style-type: none"> <li>Specialises in building and infrastructure life cycle carbon assessments and company</li> </ul>		

Chapter	Author	Relevant Experience	Reviewer	Relevant Experience
		carbon footprint assessments. <ul style="list-style-type: none"> <li>Practitioner member of the Institute of Environmental Management and Assessment (IEMA)</li> <li>Trained internal environmental auditor.</li> </ul>		
18	Interactions and Cumulative Effects			
19	Schedule of Environmental Commitments	Craig Prentice Senior Environmentalist	As above	Helen Craig As above
20	Assessment Summary Tables			

## 1.6. ES Availability and Comments

1.6.1 In line with Regulation 12 of the Drainage (Environmental Impact Assessment) Regulations (Northern Ireland) 2017), the Department shall by general and local advertisement give notice in accordance with points below, as set out within the regulations:

1.6.2 The advertisement shall state:

- That the environmental statement has been prepared and give details of the locations where and times at which copies, together with details of the proposed drainage works to which the environmental statement relates, may be inspected;
- That any person wishing to make representations in relation to the likely environmental effects of the proposed drainage works to which the statement relates shall make them in writing to the Department at the address specified in the advertisement within 30 days of the publication of the notice in the Belfast Gazette; and
- That where no objection in relation to the likely environmental effects of the drainage works is made and the Drainage Council, having undertaken the examination specified in regulation 16(1), considers that the drainage works should be approved, it may so determine.

1.6.3 On or before the date of publication in the Belfast Gazette of the notice under paragraph (1), the Department shall:

- Send a copy of the environmental statement and notice to each of the consultation bodies so that any such body has an opportunity to make representations on the likely environmental effects of the drainage works to which the statement relates before the expiry of the period specified in the notice;
- Make available for inspection at an office of the Department or some other convenient place for a period of at least 30 days following the date of publication of the notice in the Belfast Gazette, the details of the proposed drainage works and the environmental statement relating to the drainage works;



- Ensure that a reasonable number of copies of the statement are made available and, if a charge is to be made for any such copy under regulation 14, the amount of the charge; and
- Place the notice and a copy of the environmental statement on a website maintained by the Department.

1.6.4 Where the Department sends any person a copy of the environmental statement it shall consult with that person about the assessment and the likely environmental effects of the proposed drainage works to which it relates.

1.6.5 Copies of the ES may be inspected free of charge during office hours at the following deposit locations:

- Armagh City Banbridge & Craigavon Borough Council, Lakeview Rd, Craigavon BT64 1AL
- Portadown Town Hall, 15 Edward St, Portadown, Craigavon BT62 3LX
- DfI Rivers HQ, 49 Tullywiggan Road, Loughry, Cookstown, BT80 8SG.

1.6.6 A copy of the ES will also be available for viewing at <https://www.infrastructure-ni.gov.uk/articles/portadown-floodalleviation-scheme>.

1.6.7 A bound paper copy of the ES may be purchased at a cost of £200 by writing to the address provided below. The NTS is available free of charge from the same address. Copies may also be requested by email or at the address below.

Mr Mark Glendinning,

DfI – Rivers CPU,

49 Tullywiggan Road,

Loughry,

Cookstown,

Co. Tyrone,

BT80 8SG.

[Mark.Glendinning@infrastructure-ni.gov.uk](mailto:Mark.Glendinning@infrastructure-ni.gov.uk)

## 2. Environmental Impact Assessment

### 2.1. EIA Legislation and Guidance

#### EIA Directive

- 2.1.1 Environmental Impact Assessment (EIA) is a process undertaken by project proposers when it is considered that a development proposal may have significant effects on the environment.
- 2.1.2 EIA is required under the European Directive 85/337/EEC, known as the EIA Directive, which came into effect in 1985 (Ref 2.1). The Directive initiated a formal approach to environmental assessment throughout the European Community and required Member States to assess the effects that public and private projects have upon the environment. It has been amended three times; in 1997, 2003 and in 2009. The initial Directive of 1985 and its three amendments have been codified by Directive 2011/92/EU in December 2011. Directive 2011/92/EU was then amended in 2014 by Directive 2014/52/EU which entered into force on 15th May 2014.

#### The Drainage (Environmental Impact Assessment) Regulations (Northern Ireland) 2017

- 2.1.3 For the assessment of impacts resulting from drainage and flood schemes, the EIA Directive is transposed into Northern Ireland legislation through The Drainage (Environmental Impact Assessment) Regulations (Northern Ireland) 2017 (Ref 2.2). Following the UK exit from the EU, this is amended through the Drainage (Environmental Impact Assessment) (Amendment) (Northern Ireland) (EU Exit) Regulations 2019.
- 2.1.4 Under this legislation, the Department for Infrastructure is named the relevant authority to determine if a scheme is subject to the requirements of the EIA Directive. The Regulations require the Department in the execution of certain drainage works and drainage schemes, to produce an environmental statement, and on the basis of that statement, to decide whether or not to proceed with the drainage works or drainage schemes in question.
- 2.1.5 The legislation defines drainage works as the following;
- Any works carried out under the Drainage Order for the purpose of draining land or for preventing or mitigating flooding or erosion to which land is subject and includes the construction, cleansing, scouring, deepening, widening, straightening or diverting of any watercourse or outfall for water, canalisation, the construction, installation or alteration of any pump, pump machinery or pump-house, the removal of any obstruction, natural or artificial, in any watercourse and the construction, repair, raising, lowering, widening, straightening, altering or removal of any embankment, dam, barrier, sluice, weir, wall, culvert or groyne or of any structure or erection for the purpose of defence against, or relief from, water; or
  - Any changes made to or extension of such works.
- 2.1.6 As the proposed scheme involves flood alleviation works, it falls within the description of drainage works and is therefore considered under this legislation.

### 2.2. EIA Screening

- 2.2.1 The requirement to carry out a statutory EIA only applies to certain projects that are deemed to exceed certain thresholds and that are predicted to have a significant effect on the environment. The process for deciding whether it is necessary to carry out an EIA is called Screening.
- 2.2.2 The screening process contains a number of steps, as detailed below:
- Step 1: Identify whether projects fall under Annex I or II of the EIA Directive. All projects listed within Annex I of the EIA Directive require mandatory EIA as these are projects which are considered to result in significant effects on the environment. Such projects include long distance railway lines, motorways and airport runways. For projects listed within Annex II, the relevant authority must determine whether an EIA is required.

- Step 2: Identify whether an Annex II project represents a 'relevant project'. For projects listed within Annex II, they must be screened against the criteria listed within Annex II to determine if they are a 'relevant project'.
- Step 3: The 'determination' for the purposes of the Drainage (Environmental Impact Assessment) Regulations (Northern Ireland) 2017 as amended by the Drainage (Environmental Impact Assessment) (Amendment) (Northern Ireland) (EU Exit) Regulations 2019 and whether the project should be subject to an EIA;
- Step 4: Reporting the determination.

2.2.3 In 2020, Amey Consulting completed a screening exercise in order to determine whether an EIA would be required for the Portadown flood alleviation scheme. The screening concluded that the proposed scheme falls within Annex II of the EIA Directive. Drainage projects listed within Annex II of the Directive are listed below. Where any of these projects exceed an area of 1ha, they are considered to be a 'relevant project'.

- Inland-waterway construction not included in Annex I, canalisation and flood-relief works;
- Dams and other installations designed to hold water or store it on a long-term basis (projects not included in Annex I)
- Works for the transfer of water resources between river basins not included in Annex I.

2.2.4 As the proposed scheme is flood relief works, where the 20 sites collectively exceed an area of 1ha, the project is considered to be a relevant Annex II project.

2.2.5 Regulation 7 of the Drainage (Environmental Impact Assessment) Regulations (Northern Ireland) 2017 states that the Department must provide specified information on proposed drainage works of the type listed in Annex II to the Directive and consider the selection criteria in Schedule 2B to the Drainage Order when deciding if there are any likely effects of the drainage works on the environment. Schedule 2B of the Drainage Order adopts the criteria referred to in Article 4(3) of the EIA Directive, as set out below.

#### **Characteristics of drainage works or drainage schemes "the works"**

2.2.6 The characteristics of drainage schemes must be considered having regard, in particular, to:

- The use of natural resources, in particular land, soil, water and biodiversity;
- The production of waste;
- Pollution and nuisances;
- The risk of major accidents or disasters which are relevant to the works concerned, including
- Those caused by climate change, in accordance with scientific knowledge, having regard in particular to substances or technologies used; and
- The risks to human health (for example due to water contamination or air pollution).

#### **Location of drainage works or drainage schemes**

2.2.7 The environmental sensitivity of geographical areas likely to be affected by the works must be considered, having regard in particular to the:

- Existing and approved land use;
- Relative abundance, availability, quality and regenerative capacity of natural resources (including soil, land, water and biodiversity) in the area and its underground; and
- Absorption capacity of the natural environment, paying particular attention to the following areas:

- 0 Wetlands, riparian areas, river mouths;
- 0 Coastal zones and the marine environment;
- 0 Mountain and forest areas;
- 0 Nature reserves and parks;
- 0 Areas classified or protected under European Economic Area (EEA) States' legislation, Natura 2000 areas designated by EEA States pursuant to Directive 92/43/EEC and Directive 2009/147/EC;
- 0 Areas in which there has already been a failure to meet the environmental quality standards, laid down in Union legislation and relevant to the project, or in which it is considered that there is such a failure;
- 0 Densely populated areas; and
- 0 Landscapes and sites of historical, cultural or archaeological significance.

### **Type and characteristics of the potential impact**

2.2.8 The likely significant effects on the environment must be considered in relation to the criteria set out under the sub-sections above with regard to the impact of the works on the factors specified in Article 3(1) of the Directive, and having regard, in particular, to the:

- Magnitude and spatial extent of the impact of the works (for example the geographical area and size of the population likely to be affected);
- Nature of the impact;
- Transboundary nature of the impact;
- Intensity and complexity of the impact;
- Probability of the impact;
- Expected onset, duration, frequency and reversibility of the impact;
- Accumulation of the impact with the impact of other existing and/or approved projects; and
- Possibility of effectively reducing the impact.

2.2.9 The screening report subsequently reviewed the scheme against the criteria within Annex III of the EIA Directive, as transposed through Schedule 2B of the Drainage (EIA) Regulations (NI) 2017. In line with the requirements of the EIA Directive, the screening procedure was to ensure that the environmental impact assessment was proportionate and to identify any impacts which are likely to have significant effects on the environment.

2.2.10 The screening concluded that there is potential for the scheme to have significant effects on the environment through visual impacts for residential properties and through potential hydrological changes to Brackagh Bog. Construction impacts, although temporary and generally of short duration, were considered as having the potential to be significant.

2.2.11 The screening report therefore recommended that an EIA should be undertaken and an ES published. The screening report was submitted to the Department in October 2020, who agreed with the outcome of the report that EIA would be required.

## **2.3. EIA Scoping**

2.3.1 The scoping process determines the potential environmental effects which should be assessed as part of the EIA and reported within the ES. The purpose of the scoping process is to ensure that the EIA focuses only

those topics and matters where potentially significant effects may arise as a result of the proposed scheme. As a consequence of this exercise, certain environmental disciplines or 'topics' can be excluded from the environmental assessment ("scoped out" of the EIA) if the scoping process identifies no likely significant effects.

2.3.2 In October 2020, Amey Consulting prepared a scoping report for the proposed scheme to ascertain the likely significant effects. The scoping report is available in **Appendix 2.1, Volume 3**. The report concluded that each topic, with the exception of Traffic and Transport, Materials and Waste and Major Accidents and Disasters, require further assessment to determine the likelihood of impacts during construction. With regard to operation the report concluded that further assessment to determine the potential effects during operation was required for the following topics; biodiversity (terrestrial and aquatic ecology), cultural heritage, landscape and visual, hydrology and drainage and population and human health. The report was made available to Shared Environmental Services (SES) for comment and was submitted to the Department in October 2020. The Department agreed with the conclusions within the report. Table 2.1 summarises the results of the scoping exercise. It should be noted that post submission of the scoping report, a further flood defence site (Site N2) was designed and incorporated into the scheme. As a result, Site N2 is considered within all topic assessments within the ES. Full site descriptions are available in Section 6.2.

2.3.3 The scoping chapter for terrestrial biodiversity identified that some of the habitats near the proposed flood defences had suitability to support overwintering birds. In addition, given the hydrological connection between the River Bann and Lough Neagh, it was determined that an assessment under the Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995 would be carried out in conjunction with the ES.

Table 2.1 Summary of scoping report

Topic	Potential Effects	Scoped in - phases	Scoped in - sites	Scoped out-sites
Air quality	<ul style="list-style-type: none"> <li>Annoyance due to dust soiling;</li> <li>The risk of health effects due to an increase in exposure to PM10; and harm to ecological receptors</li> </ul>	Construction (dust generating activities)	All sites	N/A
Noise and vibration	Receptors may experience changes in noise and vibration environment due to plant and machinery.	Construction	All sites	N/A
Biodiversity – Terrestrial ecology	<p>Potential impacts that could arise from the scheme include:</p> <ul style="list-style-type: none"> <li>Temporary loss or fragmentation of habitat important for protected species;</li> <li>Destruction, damage or obstruction of a protected species' place of shelter or protection;</li> <li>Disturbance of a protected species through increased noise, vibration, artificial light and human activity;</li> <li>Disturbance to wintering birds;</li> <li>Dust deposition on nearby habitats which have been designated for nature conservation.</li> </ul>	Construction and operational	<ul style="list-style-type: none"> <li>A: Ashgrove Road</li> <li>A1: Corcrair Mews</li> <li>B: Derryanvil Road</li> <li>C: Woodside Green</li> <li>F: Rose Cottages</li> <li>H: Castle Street</li> <li>I: Foundry Street</li> <li>J: Bowling Green</li> <li>K: Health Centre</li> <li>L: Irwins Mill</li> <li>M: Annagh Hill</li> <li>N: Olde Golf Links</li> <li>O: 313 Tandragee Road</li> <li>P: Derryvore Lane</li> <li>Q: Ripley Mews</li> <li>R: Corcullentragh Road</li> </ul>	<ul style="list-style-type: none"> <li>D: People's Park</li> <li>E: Parkside</li> <li>S: Corcrair Drive</li> </ul>

Topic	Potential Effects	Scoped in - phases	Scoped in - sites	Scoped out-sites
Biodiversity – Aquatic ecology	<p>Potential impacts that could arise from the scheme include:</p> <ul style="list-style-type: none"> <li>▪ Pollution from sedimentation reducing water quality;</li> <li>▪ Accidental spillages;</li> <li>▪ Temporary changes to the hydrological regime of the river;</li> <li>▪ Loss of bankside vegetation affecting fish habitat;</li> <li>▪ Disturbance to migratory and resident fish from piling;</li> <li>▪ Pollution affecting invertebrate populations; and,</li> <li>▪ Spread of aquatic invasive species, if present.</li> </ul>	Construction	<p>A: Ashgrove Road  A1: Corcraun Mews  C: Woodside Green  D: People’s Park  E: Parkside Obins Street  F: Rose Cottages  H: Castle Street  I: Foundry Street  J: Bowling Green  L: Irwins Mill  M: Annagh Hill  N: Olde Golf Links  R: Corcullentragh Road</p>	<p>B: Derryanvil Road  Q: Ripley Mews  O: Tandragee Road  P: Derryvore Lane  S: Corcraun Drive</p>
Cultural heritage	<p>Potential for proposed schemes to have direct impact on assets or impact the setting or assets.</p>	Construction and operational	<p>H: Castle Street  I: Foundry Street  J: Bowling Green  K: Health Centre  L: Irwins Mill  N: Olde Golf Links</p>	<p>A: Ashgrove Road  A1: Corcraun Mews  B: Derryanvil Road  C: Woodside Green  D: People’s Park  E: Parkside Obins Street  F: Rose Cottages  M: Annagh Hill  O: Tandragee Road  Q: Ripley Mews  R: Corcullentragh Road  S: Corcraun Drive</p>
Landscape and visual	<ul style="list-style-type: none"> <li>▪ Potential for the proposed schemes to be unsympathetic to surrounding landscape or at odds with the current landscape character along the Towpath network</li> <li>▪ Potential for visual receptors to be adversely impacted.</li> </ul>	Construction and operational	<p>A: Ashgrove Road  A1: Corcraun Mews  B: Derryanvil Road  C: Woodside Green  D: People’s Park  E: Parkside Obins Street  H: Castle Street  I: Foundry Street  J: Bowling Green  K: Health Centre  L: Irwins Mills  P: Derryvore Lane  Q: Ripley Mews  R: Corcullentragh Road  S: Corcraun Drive</p>	<p>F: Rose Cottages  M: Annagh Hill  N: Olde Golf Links  O: Tandragee Road</p>

Topic	Potential Effects	Scoped in - phases	Scoped in - sites	Scoped out-sites
Soils, geology and hydrogeology	Potential for adverse effects on health from contaminants encountered during excavations, ground disturbance.	Construction	A1: Corcrain Mews C: Ulster Carpets E: Parkside H: Castle Street I: Foundry Street J: Bowling Green L: Irwins Mill M: Annagh Hill	A: Ashgrove Road B: Derryanvil Road D: People's Park F: Rose Cottages K: Health Centre N: Olde Golf Links O: Tandragee Road P: Derrывore Lane Q: Ripley Mews R: Corcullentragh Road Site S: Ripley Mews
Hydrology and drainage	Adverse impacts on surface water are anticipated due to the proximity of the work to many of the watercourses which flow throughout the study area.	Construction (surface water & flood risk) and operation (flood risk)	All sites	N/A
Population and human health	Potential impacts that could arise from the scheme include: <ul style="list-style-type: none"> <li>Reduce the threat to people and their property;</li> <li>Reduced risk/fear of flooding;</li> <li>Reduced fear of loss of livelihood;</li> <li>Reduction in risk to transport link;</li> <li>Protection of public amenity;</li> <li>Protection of flora and fauna to enhance biodiversity;</li> <li>Enhanced landscape character and visual amenity; and</li> <li>Reduced stress associated with flood risk, dealing with insurers, finding alternative accommodation.</li> </ul>	Construction (socio-economics and health, safety and well-being) and operational (socio-economics, land use and health, safety and well-being)	All sites	N/A
Materials and Waste	The scheme will require materials to construct and result in waste production. However, given the amount of materials required relative to availability and the waste likely to be produced relative to available landfill space, effects are considered to be not significant.	Scoped out	N/A	N/A
Traffic and Transport	No predicted impacts	Scoped out	N/A	N/A
Climate		Construction Operation	All sites	N/A

Topic	Potential Effects	Scoped in - phases	Scoped in - sites	Scoped out-sites
	process and land change use; and <ul style="list-style-type: none"> <li>▪ Climate change adaption</li> </ul>			
Major accidents and disasters	No significant effects	Scoped out	N/A	N/A

2.3.4 As the aim of the scheme is to provide flood defences for properties, decommissioning of the structures is not anticipated. Therefore, decommissioning impacts are scoped out of any further assessment.

## 2.4. Environmental Assessment Methodology

2.4.1 The Environmental Assessment has followed the most up-to-date topic specific guidance, the details of which are provided in each individual topic chapter. Where topic specific guidance is unavailable, the assessment has drawn upon the guidance outlined within the Design Manual for Roads and Bridges (DMRB) LA 104 Environmental Assessment and Monitoring (Ref 2.3).

## 2.5. Structure of Technical Chapters

2.5.1 Each environmental topic has been assigned a separate chapter in the ES (chapter 8 to 17) and the structure of these chapters is detailed below. Whilst the generic structure and terminology applicable to these chapters is presented under the following headings, it should be noted that certain topics have required some alteration. Where this has occurred, full details are provided in the relevant chapter.

- **Introduction:** Provides a summary of what is considered within the technical chapter.
- **Statutory and Policy Context:** Provides a summary of the legislation and planning policy relevant to the environmental topic. This information is used to ensure that the proposed scheme does not conflict with the legislation and planning policies.
- **Methodology:** References guidance and provides a description of the methodology used to assess impacts on the environmental topic as a result of the proposed scheme.
- **Baseline Conditions:** Provides a description of the existing environmental conditions within the selected study area which the proposed scheme will then be assessed against.
- **Evaluation (Value of Resource or Sensitivity of Receptor):** Provides an evaluation or sensitivity of the existing environmental conditions outlined within the baseline section. The EIA process requires the assessment to determine the significance of effects using a combination of the sensitivity of the baseline features and the magnitude of impacts.
- **Impact Assessment:** Identifies the likely impacts resulting from the scheme, during construction and operation. Impacts are defined as the predicted change or deviation from the baseline conditions as a result of the scheme and can be either adverse or beneficial. The impact assessment assumes a future baseline in a do nothing scenario to assess changes as a result of the scheme.
- **Mitigation:** Details the mitigation and enhancement measures which will be implemented over and above embedded mitigation in order to reduce or prevent environmental impacts. One key aim of the environmental assessment process is the development of mitigation measures which will prevent significant adverse impacts upon the environment, or enhancement measures which provide significant benefits to the environment.
- **Residual Effects:** Identifies the likely significant effects as a result of the scheme, taking into account the proposed mitigation measures.



- Monitoring: Summarises how likely significant environmental effects will be monitored during the construction and operation phases of the scheme.
- Summary: Summarises the main effects of the proposed scheme, considering all environmental topics.

### Assessment of Predicted Impacts and Residual Effects

2.5.2 The determination of the significance of effects is a key stage in the EIA process. In general, effect significance has been defined using a combination of the sensitivity (e.g. High, Medium or Low) of the environmental feature, and the magnitude of impact (e.g. Major, Moderate, Minor or Negligible) where appropriate. The criteria for assessing sensitivity and magnitude level have been defined for each environmental topic in the appropriate technical sections of the ES. The overall significance of an effect, considering the relationship between sensitivity and the magnitude level, is also defined for each environmental topic.

### Sensitivity

- 2.5.3 Sensitivity has generally been defined according to the relative value or importance of the feature, (i.e. whether it is of international, national, regional or local importance; by the sensitivity of the receptor in the case of the air quality and noise assessment; or by susceptibility or vulnerability to change in the case of landscape and visual aspects).
- 2.5.4 The typical criteria for assessing the sensitivity of an environmental receptor are described in Table 2.2. It should be noted that there are variations in how sensitivity is assessed, depending on whether an existing framework for sensitivity exists. Moreover, not all of the environmental sensitivity and typical descriptions have necessarily been adopted within each of the technical sections.

Table 2.2 Typical criteria for establishing sensitivity

Value (sensitivity) of receptor / resource	Typical description
Very high	Very high importance and rarity, international scale and very limited potential for substitution.
High	High importance and rarity, national scale, and limited potential for substitution.
Medium	Medium or high importance and rarity, regional scale, limited potential for substitution.
Low	
Negligible	Very low importance and rarity, local scale

### Magnitude of impact

- 2.5.5 Typical descriptions and criteria for defining magnitude of impact are described in Table 2.3. It should be noted that not all of the magnitude of impact and typical descriptions have necessarily been adopted within each of the technical sections.

Table 2.3 Typical criteria for establishing magnitude of impact

Magnitude of Impact (change)		Typical description
Major	Adverse	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements
	Beneficial	Large scale or major improvement of resource quality; extensive restoration; major improvement of attribute quality
Moderate	Adverse	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements
	Beneficial	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality.
Minor	Adverse	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements
	Beneficial	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring
Negligible	Adverse	Very minor loss or detrimental alteration to one or more characteristics, features or elements
	Beneficial	Very minor benefit to or positive addition of one or more characteristics, features or elements
No Change		No loss or alteration of characteristics, features or elements; no observable impact in either direction

2.5.6 The duration of impacts can be short, medium or long term. Short term impacts will generally occur during the construction phase of the scheme, the construction phase for the scheme is expected to be 36 months. Medium term impacts may last between 1-5 years, while long term impacts could be 5-10 years.

### Significance of effect

2.5.7 The approach to assigning significance of effect relies on reasoned argument, professional judgement, and advice of appropriate stakeholders. For some disciplines, predicted effects may be compared with quantitative thresholds and scales in determining significance. Assigning each effect to one of the five significance categories enables different topic issues to be placed upon the same scale, in order to assist the decision-making process. The matrix in Table 2.4 is used to determine the overall significance of effect for the majority of the environmental topics.

Table 2.4 Significance of effect matrix

	Magnitude of Impact (degree of change)				
	No Change	Negligible	Minor	Moderate	Major
Very High	Neutral	Slight	Moderate or large	Large or very large	Very large
High	Neutral	Slight	Moderate or large	Moderate or large	Large or very large
Medium	Neutral	Neutral or slight	Moderate	Moderate	Moderate or large

	<b>Low</b>	Neutral	Neutral or slight	Slight	Slight	Slight or moderate
	<b>Negligible</b>	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight

2.5.8 It should be noted that significance categories are required for positive (beneficial) as well as negative (adverse) effects. The five significance categories give rise to eight potential outcomes. As evident within the matrix in Table 2.4, the greater the environmental sensitivity or value of the receptor or resource, and the greater the magnitude of impact, the more significant the effect. The consequences of a highly valued environmental resource suffering a major detrimental impact would be a very significant adverse effect. The typical significance categories are presented in Table 2.5.

Table 2.5 Significance of effect categories and typical descriptors

Significance Category	Typical Descriptors of Effect
Very large	Effects at this level are material in the decision-making process.
Large	Effects at this level are likely to be material in the decision-making process.
Moderate	Effects at this level can be considered to be material decision-making factors.
Slight	
Neutral	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

## 2.6. Cumulative Effects

2.6.1 The assessment of cumulative effects is a requirement under the EIA Directive 2014/52/EU. Chapter 18 of the ES considers the cumulative effects of the proposed scheme and has followed the guidance outlined within LA 104.

2.6.2 Cumulative effects comprise the combined effects of reasonably foreseeable human induced changes within a specific geographical area on receptors over a certain period of time and can be both direct and indirect. Assessment of the significance of cumulative effects needs to be undertaken in the context of the characteristics of the existing environment.

2.6.3 Two types of cumulative effects are considered within the assessment:

- Effects from a single project (e.g numerous different effects impacting a single receptor) and;
- Effects from different projects (together with the project being assessed).

2.6.4 The depth of cumulative assessment is usually dependent on the information available on the other proposed schemes within or near the study area.

2.6.5 There is currently no standard methodology for the assessment of cumulative effects however there is a range of guidance available. The following guidance has been taken into consideration during the preparation of this chapter;

- Design Manual for Roads and Bridges (DMRB) LA 104 Environmental assessment and monitoring (Standards for Highways, 2020 (section 3.19 – 3.22), which sets out a high-level methodology for assessing cumulative effects on highways projects.

- Planning Inspectorate advice note seventeen: Cumulative effects assessment relevant to nationally significant infrastructure projects (Planning Inspectorate, 2019) (Ref 2.4).

## 2.7. Habitats Regulations Assessment

- 2.7.1 The European Commission Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (Habitats Directive), is transposed in Northern Ireland by the Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995, the Conservation (Natural Habitats, etc.) (Amendment) Regulations (Northern Ireland) 2012, and the Conservation (Natural Habitats, etc.) (Amendment) (Northern Ireland) (EU Exit) Regulations 2019.
- 2.7.2 The Habitats Directive provides legal protection for habitats and species of European importance. Under Article 6 (3) of the Habitats Directive *'any plan or project not directly connected with or necessary to the management of the 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. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of the paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.'*
- 2.7.3 Regulation 43 (1) of the Habitats Regulations (NI) requires that:
- '(1) A competent authority, before deciding to undertake, or give any consent, permission or other authorisation for a plan or project which-*
- a) is likely to have a significant effect on a European site in Northern Ireland (either alone or in combination with other plans or projects), and;*
- b) is not directly connected with or necessary to the management of the site, shall make an appropriate assessment of the implications for the site in view of that site's conservation objectives'.*
- 2.7.4 The European Commission document 'Methodological Guidance on the provision of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC' (Ref 2.5) recommends a four stage approach in carrying out a Habitats Regulations Assessment as follows.

### Stage 1 Screening

- 2.7.5 Determines whether a plan or project, either alone or in combination with other plans or projects, is likely to have a significant effect upon a European site. A significant effect is any effect that would undermine the conservation objectives for a European site.
- 2.7.6 If the screening process identifies effects to be significant, potentially significant or uncertain, or if the screening process becomes overly complicated, then the process must proceed to Stage 2. The process should apply the precautionary principle to ascertain if significant effects are likely.

### Stage 2 Appropriate Assessment

- 2.7.7 Considers the impact on the integrity of the European sites of the project or plan, either alone or in combination with other plans or projects with respect to the site's structure and function and its conservation objectives. Additionally, where there are adverse impacts, it assesses the potential mitigation for those impacts.

### Stage 3 Assessment of Alternative Solutions

- 2.7.8 Examines alternative ways of achieving the objectives of the project or plan that avoid adverse impacts on the integrity of the European sites.

**Stage 4 Assessment where no Alternative Solutions Exist and where Adverse Impacts Remain**

2.7.9 Assesses compensatory measures where, in the light of an assessment of imperative reasons of overriding public interest (IROPI), it is deemed that the plan or project should proceed.

**European Sites**

2.7.10 The desk study carried out at the scoping stage identified a hydrological connection between River Bann and Lough Neagh, as the Bann flows into the lough north of Portadown. Lough Neagh is designated as a Special Protection Area for its bird populations, and as a wetland of international importance (Ramsar site). As such the proposed flood alleviation scheme in Portadown must fulfil the requirements of the Habitats Directive. Therefore a Statement to inform a Habitats Regulations Assessment has been prepared in conjunction with this ES. This document can be viewed on <https://www.infrastructure-ni.gov.uk/articles/portadown-flood-alleviation-scheme#toc-7>. A summary of the HRA is provided in Chapter 11 Terrestrial Biodiversity.

## 3. Legislative and Policy Context

### 3.1. National

#### **The Water and Floods (Amendment) (Northern Ireland) (EU Exit) Regulations 2019**

- 3.1.1 In response to major flood events throughout Europe between 1998 and 2009, the EU prepared and implemented a directive aimed at reducing and preventing impacts from flooding through a flood risk assessment framework. The EU Flood Directive 2007/60/EC on the assessment and management of flood risk came into force on 26th November 2007. The directive required member states to assess the flood risk of all watercourses and coast lines within their regulatory boundaries and to map the flood extent and assets at risk within these areas.
- 3.1.2 This EU Directive was transposed in Northern Ireland legislation through The Water Environment (Floods Directive) Regulations (Northern Ireland) 2009, later amended to The Water Environment (Floods Directive) (Amendment) Regulation (Northern Ireland) in 2018 and most recently The Water and Floods (Amendment) (Northern Ireland) (EU Exit) Regulations 2019 (Ref 3.1). In line with the Directive, the legislation requires the preparation of flood risk mapping and flood risk management plans on a catchment scale on continuous cycles.

#### **The Water (Amendment) (Northern Ireland) (EU Exit) Regulations 2019**

- 3.1.3 The Water Framework Directive (WFD) (2000/60/EC) (Ref 3.2) is a key piece of European legislation which was introduced in 2000 as a way of protecting and improving the quality of watercourses in European member states. The Directive introduced a holistic approach to the management of water quality through the implementation of River Basin Management on a catchment level. It requires the protection and improvement of all aspects of the water environment including rivers, lakes, estuaries, coastal waters and groundwater. The Directive was first introduced into Northern Ireland legislation through the Water Environment (Water Framework Directive) Regulations 2003, later amended by the Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2017 and the Water (Amendment) (Northern Ireland) (EU Exit) Regulations 2019 (Ref 3.3). The regulations place a responsibility on Northern Ireland to ensure that all inland and coastal waters reach at least "good status" (or good ecological potential for artificial or heavily modified water bodies). The regulations use a five status classification for waterbodies: High, Good, Moderate, Poor and Bad and allows for extended deadlines or less stringent objectives to be set for water bodies, should certain conditions be met.
- 3.1.4 To achieve the target of reaching good status or above, Northern Ireland is required to implement management planning at river basin level, linking with other key policy areas such as agriculture, land use, biodiversity, tourism, recreation and flood protection. This is done through the publication of a River Basin Management Plan (RBMP) which sets out a programme of measures to be implemented over six-year cycles aimed at improving the status of waterbodies.

#### **The Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995**

- 3.1.5 These Regulations as amended in 2012 and 2019 (the Conservation (Natural Habitats, etc.) (Amendment) Regulations (Northern Ireland) 2012, and the Conservation (Natural Habitats, etc.) (Amendment) (Northern Ireland) (EU Exit) Regulations 2019), provide legal protection for species of European importance.
- 3.1.6 This legislation implemented the creation of a network of sites called Natura 2000, which in the UK are now referred to as European Sites. The Birds Directive requires the establishment of Special Protection Areas (SPAs) for birds. The Habitats Directive similarly requires Special Areas of Conservation (SACs) to be designated for other species and for particular habitats. Together, SPAs and SACs make up the European Sites series. All EU Member States contribute to the network of sites in a Europe wide partnership.
- 3.1.7 From January 2021 SACs and SPAs in the UK no longer form part of the EU Natura 2000 network. The 2019 Habitats Regulations Exit Regulations created a national site network on land and sea and include both inshore and offshore marine areas in the UK. All the existing SACs and SPAs are still subject to the existing protection regime, including the requirement to undertake an assessment on plans and projects that may affect the network.

## Regional Development Strategy 2035

3.1.8 The Regional Development Strategy (RDS) (Ref 3.4) is the spatial strategy of the Northern Ireland Executive and sets out the future development of Northern Ireland to 2035. It provides an overarching strategic planning framework to facilitate and guide the public and private sectors. The strategy has eight aims including the following which relate to the environment;

- Promote development which improves the health and well-being of communities;
- Improve connectivity to enhance the movement of people, goods, energy and information between places;
- Protect and enhance the environment for its own sake;
- Take actions to reduce Northern Ireland's carbon footprint and facilitate adaptation to climate change.

3.1.9 In regards to the environment, the RDS lists several Regional Guidance (RG) aims, those which are relevant to the proposed scheme are detailed below.

### **RG9: Reduce our carbon footprint and facilitate mitigation and adaptation to climate change whilst improving air quality**

- Minimise development in areas at risk from flooding from rivers, the sea and surface water run-off. The RDS sets out that flooding is a natural phenomenon that cannot be entirely prevented. It states that a precautionary approach to development in areas of flood risk should be exercised using the latest flood risk information available and that town and cities should be developed in a manner that avoids the risk where possible. Developments in areas, even those outside flood risk areas should incorporate Sustainable Drainage Systems (SuDS).
- Identify key assets and areas that are at risk through climate change. The RDS sets out that in adapting to climate change it is essential accurate and reliable information about key assets is maintained. These include impacts on species and habitats and on health through the impacts of warmer temperatures, storms, floods, rising sea level, coastal erosion and the coastal squeeze caused by habitats that are trapped between a fixed landward boundary, such as a sea wall and rising sea levels.

### **RG11: Conserve, protect and, where possible, enhance our built heritage and our natural environment**

3.1.10 RG11 sets out various aims in order to conserve, protect and enhance the built heritage assets and natural environment that Northern Ireland has to offer. One of the main aims relating to the proposed scheme is the protection, enhancement and restoration of the quality of all inland waterbodies within Northern Ireland.

### **RG12: Promote a more sustainable approach to the provision of water and sewerage services and flood risk management.**

3.1.11 Encourage sustainable surface water management. The RDS states that greater use of Sustainable Drainage Systems (SuDS) should be encouraged, particularly as part of significant development proposals. SuDS provide a water quality benefit and if designed appropriately can help control flows into rivers and drains thereby reducing the risk of flooding.

## **Strategic Planning Policy Statement for Northern Ireland (SPPS)**

3.1.12 The SPPS (Ref 3.5) sets out the Department for Infrastructure's regional planning policies for ensuring consistent development throughout Northern Ireland under a reformed two-tier planning system. The SPPS consolidates numerous separate policy publications into one document and sets out the Department's policy on important planning matters that should be addressed across Northern Ireland.

3.1.13 The provisions outlined in SPPS are incorporated into Local Development Plans (LDPs) and are also consulted during individual planning applications and appeals. The SPPS has a statutory basis under Part 1

of the Planning Act (Northern Ireland) 2011 which requires the Department to formulate and co-ordinate policy for securing the orderly and consistent development of land and the planning of that development.

3.1.14 The following environmental policies outlined within the SPPS relate to the proposed scheme.

### **Preserving and improving the built and natural environment**

3.1.15 This is one of five core planning policies outlined within the SPPS. It sets out that the environment must be managed in a sustainable manner to preserve and improve the built and natural environment and to halt biodiversity loss. The SPPS recognises that the importance of the environment goes beyond the immediate benefits it can provide. It states that unique landscapes (including heritage assets) and biological diversity should be protected as it makes an important contribution to the protection of the wider global ecosystem. It is therefore critical that this vital asset is preserved and improved for the enjoyment and benefit of future generations.

3.1.16 In addition to the core planning policies, SPPS details various subject policies, many of which relate to the environment. One of the subject policies relates to the proposed scheme, as detailed below.

### **Flood risk**

3.1.17 The strategic aims for flood risk include:

- Prevent inappropriate new development in areas known to be at risk of flooding, or that may increase the flood risk elsewhere;
- Ensure that the most up to date information on flood risk is taken into account when determining planning applications and zoning / designating land for development in Local Development Plans (LDPs);
- Manage development in ways that are appropriate to the four main sources of flood risk in Northern Ireland, i.e. fluvial, coastal, surface water and water impoundment (reservoir) breach or failure;
- Seek to protect development that is permitted within flood risk areas by ensuring that adequate and appropriate measures are employed to mitigate and manage the flood risks;
- Promote sustainable development through the retention and restoration of natural flood plains and natural watercourses as a form of flood alleviation and an important environmental and social resource;
- Promote sustainable development through encouraging the use of sustainable drainage for new development and redevelopment / regeneration schemes;
- Promote public awareness of flood risk and the flood risk information that is available and of relevance to undertaking development; and
- Promote an integrated and sustainable approach to the management of development and flood risk which contributes to:
  - The safety and well-being of everyone,
  - The prudent and efficient use of economic resources,
  - The conservation and enhancement of biodiversity, and
  - The conservation of archaeology and the built heritage.

### **Planning policy**

3.1.18 While the Local Councils work on bringing forward their new Local Development Plans in line with the SPPS, planning authorities within Northern Ireland will continue to apply retained planning policy together with the



SPPS. Any conflict between the SPPS and any policy retained under the transitional arrangements must be resolved in the favour of the provisions of the SPPS. The following planning policies have been retained:

- Planning policy statement (PPS) 2: Natural Heritage;
- PPS 6: Planning, archaeology and the built environment;
- PPS 6: Areas of Townscape character;
- PPS 8: Open space, sport and outdoor recreation;
- PPS 15: Planning and flood risk; and
- PPS 18: Renewable energy (Ref 3.6)

### **Planning Policy 15: Planning and flood risk**

3.1.19 Further details on PPS 15 are provided below as this is the policy most relevant to the proposed scheme. The main objectives of the policy are as follows:

- Seek to prevent inappropriate new development in areas known to be at risk of flooding, or that may increase the flood risk elsewhere;
- Ensure that the most up to date information on flood risk is taken into account when determining planning applications and zoning / designating land for development in development plans;
- Adopt a precautionary approach to the identification of land for development through the development plan process and the determination of development proposals, in those areas susceptible to flooding where there is a lack of precise information on present day flood risk or future uncertainties associated with flood estimation, climate change predictions and scientific evidence;
- Manage development in ways that are proportionate and appropriate to the 4 main sources of flood risk present in Northern Ireland, ie fluvial, coastal, surface water and water impoundment (reservoir) breach or failure;
- Seek to protect development that is permitted within flood risk areas by ensuring that adequate and appropriate measures are employed to mitigate and manage the flood risks to the development and elsewhere;
- Support the retention and restoration of natural flood plains and natural watercourses as a form of flood alleviation and an important environmental and social resource, and ensure that this is recognised in the decision making process;
- Promote sustainable development through encouraging the use of sustainable drainage for new developments and redevelopment / regeneration schemes;
- Promote public awareness of flood risk and the flood risk information that is available and of relevance to undertaking development;
- Promote an integrated and sustainable approach, both locally and at catchment scale, to the management of development and flood risk which contributes to:
  - 0 The safety and wellbeing of everyone;
  - 0 The prudent and efficient use of economic resources; and
  - 0 The conservation and enhancement of the natural environment and biodiversity;
  - 0 The conservation of archaeology and the built heritage.

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

- 3.1.20 This Strategy (Ref 3.7), prepared by the Water Policy and Shareholder Division of the Department for Regional Development, sets out a range of initiatives to deliver the Executive's long-term goal of a sustainable water sector in Northern Ireland.
- 3.1.21 The Strategy presents a framework for action which will facilitate implementation of a range of initiatives aimed at delivering the long-term vision to have a sustainable water sector in Northern Ireland. To achieve this vision, the Strategy encourages a sustainable and integrated approach to managing all water needs in a way which promotes regional development, without compromising the environment or increasing flood risk.
- 3.1.22 The strategy focuses on four strategic aims, one of which relates specifically to flood risk management, as below:
- Manage flood risk and drainage in a sustainable manner.
- 3.1.23 There are five sub aims relating to this strategic aim. The aims are detailed below along with identified policies to help ensure the aim is met.
- FRMD Aim 1: Deliver sustainable flood resilient development.
    - FRMD 1A: To ensure land-use planning decisions are informed to help minimise flood risk.
    - FRMD 1B: Make space for surface water management in development plans.
    - FRMD 1C: Sustainable Drainage Systems (SuDS) are the preferred option for managing surface water in new developments.
    - FRMD 1D: Design for drainage exceedance to be incorporated into all new drainage infrastructure.
  - FRMD Aim 2: Manage the catchment to reduce flood risk.
    - FRMD 2A: Effective regulation of reservoir construction and maintenance.
    - FRMD 2B: Manage rural land within catchments to reduce surface runoff and provide flood storage.
    - FRMD 2C: Manage urban areas to reduce surface water run-off and provide flood storage.
    - FRMD 2D: Effective education and public awareness on sustainable drainage
    - FRMD 2E: Effective watercourse inspection and maintenance.
  - FRMD Aim 3: Provide sustainable integrated drainage in rural and urban areas.
    - FRMD 3A: Establish a strategic overview for flood risk management and integrated drainage.
    - FRMD 3B: Reduce the amount of rainwater in combined sewers.
    - FRMD 3C: Manage 'private' drainage systems to reduce the risk of flooding.
  - FRMD Aim 4: Improve flood resistance and resilience in high flood risk areas.
    - FRMD 4A: Develop and maintain accurate information on flood risk.
    - FRMD 4B: Continue a flood defence and alleviation programme
    - FRMD 4C: Reduce the number of properties at risk of sewer flooding
    - FRMD 4D: Deliver a programme of integrated surface water drainage schemes to alleviate localised flooding.
    - FRMD 4E: Promote the use of Individual Property Protection (IPP).

- FRMD 4F: Ensure affordable flood insurance continues to be available to households and businesses.
- FRMD Aim 5: Be prepared for extreme weather events.
  - FRMD 5A: Provide effective, efficient flood emergency information and communication systems.
  - FRMD 5B: Put in place effective and reliable flood warning systems.
  - FRMD 5C: Effective flood emergency planning and delivery structures.

## 3.2. Local

### Armagh City, Banbridge and Craigavon Local Development Plan and Preferred Options Paper

- 3.2.1 The proposed scheme lies within the local administrative area of Armagh City, Banbridge and Craigavon Council. The district was created 1<sup>st</sup> April 2015 through the merging of the City and District of Armagh, Banbridge District and most of the Borough of Craigavon. Prior to this, Portadown and the surrounding area fell within Craigavon Borough Council. The Local Development Plan for Armagh City, Banbridge and Craigavon is in the process of being developed and is currently at the consultation phase. In the interim, the Council have prepared a Preferred Options Paper (POP) (Ref 3.8) which outlines the key issues for the region over the next 15 years. The POP sets out draft policy framework and land use proposals that will guide development decisions within the Borough up until 2030. Public consultation will help to determine what aspects of this framework will be taken forward and included within the LDP.
- 3.2.2 The LDP aims to facilitate future growth throughout the Borough for housing, employment and services, while protecting the environment. The environmental objectives for the region as set out in the POP are detailed below:
- To conserve, protect and where possible enhance the natural and built environment to improve biodiversity, achieve quality design and promote health and well-being.
  - To promote sustainable high quality design in all developments to assist with climate change adaptation and place-making.
  - To prevent inappropriate new development in areas known to be at risk of flooding or that may increase the flood risk elsewhere and put in place measures to assist in flood risk management.
  - To protect and develop networks of green and blue spaces to support biodiversity and habitats and promote health and well-being.
  - To facilitate integration between land use, planning and transportation to encourage a shift to more sustainable and active modes of transport.
  - To safeguard unique sensitive landscapes from inappropriate development.
  - To protect and enhance the network of open spaces in the Borough and promote opportunities for connections to create an enhanced network of pedestrian paths, cycleways and ecological corridors to improve linkages throughout the Borough.
  - To support the generation of energy from renewable sources in appropriate locations whilst affording protection to the environment including sensitive or vulnerable landscapes.
- 3.2.3 In addition to the overarching environmental objectives, the POP also details key environmental issues that the LDP should address, and further identifies their preferred policy options. Table 3.1 summarises the key issues per environmental topic and the council's preferred options.

Table 3.1 Key environmental issues as outlined within the POP

Environmental topic	Key issue	Preferred option
Built heritage and archaeology	Protecting, conserving and enhancing built heritage and archaeological assets;	An approach in line with existing policy with regards to protecting, conserving and enhancing built heritage and archaeological assets within the Borough; and review existing areas / designations and identify new areas / designations as appropriate.
Natural heritage	Protecting international, national and local nature conservation designations;	An approach in line with existing policy with regards to protecting and enhancing international, national and local nature conservation sites that are not LDP designations.
	Identifying and protecting local nature conservation designations;	An approach in line with the existing policy with regards to protecting and enhancing local nature conservation designations; and review existing and identify new LDP designations as appropriate
Landscape	Identifying and protecting sensitive landscapes;	Consider areas of sensitive landscape for designation as Areas of High Scenic Value (AoHSV) or Special Countryside Areas (SCA)
	Identifying and protecting Local Landscape Policy Areas (LLPAs)	Evaluate and, as appropriate, retain existing Local Landscape Policy Areas (LLPAs) designated in the extant Area Plans; consider the identification of new LLPAs; and introduce a consistent LLPA policy
	Identifying and protecting Urban/Rural Landscape Wedges	Review existing open space wedges and policy zones as potential Urban Landscape Wedges; and identify both new Urban and Rural Landscape Wedges with associated policy
Flood risk and drainage	Developing within areas of flood risk (floodplains);	Adopt a precautionary approach in line with existing policy and regional direction by having a presumption against development in flood plains other than in exceptional circumstances. The precautionary principle will be applied to areas which are currently subject to flood risk or in the future.
	Encouraging Sustainable Drainage Systems (SuDS);	Bring forward policy to encourage the use of Sustainable Drainage Systems (SuDS) in new development where appropriate.
Renewable energy	Facilitating appropriate renewable energy development;	An approach to renewable energy development in line with existing policy but in addition identify areas of sensitive landscape which may be

Environmental topic	Key issue	Preferred option
		unsuitable for particular forms of renewable energy development
	Facilitating sustainable waste management.	An approach to waste management in line with existing criteria based policy but tailored to meet local circumstances; and in addition identify suitable locations for waste management facilities where appropriate.

### Craigavon Area Plan 2010

3.2.4 Prior to the establishment of Armagh City, Banbridge and Craigavon Council, Portadown fell within the administrative area of Craigavon Borough Council and was subject to the development objectives and planning policies outlined within the Craigavon Area Plan 2010 (Ref 3.9). The following planning policy is relevant to the proposed scheme:

- Plan Policy UTIL 1: Development within the Portadown Flood Pondage Area. Development, including proposals involving the raising of land, will not be permitted in those areas of flood pondage lying below the 16 metre Ordnance Datum (O.D.) contour.

### Living with Water- Belfast

3.2.5 Living with Water (Ref 3.10) is a strategic document prepared by the Department for Infrastructure which sets out an integrated plan for drainage and wastewater management for Greater Belfast. The plan sets out the following aims:

- 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.

3.2.6 To develop and deliver this Plan, an interdepartmental group, called the Living With Water Programme (LWWP), has been established.

3.2.7 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).

## 4. Consultation

### 4.1. Consultation Process

4.1.1 In line with EIA regulations, it is a requirement that consultation is undertaken with statutory bodies and other stakeholders who may be impacted by the proposed scheme. This section details the consultation which has taken place to date as part of the EIA process.

4.1.2 Where projects require EIA in accordance with the Drainage (Environmental Impact Assessment) Regulations (Northern Ireland) 2017, projects must ensure;

- The public are given early and effective opportunities to participate in environmental decision making procedures before consent is given.
- The public are informed electronically and by public notices or by other appropriate means that an ES is available.
- The public are consulted for a minimum of 30 days on the ES.
- The authorities likely to be concerned by a project are given an opportunity to express their opinion on the project before consent is given.

4.1.3 The purpose of the consultation process is as follows:

- Ensure that statutory consultees and other environmental stakeholders are informed of the scheme and provided with the opportunity to comment.
- Ensure that baseline data collected in regard to existing environmental conditions is supplemented and supported by information from relevant environmental bodies and local stakeholders.
- Actively encourage local stakeholders to engage with the project to highlight any issues with the proposed scheme.

4.1.4 A list of consultees relevant to the proposed scheme was prepared by the project team environmental specialists using the relevant guidance to identify statutory bodies with responsibilities or interests in the area. Local stakeholders and charity groups have also been identified. Details of the consultees are provided below.

- Armagh City, Banbridge and Craigavon Borough Council;
- RSPB Northern Ireland;
- Northern Ireland Bat Group;
- Northern Ireland Environment Agency (NIEA) – Natural Environment Division;
- NIEA – Water Management Unit;
- NIEA – Development Management Unit;
- Department for Communities - Historic Environment Division;
- Council for Nature Conservation and the Countryside (CNCC);
- Northern Ireland Environment Link (NIEL);
- CEDaR (Ulster Museum);
- Ulster Wildlife Trust (UWT);
- Waterways Ireland;

- DfI - Inland Waterways;
- Ulster Angling Federation;
- Department of Agriculture, Environment and Rural Affairs (DAERA) - Inland Fisheries;
- Drainage Council.

4.1.5 Consultees were contacted by letter via email on 30th September 2021. This provided details of the proposed scheme and invited the consultees to comment on the scheme to help inform the environmental assessment. A copy of the consultation letter is available in **Appendix 4.1, Volume 3**. It should be noted that not all of the consultees responded. A summary of the responses that were received are in Table 4.1.

4.1.6 The comments and views obtained from the consultees have subsequently been used to identify baseline conditions and where possible have been used to form mitigation proposals to minimise scheme effects.

## 4.2. Summary of Consultation Responses

4.2.1 The responses received by consultees are provided in Table 4.1. Full responses from all consultees are available in **Appendix 4.1, Volume 3**.

Table 4.1 Consultee responses

Consultee	Date response received	Response summary
Council for Nature Conservation and the Countryside (CNCC)	09/11/2021	CNCC responded via email on 09/11/2021 indicating that they do not hold any relevant information that could assist the scheme but requested sight of the completed Environmental Statement.
NIEA Water Management Unit	26/10/2021	<p>The NIEA Water Management Unit (WMU) team responded via email on 26/10/2021. They indicated that several other specialist NIEA teams should be consulted in regards to the work, including Pollution Prevention, Natural Environment Division and Inland Fisheries.</p> <p>The WMU advised that given the early stage of the scheme and details provided, they could only provide general advice at this stage. They recommend that several DAERA Standing Advice documents should be consulted and welcomed future consultation on foul sewage, surface water management, the Construction Environmental Management Plan (CEMP) and works within watercourses.</p>
Department for Communities-Historic Environment Division (Historic Buildings)	26/11/2021	<p>HED note that the majority of the proposed flood defences do not directly impact on the setting of listed buildings with the exception of proposed sites C, H &amp; I which affect the setting of the listed building HB14 11 001.</p> <p>As part of their consultation, HED requested further information on earthworks, the height of the flood defences and confirmation of the proposed finishes of the flood defences.</p> <p>It was also noted by HED that high-quality materials are used in the vicinity of listed buildings within Portadown and suggest this should be extended to Portadown town centre to provide a coherent backdrop to the town and that the wider setting of listed buildings is considered.</p>

Consultee	Date response received	Response summary
Department for Communities-Historic Environment Division (Historic Monuments)	29/11/2021	<p>The HED (Historic Monuments) responded on 29/11/2021 indicating that the proposed flood alleviation works have the potential to impact both on below-ground archaeological remains, particularly those relating to the historic development of Portadown as a settlement and industrial centre, on extant industrial and defence heritage assets, including their settings and two designated Local Landscape Policy Areas (LLPAs), which are both based on historic designed landscapes.</p> <p>HED note that of the 20 locations proposed for flood alleviation works, 12 contain or are adjacent to Industrial Heritage sites in the Department's Industrial Heritage Record, Defence Heritage Record sites, LLPAs or are within the historic centre of Portadown.</p> <p>Due to the potential impacts on both heritage assets and their settings and below-ground remains entailed by these proposals, HED HM advise that an archaeological consultant should be engaged to prepare an Archaeological Impact Assessment (AIA) to inform consideration and design of the proposed works and provide an appropriate archaeological mitigation strategy. HES recommend what should be included within the AIA.</p>
DAERA - Inland Fisheries	10/12/2021	<p>DAERA Inland Fisheries responded via email on 10/12/2021. They indicated that the majority of the proposals are located quite a distance from the watercourses and most of the watercourses seem to be lacking in habitat. They confirm that locations K, F, D, B, L, O, R and S can be ruled out for cause of concern.</p> <p>They state that the locations along the River Bann itself are of more concern from a fisheries perspective but that most of the works again appear to be outside of the river itself.</p> <p>They raise concern over a number of issues within their response, including: the use of piling activities, any potential reduction in access to the Public Angling Estate through Portadown and the construction of a culvert at Site M which could potentially create a permanent barrier to fish migration. As a result of these concerns, they requested a site visit to discuss the proposals. Following additional discussions, DAERA were to visit the site and provide any feedback to Amey.</p>

### 4.3. Consultation Meetings

4.3.1 At this stage of the project, consultation meetings have taken place with local landowners and Armagh City, Banbridge and Craigavon Borough Council. No consultation events have taken place with the general public.



#### **4.4. Public Information Day Events**

4.4.1 At the time of writing (January 2023) no public information events have taken place. Public information days are planned to be held in 2023, with dates yet to be confirmed.

## 5. Existing Environment

### 5.1. Overview

- 5.1.1 As detailed within The Drainage (Environmental Impact Assessment) Regulations (Northern Ireland) 2017, the ES should include information on the existing environment to allow the assessment of the environmental effects of the proposed scheme.
- 5.1.2 This section provides an overview of the existing environmental conditions within the study area of the proposed scheme. Further detailed baseline information is available in each topic chapter.
- 5.1.3 The proposed scheme is located within and around the town of Portadown, County Armagh. The works are largely situated around the residential, commercial and community receptors that are located within the town centre which lie adjacent to the River Bann and its tributaries. Outwith the town, agriculture is the predominant land use and farm holdings and residential properties are located sporadically throughout the surrounding countryside.
- 5.1.4 The River Bann is one of the main features of the area and it flows directly through the centre of Portadown. Numerous tributaries of this watercourse also flow throughout the town, including Cushier River, Ballybay/Corcrair River and the Annagh River. The River Bann and its tributaries are a key source of fluvial flooding within the area and Portadown has experienced numerous flood events in recent years, most recently in 2017. As detailed in Section 1.3, in the most recent Northern Ireland Flood Risk Assessment, Portadown and its neighbouring settlement, Craigavon, are classified as 'Areas of Potential Significant Flood Risk' (APSFRR). APSFRR are the areas within Northern Ireland which are considered to be at greatest risk from flooding.

#### Neagh Bann River Catchment

- 5.1.5 The proposed scheme lies entirely within the Neagh Bann river catchment. The Neagh Bann catchment covers an area of approximately 5740km<sup>2</sup>, including County Armagh and large parts of Counties Antrim, Londonderry, Down and Tyrone and a small area of County Fermanagh.
- 5.1.6 The River Bann is the principle river system in the catchment. The source of the river lies in the south east of Northern Ireland close to Spelga Dam. It flows in a northerly direction and into Lough Neagh, approximately 10km to the north of Portadown. Lough Neagh is the largest freshwater lake in the British Isles. It covers 160 square miles and drains almost half of Northern Ireland. Six major rivers flow into the Lough while only one, the Lower Bann, flows out.
- 5.1.7 Due to its international importance for wildfowl Lough Neagh is designated as a Ramsar site, Special Protection Area and Area of Special Scientific Interest.

### 5.2. Study Area and Immediate Surroundings

- 5.2.1 The proposed scheme is comprised of 20 sites located within and surrounding Portadown. Table 5.1 below details the location of each site and provides a brief description of the area surrounding each site. The scheme location is illustrated in **Figure 1.1, Volume 4** and the locations of each flood defence site are illustrated in **Figures 1.2a – 1.2f, Volume 4**.

Table 5.1 Site descriptions

Site Name	Description
Site A: Ashgrove Road	Ashgrove Road lies within the northern extent of Portadown. It is surrounded predominantly by residential properties to the west and farmland to the east. This site also extends along Island Road which runs to the east of Ashgrove Road. Agricultural land primarily lies to the north and south of Island Road.
Site A2: Corcrair Mews	Corcrair Mews lies within the north western extent of Portadown. The site is primarily surrounded by residential properties. The Ballybay river flows to the

Site Name	Description
	immediate north west of the site and beyond this lies St John the Baptist's college. There are a limited number of commercial properties located along Corcrair Road close to the site.
Site B: Derryanvil Road	This site is located outside Portadown to the north east of the town adjacent to a farm. The site is surrounded by agricultural land. A minor tributary of the River Bann flows to the immediate south of the site, while the River Bann itself flows to the east.
Site C: Woodside Green/Ulster Carpets	The works at this site lie within the north east extents of Portadown. It is surrounded by a large retail manufacturing unit (Ulster Carpets). Residential properties lie to the west along Garvaghy Road, Walter Street, Castle Avenue and Woodside Green. Portadown People's Park lies beyond Garvaghy Road to the south west. The site lies immediately adjacent to both the River Bann and Corcrair River.
Site D: People's Park	The work at this site lie within the north east extents of Portadown along the banks of Corcrair River. The People's Park lies to the immediate south/west of the site. Residential properties are located to the east along Whitten Close and King Street and to the north along Garvaghy Road. Beyond Garvaghy Road lies the Ulster Carpets site.
Site E: Parkside	This site lies within the north eastern extent of Portadown close to Portadown People's Park which lies to the north of the site. The Corcrair River flows to the immediate north of the site. Residential properties along Parkside and Obins Street lie to the immediate south. A playing field and sports pitches lie to the east of the site.
Site F: Rose Cottages	This site lies within the north eastern extent of Portadown to the immediate north of Corcrair River. Residential properties lie to the immediate north of the site within the Rose Cottages development. To the south of Corcrair River there are further residential properties located along Obins Street and an area of industrial yards.
Site H: Castle Street	The site lies within the north eastern extents of Portadown to the east of Garvaghy Road and to the immediate west of the River Bann. A number of commercial premises lie to the immediate west of the site.
Site I: Foundry Street	The site lies within the north eastern extents of Portadown, to the west of Foundry Street and to the immediate east of the River Bann. Commercial and industrial premises lie to the east of the site between the River Bann and Foundry Street.
Site J: Bowling Green	The site lies within the eastern extent of Portadown, adjacent to the River Bann. To the west of the works lies Portadown Bowling Green, a park with children's play area, a supermarket and Portadown Boat Club. Beyond this, commercial premises are located along Meadow Lane. On the eastern side of the River Bann there is a large commercial unit and open agricultural land.
Site K: Health Centre	The site lies within the eastern extent of Portadown along Meadow Lane. Agricultural land lies to the immediate east of the works and beyond this, the River Bann. Portadown Health Centre is located to the immediate west of the works at this site.
Site L: Irwins Mill	The site lies within eastern Portadown to the immediate east of the River Bann, close to Goban Street. A large commercial premises lies to the immediate east of the works. Agricultural land lies to the south east of the site.
Site M: Annagh Hill Industrial Estate	The site lies within the south eastern extents of Portadown. The works at this location lie adjacent to both Annagh River and a minor tributary of the River Bann. Annagh Hill industrial estate lies to the west of the site, while agricultural

Site Name	Description
	land lies to the east. Residential properties are located to the north along Mourneview Street.
Site N: Olde Golf Links	The site is located within the southern extents of Portadown on either side of Tandragee Road. To the east of Tandragee Road, the works are surrounded by a football club and residential properties, while agricultural land lies further to the east. To the west of Tandragee Road, there are further residential properties located within the Olde Golf Links development. Beyond this development flows Annagh River.
Site N2: Fairways Estate	This site lies to the south of Portadown to the rear of the residential properties located within the Fairways estate. To the east of the site lies agricultural land and a minor unnamed drainage channel which most likely discharges into the River Bann further to the east. To the west of the site lies the Fairways estate.
Site O: Tandragee Road	The site lies to the south of Portadown to the east of Tandragee Road. The area is rural in nature and the works are surrounded by agricultural land and agricultural outbuildings. Numerous unnamed drainage channels flow to the south east of the site within the agricultural land.
Site P: Derrylvore Lane	The site lies to the north east of Portadown where the land use is predominantly rural. Agricultural land surrounds the majority of the work. There is an industrial estate located off Derrylvore Lane. There are a minor number of residential properties located sporadically throughout the countryside close to Derrylvore Lane as well as a number of unnamed drainage channels.
Site Q: Ripley Mews	The site is located within southern extent of Portadown to the east of the A27. Agricultural land lies to the immediate east of the work, while residential properties located along the A27, Ripley Mews and Ripley Meadows lie to the west and south west.
Site R: Corcullentragh Road	The site is located to the west of Portadown off Corcullentragh Road. The site is surrounded predominantly by farmland. One agricultural property lies to the to the immediate south of the works and the Ballybay River flows to the immediate east.
Site S: Corcrair Drive	The site is located within north west Portadown along Corcrair Drive, Selshion Parade and Drumcree Grove. Ballybay River and playing fields lie to the north west of the works at this location. To the east there are numerous residential properties.

## 6. Description of Proposed Scheme

### 6.1. Introduction

6.1.1 The ES is required to include the information referred to in Schedule 2A to the Drainage Order 1973, as substituted by The Drainage (Environmental Impact Assessment) Regulations (Northern Ireland) 2019. This information should be of sufficient detail to allow the Department to make a reasonable assessment of the proposed drainage works. The information required includes:

- A description of the location of the works;
- A description of the physical characteristics of the whole works, including where relevant, requisite demolition works and the land-use requirements during the construction and operational phases.

6.1.2 This section therefore provides a description of the physical characteristics of the works, the construction activities required and the land use requirements for both the construction and operation phases. The general arrangement drawings are available in **Appendix 6.1, Volume 3**.

### 6.2. Objective of the scheme

6.2.1 The primary objective of the scheme is to provide flood protection, to the residential, commercial and community receptors which are currently at risk of flooding, during a 1% AEP flood event, as indicated within the Flood Risk Management Plans for Northern Ireland (2015). The proposed scheme will be designed to provide protection to properties during a 1% AEP flood event, with allowance for climate change.

### 6.3. Overview - General Description

6.3.1 The proposed scheme involves the provision of flood alleviation infrastructure at 20 sites within and surrounding Portadown. The scheme proposes the construction of both hard and soft flood defences to reduce the risk of flooding from the River Bann, and its tributaries.

6.3.2 The proposed work at each of the 20 sites differs, however it will comprise of one or more of the following;

- Installation of sheet piles;
- Creation of flood embankments or flood walls;
- Realignment of existing pathways;
- Demolition of property walls and fences;
- Tree felling.

### 6.4. Detailed Site Description

6.4.1 Table 6.1 details the proposed work at each of the 20 locations throughout Portadown. The general arrangement drawings are available in **Appendix 6.1, Volume 3**, while the locations of each flood defence site are illustrated in **Figures 1.2a – 1.2f, Volume 4**.

Table 6.1 Proposed work at each site

Site Name	Scheme Description
Site A: Ashgrove Road	The work at this site includes the provision of flood defences along two areas at Ashgrove Road. The first location runs from the northern extents of Ashgrove Road to its junction with Island Road. The works at this location will include localised road realignment, steel sheet piles and an embedded flood wall. The second location is to the rear of the property at 7 Ashgrove Road.

Site Name	Scheme Description
Site A1: Corcrain Mews	The works at this site are to provide flood defences along the Ballybay River, to the rear and west of properties at Corcrain Mews and a wall on Obins Street. The wall will extend along the rear of the Orange Hall on Obins Street. The defences will consist of sheet piles for an approximate total length of 450m.
Site B: Derryanvil Road	The works at this site will provide flood defences around a number of farm outbuildings. The defences will consist of sheet piling which will be constructed along the boundary of the agricultural property to the east, south and west to a height of 15.85 AOD.
Site C: Ulster Carpets	The works at the Ulster Carpet factory consist of the provision of flood defences along the banks of the River Bann and Corcrain River. The defences will consist of a combination of embedded walls and steel sheet piles, which will be constructed to a flood height of 16m AOD. Improvements will be made to Castle Island Bridge and a footbridge which spans Corcrain River in order to raise their parapets to the flood defence level of 16m AOD.
Site D: People's Park	The works at this location involve the provision of flood defences along the banks of Corcrain River at Portadown People's Park. It is proposed to provide sheet piles to a height of 16.40 AOD along the rear of the properties at Whitten Close which will extend around the western extents of the properties. There is an existing footbridge over the Corcrain River at this location and it is proposed to raise the ground level in the vicinity of the path and provide a new section of path over the embankment. The embankment will extend along the Corcrain River through the park at the edge of the playing field. A small area of the park will be locally raised just north of the community centre. Another embankment will be constructed along the north eastern boundary of the park, to provide protection to properties on Garvaghy Road. The existing path will be ramped up to the flood embankment with a maximum gradient of 1:10.
Site E: Parkside	The works at this location involve the construction of flood defences to the south of People's Park at the properties located at Parkside. The flood defences will comprise of an embedded flood wall constructed to a flood defence height of 16.40 AOD. In addition, landscaping will be undertaken to the south of Corcrain River and the footpath adjacent to the playing field at this location will be realigned to a flood defence height of 16.40 AOD.
Site F: Rose Cottages	The works at this location will involve the construction of flood defences to the north of Corcrain River at Rose Cottages. It is proposed to provide steel sheet piles to the rear of the residential properties located on Rose Cottages. The proposed flood protection will be approximately 341m in length and will be constructed to a flood defence height of 16.65m AOD.
Site H: Castle Street	The works at this location will involve the construction of multiple flood defences to the west of the River Bann between Shillington Bridge and Bridge Street. The defences will include a combination of steel sheet piles, embedded walls, reinforced walls, precast panel walls on auger piling, temporary flip up barriers, embankments and landscaping. It is proposed to provide a steel sheet piled flood wall along the rear of the Haldane Fisher storage yard along the riverside path, to a flood defence height of 16.20m AOD. An embedded flood wall will also be constructed beneath Shillington Bridge and around the grass mound to the same flood defence height. Landscaping is proposed to take place to the north of the bridge, again to a flood defence height of 16.20m AOD. A section of precast panel 'L' walls on auger piling are proposed to be constructed to the north of the Haldane Fisher building which will be constructed to a flood defence height of 16.20m AOD. A section of demountable or temporary, flip-up flood barrier will be constructed to the south east of the Haldane Fisher building in front of the coffee shop to maintain riverside views, but which can be quickly erected should flooding be predicted. The total length of flood defences at this location are approximately 330m.
Site I: Foundry Street	The works at this location will involve the construction of flood defences to the east of the River Bann between Shillington Bridge and Bridge Street. The proposed defences are steel sheet piles and an embedded wall. It is proposed to provide an embedded wall

Site Name	Scheme Description
	along the storage yard associated with the commercial properties and along the rear of the buildings at the edge of the Bann. To the west of the existing warehouses the embedded wall will tie into steel sheet pile defences which will run along the riverbank to Bridge Street. Both defences will be constructed to flood defence height of 16.20m AOD. Steps will be provided over the flood wall for access to the existing fishing platforms. The total length of the flood defences at this location is approximately 295m.
Site J: Bowling Green	The works at this location will involve the construction of flood defences to the west of the River Bann between Bridge Street and Portadown Boat Club. The proposals will be a sheet piled wall between the memorial garden and the bowling green, which cuts along the playground and wraps around the western and southern extents of the grassed area beside the playground. The wall then runs along the boundary of the car park for Tesco and to the rear of the boat club. In total the wall will be approximately 500m long.
Site K: Health Centre	The works at this location involve the construction of a flood defence to the east of Portadown Health Centre and to the north west of Annagh River. A secant piled wall is proposed to be constructed along the eastern carriageway verge of Meadow Lane which will run for an approximate length of 154m and will be constructed to a flood defence level of 16.45m.
Site L: Irwins Mill	The works at this location involve the construction of flood defences to the east of the River Bann adjacent to the Irwins Mill industrial site. The work will consist of a steel sheet piled wall. It is proposed to provide a sheet piled flood wall along the rear of the buildings at Irwin's Mill, extending along the eastern side of the building. The total area of flood defences is anticipated to be 460m. The sheet piles will be constructed to a flood defence level of 16.35m AOD.
Site M: Annagh Hill Industrial Estate	The works at this location involve the construction of flood defences to the north east of Annagh Industrial Estate. The works will be a combination of steel sheet piles, embedded flood wall and a reinforced wall. Steel sheet piling is proposed to be constructed along the banks of Annagh River to the southeast of Mourneview Street. The piling will run for an approximate length of 80m and will be constructed to a flood level depth of 16.6m AOD. In-river works will take place at this location within Annagh River through the construction of a culvert and a flap valve. In addition to this, an embedded flood wall is proposed to be constructed along the minor watercourse to the south of Mourneview Street and to the east of Annagh Hill Industrial Estate. The defence will run for an approximate length of 120m and will be constructed to flood defence level of 16.6m AOD. To the east of Annagh Hill industrial estate the embedded wall will tie into a reinforced wall of the same height. The reinforced wall will run for an approximate length of 80m.
Site N: Olde Golf Links	The works at this location involve the construction of flood defences to the east of Annagh River around the housing development at Olde Golf Links. The defences will consist of steel sheet piles and embedded walls. It is proposed to provide an embedded steel sheet pile wall along the boundary of the football pitch at Annagh Football Club and a group of residential properties. Sheet piles will also be constructed around the houses in The Olde Golf Links and 186 Tandragee Road. The total length of flood defence is approximately 988m.
Site N2: Fairways Estate	The works at this location will involve the construction of flood defences to the east of Annagh River along the eastern boundary of the residential development Fairways Estate. A sheet piled wall is proposed at this location, to the rear of properties at Fairways estate. The wall will be approximately 325m in length and will be constructed to a flood defence level of 16.50m AOD.
Site O: Tandragee Road	The works at this location will involve the construction of flood defences around the boundary of agricultural outbuildings which lie to the east of Tandragee Road. The flood defence will be a cantilever flood wall which will run for an approximate length of 419m and will be constructed to a flood defence height of 16.5m AOD.

Site Name	Scheme Description
Site P: Derryvore Lane	The works at this location will involve the construction of flood defences to the north east of the River Bann around the boundary of an industrial estate located on Derryvore Lane. The works will consist of a combination of steel sheet piles, embedded walls and a flood gate. The steel sheet piles will be located along the western boundary of the industrial estate and will run for an approximate length of 440m. In river works will also be required at this location for the installation of a culvert. The wall is proposed to run along the north eastern boundary of the industrial estate where a flood gate will also be installed at the entrance to the property. The wall will run for an approximate length of 100m. The wall will be constructed to a flood defence level of 15.80m AOD.
Site Q: Ripley Mews	The works at this location will involve the construction of flood defences adjacent to the minor watercourse Kingsway Drive Drain to the rear of the residential properties located along Ripley Mews. The defences will comprise steel sheet piles and an earth bund. The steel sheet piles are proposed to be constructed along the eastern bank of Kingsway Drive Drain and will run for an approximate length of 190m. They will be constructed to flood defence level of 15.9m AOD. An earth bund approximately 46m in length is proposed to be constructed to the south east of Ripley Crescent to the flood defence level of 15.9m AOD.
Site R: Corcullentragh Road.	The work at this location involves the construction of flood defences to the west of Ballybay River along the boundary of a residential property located on Corcullentragh Road. The defences comprise of steel sheet piles, earth bunds and road alignments. The steel sheet piles will be constructed along the western banks of Ballybay River immediately adjacent to the residential property. They will run for an approximate length of 60m and will be constructed to a flood defence level of 21.8m AOD. Earth bunds are proposed to be constructed along the south western and north eastern boundaries of the property, totalling an approximate length of 288m. The bunds will be constructed to the flood defence level of 21.8m AOD. A minor road to the east of the east of the property will further be re-aligned to same flood defence level.
Site S: Corcraun Drive	The work at this location involves the construction of flood defences to the east of the River Bann along the boundary of the residential properties located along Corcraun Drive. The defences will be a series of reinforced walls located adjacent to the properties located along Selshion Parade, Drumcree Grove and Charles Park. The walls will run for a total length of approximately 365m and will be constructed to a flood defence level of 18.5m AOD. Further work at this location will include modifications to a footpath to the north of Drumcree Grove which will be realigned to the flood defence level of 18.5m AOD.

## 6.5. Indicative Construction Methodology

6.5.1 The following construction methodology is indicative and will become more accurate as the detailed design develops and further stakeholder engagement is taken into consideration.

6.5.2 A Construction Environmental Management Plan (CEMP) has been prepared and will be adhered to throughout the construction phase. The CEMP will be updated by the Contractor and will be approved by DfI prior to construction. The CEMP is considered a live document and will be updated regularly as construction of the scheme progresses. The draft CEMP is available in **Appendix 6.2, Volume 3**.

### Construction Programme

6.5.3 The programme for the construction of the flood alleviation works is dependent on the successful completion of the statutory procedures and the availability of funding. The current programme for construction works is assumed to be approximately 36 months at this stage. The duration of construction will vary at each site, as detailed in Table 6.2.



Table 6.2 Approximate construction durations per site

Site	Approximate construction duration
A: Ashgrove Road	6 months
A1: Corcrair Mews	3 months
B: Derryanvil Road	6 months
C: Ulster Carpets	9 months
D: People's Park	9 months
E: Parkside	9 months
F: Rose Cottages	6 months
H: Castle Street	9 months
I: Foundry Street	6 months
J: Bowling Green	9 months
K: Health Centre	3 months
L: Irwins Mill	6 months
M: Annagh Hill	6 months
N: Olde Golf Links	9 months
N2: Fairways Estate	6 months
O: Tandragee Road	3 months
P: Derryvore Lane	6 months
Q: Ripley Mews	6 months
R: Corcullentragh Road	3 months
S: Corcrair Drive	

### Indicative works

- 6.5.4 A contract for the construction of the works will be competitively procured. After the contract has been awarded the successful contractor will provide a detailed schedule of work, including risk assessments and methodologies.
- 6.5.5 Preliminary works will involve tasks such as community consultation and liaison, establishing the site compounds, site clearance works, erection of fencing, installation of pollution control/pre-earthworks drainage and establishing traffic management measures.
- 6.5.6 The proposed scheme will involve a combination of in-river works, land based works and temporary works. In river works may be delivered specific to the contractor's method statement, whereas land-based works can be assumed to be completed using traditional construction methods. Generally flood walls are constructed by excavating to the preferred depth and foundations constructed (stone/concrete/structural concrete (rebar)). The proposed flood defence is then either placed onto the foundation and/or tied into the foundation, depending on the preference to pour concrete on site or place a pre-cast unit. Earth embankments follow a similar process, where the existing ground is excavated to a preferred level and

construction make-up installed (clay core generally). The embankment is then formed using soil material, shaped, compacted and landscaped. Piling will be used for both foundation types and flood protection, as detailed later in this Section.

### Construction plant

6.5.7 The following construction plant will likely be required throughout the construction phase. A full list of plant will not be available however until a contractor has been selected.

#### Foundations

- Piling rigs from land (up to 5).
- Piling rigs from barge (up to 5).
- Excavators and Earth movers (up to 10).
- Piling rigs and piling hammer (up to 5).
- Concrete pumps and delivery trucks (up to 5).

#### Superstructure

- Mobile cranes on land (up to 5).
- Barges (up to 5).

#### Approach ramps and surrounding area

- Excavators and Earth movers (up to 10).
- Paving machines (up to 3).
- Material Delivery trucks (up to 10).

#### Site compound

6.5.8 Following engagement with landowners, there are several sites that have been identified as appropriate locations for contractor compounds. Due to the nature of this scheme taking place across 20 sites within an anticipated 36-month programme, it is anticipated that the successful contractor may set up a semi-permanent site offices central within Portadown, with satellite compounds to be used on sites where works are actively taking place. The indicative locations for the site compounds are detailed below and illustrated on **Figures 6.1a-b, Volume 4**:

- Annagh Hill;
- Tandragee Road;
- DfI carpark at Shillington's factory;
- Foundry Street car park; and
- People's Park car park.

#### Proposed structures

6.5.9 Across this flood alleviation scheme, numerous structures and techniques have been considered to deliver an efficient and economically feasible scheme, which provides minimal impact to the surrounding area.

6.5.10 The following techniques will be used throughout the proposed scheme:

- **Raised flood embankments:** The construction of the embankments will involve excavation and earthworks together with clay/ stone placement and compaction. The cores to the embankments will either be sheet piled for deep cut off or clay core, where appropriate (detailed geotechnical design will determine the exact requirements).
- **Reinforced concrete walls:** The construction of the reinforced concrete walls will involve both pre-cast and in-situ solutions. The design will be prepared to allow for in-situ pouring on site (rebar drawings etc) however the preference will be for pre-cast option where appropriate and achievable. Any environmental mitigations should be detailed/communicated to allow for a design preference to be set.
- **Landscaping:** The landscape design proposals for the scheme fall into three design categories, as follows: 1. Public Parks 2. Residential / Agricultural Fringe and 3. Riverside, riverine environments. Each of these three categories will have a particular planting design palette (planting form), appropriate species selection and boundary treatment. Where elevated embankments and walkways are intrinsic to the design, this opportunity will broaden the spectrum of planting solutions.
- **Sheet pile walling:** This involves sections of sheet material with interlocking edges that are driven into the ground to provide earth retention and excavation support. The piles are generally cut to finished height on site after driving, as exact driven lengths cannot be confirmed beforehand.
- **Embedded walls:** An embedded wall is a relatively thin structure which can be anchored into the earth to be used as a retaining wall, where shallow foundations are appropriate to the ground conditions. Such walls are usually made of steel, reinforced concrete, or timber and supported by anchorages, struts, and passive earth pressure. Embedded walls are used where a shallow depth of cut-off is also required, whereas piling becomes the preferred option for deeper cut-off lengths.
- **Raised footpath / walkways:** This will involve excavation and earthworks to meet levels as well as laying of fill and compaction of stone. Walkways will be surfaced appropriate to the surrounding area, e.g. paving stone/bitmac/asphalt etc. The fill used will be dependent upon the ground conditions (existing excavated material if suitable). The construction make-up of the path will be stone to a certain depth (100-200mm stone then surfacing material).
- **Embedded cantilever wall:** As with the embedded walls, earth pressure will be used to anchor the wall and provide retaining support, allows for a shallower excavation.
- **Secant piling:** This involves the formation of a retaining wall through the placement of reinforced concrete piles that interlock to form a continuous wall. Primary piles are cast in-situ followed by secondary piles being cast into prepared primary piles to make a continuous wall. This method involves rotary boring to excavate material, placing steel rebar then pouring concrete (essentially structural concrete below ground level).

## Foundations

- 6.5.11 Various foundations will be used throughout the scheme, dependent on the technique selected for each site. The details for the preferred method of founding the various structures within the sites is identified in each of the general arrangement (GA) site drawings illustrated in **Appendix 6.1, Volume 3**.

## Access and tie ins

- 6.5.12 It is assumed that due to the built-up nature of many of the sites, there will be a large proportion of reinstatement and tying in works to be completed by the contractor. This will be confirmed following further investigation.

## Finishes and Aesthetic considerations

- 6.5.13 The finishes to be used throughout the proposed scheme have been considered by the design team in order to ensure the flood defences tie into the existing environment. Where possible, flood walls will be clad with brickwork which compliments the surrounding urban character. At Site H Castle Street, a flip-up barrier will be constructed in order to maintain views of the River Bann from the surrounding commercial and

recreational assets. Landscaping will take place at all sites which will comprise of bespoke planting mixes. Full details of landscaping are provided in **Chapter 10: Landscape and Visual Effects and Appendix 10.1, Volume 3**.

### Maintenance requirements

- 6.5.14 During design, designers have applied the Eliminate, Reduce, Inform, Control (ERIC) Framework as advised within the Construction Design and Management (CDM) 2015 Regulation 9. This ensures that designs are appropriate for the environment and that designers have eliminated, or reduced risks involved with maintenance of the proposed structures. Where this isn't possible, information will be provided to the appropriate stakeholders to ensure any that residual risks are well documented and reported.
- 6.5.15 Designers will provide a safe access where possible to ensure that both planned and reactive maintenance can be carried out by the appropriate stakeholder, when required.
- 6.5.16 Following completion of works, maintenance will be handed over to DfI Rivers. Maintenance will likely include, but not limited to, public safety risk assessment, vegetation management, debris/graffiti removal, annual visual inspections and resulting nugatory works. Assessment may also be included in the maintenance schedule for the defences.

### Earthworks and quantities

- 6.5.17 Earthworks will be required at each of the proposed 20 sites in order to construct the proposed flood defences. Excavations of topsoil and other material will be necessary to allow the foundations of each flood defence to be constructed. Excavated material will either be temporarily stored on site for later reuse in landscaping and for the creation of earth bunds or will be removed from site. Information on expected quantities of soils excavated was derived from the cost estimates and summarised in Table 6.3.

Table 6.3: Earthwork quantities per site

Site	Approximate excavation quantities of soil m <sup>3</sup>
A: Ashgrove Road	210
A1: Corcraun Mews	109.25
B: Derryanvil Road	75
C: Woodside Green/Ulster Carpets	233.25
D: People's Park	366
E: Parkside	1132
F: Rose Cottages	90
H: Castle Street	356
I: Foundry Street	890
J: Bowling Green	135
K: Health Centre	36.75
L: Irwins Mill	112
M: Annagh Hill	105.65
N: Olde Golf Links	

Site	Approximate excavation quantities of soil m <sup>3</sup>
N2: Fairways Estate	82.5
O: Tandragee Road	1095
P: Derryvore Lane	127.5
Q: Ripley Mews	49
R: Corcullentragh Road	51
S: Corcraín Drive	

### Drainage design

- 6.5.18 Drainage design for this scheme is still to be confirmed. It can be assumed that where additional structures are required and where piling will be undertaken, there will be additional drainage as part of the delivery of the scheme. This will be confirmed following the completion of detailed design.
- 6.5.19 Any drainage design will be to collect and manage any surface water draining to the back of the proposed defences. Generally, it will consist of a carrier pipe with designated outlets (i.e sheet piling) or an extension of the existing drainage to ensure it still has an outlet beyond the proposed defences. Solid carrier pipes, filter drains, gullies and inspection chambers will be utilised across the 20 sites. Non-return valves and flap valves will be used to avoid any backfilling and subsequent flooding of existing outlets.
- 6.5.20 No new standalone drainage systems are proposed as part of this scheme.

### Utilities and services

- 6.5.21 Existing utilities and services, may be altered, diverted, protected or replaced to ensure minimal disruption to the existing utilities infrastructure. Any works surrounding the infrastructure, will be confirmed following the ongoing engagement with providers and the completion of the detailed design.

### Operation

- 6.5.22 The proposed flood defences are a mixture of flood walls and earth embankments. The walls will be clad with suitable material finishes to integrate with the surroundings. There will be no associated infrastructure such as lighting required on or around the walls and embankments.
- 6.5.23 The on-going maintenance of the defences will be minimal in the first years post construction. Routine maintenance on the defences include repair of any defects or gaps in the walls, removal of any encroaching vegetation and repair of embankments/filling in gaps where necessary. Any emissions from maintenance works will be minimal.
- 6.5.24 As the scheme is a flood defence scheme to minimise risk of flooding to properties, they will be operational indefinitely. Decommissioning is not anticipated.

## 6.6. Embedded/Design Mitigation

### Construction

#### Construction Environmental Management Plan

- 6.6.1 A Construction Environmental Management Plan (CEMP), **Appendix 6.2, Volume 3** has been prepared alongside this ES in order to provide the management framework required for the planning and implementation of construction activities in accordance with the environmental commitments outlined within

the ES. The CEMP will be updated on a regular basis as the detail design progresses and it will be a requirement on the Contractor to seek approval of the CEMP from the Department before construction commences. As a minimum, the following water quality and pollution prevention measures will be adhered to.

- A water monitoring regime will be implemented in advance of construction, during and post-construction.
- 10m buffer zones will be established for watercourses where flood defences are not being constructed. Within the buffer zones, works must not occur and materials should not be stored. If works are required within these watercourses, detailed method statements and risk assessments shall be produced for the task, in consultation with the Amey ECoW. Where necessary, the NIEA will be consulted.
- A Pollution Prevention and Spill Response Procedure will be developed by the Contractor for the duration of the works. Spill control measures will be used to contain contaminated materials if spillages occur, such as plastic sheeting, sorbent pads and sorbent booms. All site personnel will be trained in the use of spill control measures. If a reportable spill occurs, the NIEA will be informed immediately.
- Topsoil should be limited to being stripped outside of periods of rainfall, to prevent subsoil being exposed to weathering and scour, with any haul road / working platform material placed as soon as practically possible to reduce exposure and ensure the drainage patterns are uninterrupted for the shortest duration possible during construction.
- Where the use of concrete is required in the construction process, appropriate shuttering will be in place with additional cut-off drains to prevent spillages or excess concrete reaching the watercourse.
- All measures must be taken to ensure that any liquid of a hazardous nature is controlled in accordance with Control of Substances Hazardous to Health (COSHH) Regulations.
- Water from wash-down areas will not be permitted to enter the local water environment untreated.
- No storage of materials on the floodplain or within 10m of any watercourse where flood defences are not being constructed.
- The following list shows measures will be put in place to prevent pollution from oils, fuels and lubricants and conform to the best practice policy proposed by the Northern Ireland Environment Agency via the Pollution Prevention Guidelines (PPG) and Guidance for Pollution Prevention (GPPs);
  - All fuel oils, lubricants and solvents to be stored in bunded areas.
  - Drip trays and plant nappies to be placed under all plant left stationary for more than 24 hours.
  - All refuelling to take place in a bunded area or with suitable drip trays placed during the operation.
  - Oil separators installed just prior to any outfall from site to remove hydrocarbons from catchment areas with a high risk of spillage.
  - Oil absorbent materials will be used to remove small quantities of oil and provide the same oil absorbent materials for emergency spillage clean-up.
  - Sustainable Urban Drainage Systems (SuDS) techniques to filter and biodegrade hydrocarbons.
- The following guidance documents will be adhered to throughout the construction phase:
  - Construction Industry Research and Information Association (CIRIA) Report C532: Control of water pollution from construction sites. Guidance for consultants and contractors (Ref 6.1);
  - CIRIA Report C648: Control of Water Pollution from Linear Construction Projects - Technical Guidance (Ref 6.2); and

- o CIRIA: Control of Water Pollution from Linear Construction Projects, Site Guide (Ref 6.3).

## **Operation**

6.6.2 In terms of the design of the scheme, the operational mitigation embedded into the design includes:

- The extension of existing drainage systems in order to ensure the protection of existing watercourses;
- Provision of footways and shared pedestrian and cycleway footways;
- Landscape design to minimise visual impacts on local receptors;
- Maintaining existing public rights of way,
- Reinstatement of any fishing pontoons that are required to be temporarily removed to accommodate the flood defences.

## 7. Alternatives

### 7.1. Introduction

- 7.1.1 A requirement of the EIA regulations is that alternatives for a scheme are considered during the environmental assessment process. Scheme alternatives could involve an alternative location, design or technology. By considering alternative options, the aim is for the scheme to evolve sustainably by taking into account all constraints throughout the lifetime of the project.
- 7.1.2 As detailed within Section 1.3, RPS Consulting were commissioned by DfI in 2018 to identify the flood risk associated with the watercourse system in Portadown and to assess options for the alleviation of future flooding. Their resulting Portadown Feasibility Study (Ref 7.1) outlined various methods for managing flood risk within the town. The initial options were grouped into four areas as detailed below:
- Protect methods: reduce the likelihood of flooding. Methods include flood walls, flow diversion and upstream storage.
  - Prepare methods: reduce the impact of flooding. Methods include individual property protection, flood forecasting and public awareness campaigns.
  - Prevent methods: avoids future flood risk. Methods include planning and development control.
  - Permit methods: accepts that flooding will occur. Methods include maintaining the existing regime and doing a minimal amount of maintenance.
- 7.1.3 The feasibility study assessed whether an economical, environmentally and socially sensitive scheme could be produced which would alleviate flood risk to affected properties, infrastructure and businesses. This entailed providing 'protect' methods over 'prepare' methods, and avoiding 'permit' methods where possible.

### 7.2. Do Nothing Alternative

- 7.2.1 A "Do nothing" scenario was considered at the feasibility stage, yet was determined to be not applicable to Portadown. Under the requirements of the Drainage (Northern Ireland) Order 1973, the DfI is required to maintain the watercourses of Northern Ireland and a key aim of the Department is to reduce the risk to life and damage to property as a result of flooding from rivers and the sea. A do nothing or walkaway approach was therefore not deemed appropriate considering the current flood risk issues in the town and surrounding area.

### 7.3. Alternative Designs

- 7.3.1 As detailed within the RPS Portadown Feasibility Study, a range of potential flood risk management options were developed in line with the four categories mentioned previously; protect, prepare, prevent and permit. The initial alternative options are summarised in Table 7.1 below.

Table 7.1 Alternative designs

Option	Method type	Description
Do nothing	Permit	Implement no new flood risk management measures and abandon any existing practice.
Maintain existing regime	Permit	
Do Minimum (Temporary Defences)	Permit	Implement additional minimal measures to reduce the flood risk in specific problem areas without introducing a comprehensive strategy



Option	Method type	Description
Planning and Development Control	Prevent	Zoning of land for flood risk appropriate development, prevention of inappropriate incremental development, review of existing planning policies.
Land use management	Protect	Changing how the land is used in order to store or slow surface water runoff and slow in channel and out of bank flow along the river in order to store flood water in suitable locations. This may consist of the creation of wetlands, restoring river meanders, increasing the amount of boulders and vegetation within the channel, perpendicular hedges or ditches in the floodplain, tree rows and planting in the floodplain to either slow the flow or direct flow, planting along banks parallel to flow, fencing off livestock from riparian strip, changing agricultural practices to decrease soil compaction and increase water infiltration.
Maintenance Programme	Protect	Increased frequency of routine maintenance, targeting of problem culverts, bridges or other control structures, removal of debris and rubbish tipping, desilting of sedimentation prone areas.
Upstream storage	Protect	Large scale dam and reservoir, offline wash lands (embanked areas of floodplain to store water during larger flood events).
Tidal Barrage	Protect	A fixed or moveable barrier across the river to prevent tidal water from progressing upstream.
Improvement of Channel Conveyance	Protect	Deepening of channel bed, widening of channel, realigning long section profile, removal of constraints, lining or smoothing channel. Increasing the capacity of existing culverted watercourses.
Hard defences	Protect	Reinforced concrete walls, earth embankments, demountable barriers.
Relocation of properties	Protect	Abandoning flood risk area and properties within and providing alternative properties in suitable area.
Diversion of flow	Protect	Removing flow from the watercourse via a diversion and discharging to a suitable river or coastline or reintroducing the flow further downstream.
Sealing manholes	Protect	Preventing pressurised culverts from surcharging through manholes and flooding the surrounding area.
Flood warning /Forecasting	Prepare	Installation of flood forecasting and warning system and development of emergency flood response procedures
Public Awareness Campaign	Prepare	Informing public who live, work or use flood risk area on risks of flooding and how to prepare for flooding.
Individual Property Protection	Prepare	Flood protection and resilience methods such as flood gates, vent covers, use of flood resilient materials, raising electrical powerpoints.

7.3.2 RPS reviewed each of the methods outlined in Table 7.1 for their applicability to Portadown. Table 7.2 summarises this review process and illustrates the options which were taken forward for further assessment.

Table 7.2 RPS options taken forward for further consideration

Option	Review comment	Applicable
Do nothing	DfI Required to maintain watercourses and remove blockages etc under the requirements of the Drainage (Northern Ireland) Order 1973. The do nothing option is not applicable.	No
		Yes
Do Minimum (Temporary Defences)	Consider further	Yes
		Yes
Land Use Management	Consider further	Yes
		Yes
Upstream Storage	Consider further	Yes
		No
Improvement of Channel Conveyance	Consider further	Yes
		Yes
Relocation of Properties	Consider further	Yes
		Yes
Sealing Manholes	Consider further	Yes
		Yes
Public Awareness Campaign	Consider further	Yes
		Yes

### Development of options

7.3.3 Each of the methods in Table 7.2 determined to be applicable to Portadown were then subject to further review by RPS and their suitability for each flood cell within Portadown assessed. Further information on the flood cells identified within Portadown is available in Section 1.3.

### River Bann (Flood Cell 1)

7.3.4 The methods considered for Flood Cell 1: River Bann, as outlined within the feasibility report are detailed in Table 7.3.

Table 7.3 Options considered for flood cell 1

Option	Suitable	Justification
Do nothing	No	Technically unfeasible

Option	Suitable	Justification
Do Minimum (Temporary Defences)	Yes	Short term solution
Land Use Management	No	Technically unfeasible
Improvement of Channel Conveyance	No	Technically unfeasible
Hard Defences	Yes	Long term solution
Diversion of Flow	No	Technically unfeasible
Public Awareness Campaign	Yes	Short term solution
Other works (flood resilient properties and flap valves)	Yes	Long term solution

7.3.5 The long-term solutions that were taken forward to address flooding from the River Bann were as follows:

- Hard defences;
- Flood warning/forecasting;
- Other works (flood resilient properties and flap valves).

7.3.6 The short term solutions that were taken forward for the River Bann were as follows:

- Temporary defences;
- Planning and development control;
- Public awareness campaign;
- Individual property protection.

### **Annagh River, Kilmoriarty River and Ballybay River (Flood Cells 2 & 3)**

7.3.7 The methods considered for flood cells 2 and 3 (Annagh River, Killmoriarty River, Ballybay River), as outlined within the feasibility report are summarised in Table 7.4.

Table 7.4 Options considered for flood cells 2 and 3

Option	Suitable	Justification
Do nothing	No	Technically unfeasible
Do Minimum (Temporary Defences)	Yes	Short term solution

Option	Suitable	Justification
Planning and Development Control	Yes	Short term solution
Land Use Management	No	Technically unfeasible
Improvement of Channel Conveyance	No	Technically unfeasible
Hard Defences	Yes	Technically feasible
Diversion of Flow	No	Technically unfeasible
Public Awareness Campaign	Yes	Short term solution
Other Works	No	Technically unfeasible

7.3.8 RPS identified hard defences as the long-term solution to address flooding from the Annagh River, Kilmoriarty River and Ballybay River.

7.3.9 The short-term solutions that were taken forward were as follows:

- Temporary defences;
- Planning and development control;
- Public awareness campaign.

### Potential options

7.3.10 Further review of the solutions was then undertaken by RPS in order to develop potential long-term options. For all flood cells, hard defences were identified as the only method that would provide the design standard of protection by itself. The only exception to this is Site J: Bowling Green within flood cell one at Portadown Boat Club, where flood resilient methods would require to be implemented. The report also identified that other methods such as the fitting of a flap valve at the River Annagh Tandragee Road culvert could help reduce the amount of hard defences required.

7.3.11 Three long term options were identified within the RPS report, as detailed below:

- Option 1: Maintain existing regime (Baseline scenario);
- Option 2: Hard defences and flood resilience;
- Option 3: Hard defences, flood resilience and flap valves (Tandragee Road).

### Appraisal of options

7.3.12 A qualitative assessment of the three options was undertaken and is available within the feasibility report (Table 4.3). The assessment included a high-level environmental appraisal where each option was assessed against the criteria listed below. The appraisal adopted a six-point scale for the appraisal which ranged from 'Very Good performance' to 'Very Negative Performance'.

- Provide design SoP to all properties:
- Impact to road drainage:
- No increase in flood risk to other receptors:
- Reduce backwater effect in tributaries:
- Adaptability to climate change:
- Impact to residential areas:
- Impact to private landowners:
- Impact to socially important receptors:
- Impact to the salmonid River Bann: and
- Impact to ASSI's and ancient woodlands.

7.3.13 The qualitative assessment indicated that both Option 2 and 3 would produce a significant improvement to the flood risk in Portadown in comparison to Option 1 and so Option 1 was not considered further.

7.3.14 Options 2 and 3 were determined to have broadly similar impacts, which are summarised below.

- Options 2 and 3 could both be adapted to increase the standard of protection in order to account for climate change. However, Option 3 is less readily adaptable for climate change as flap valves and culverts are not easily modified as the hard defences used in Option 2.
- Comparing Option 2 and 3, the addition of a flap valve in Option 3 would reduce the number of reinforced concrete walls needed downstream while in Option 2 a greater number of walls would be required.
- Both options are determined to create some level of disruption to residential access during construction, however the proposed flood defences will prevent future blocking of these accesses due to flooding by protecting the road network in Portadown.
- Both Option 2 and 3 included hard defences in the form of walls along the banks of the River Bann which is a salmonid river. Although the method may cause some disruption to the River, this would be kept as a minimum.

7.3.15 The cost estimated for Option 2 was determined to be approximately £9.80 million, while the estimated cost for Option 3 was £7.85 million. Option 3 was therefore determined to offer a better value for money.

### **Preferred option**

7.3.16 The option analysis and appraisal showed that Option 2 and 3 would achieve the primary objective of providing the design standard of protection. Both options were assessed for their benefits and for the costs over a 100 year design life span. To evaluate the costs of Option 2 and 3 an Economic Appraisal was carried out. The results from this appraisal revealed that both options are economically viable and that the potential benefit was estimated at approximately £15.72 million. Nonetheless, the cost for Option 3 was estimated to be £7.85 million compared to the cost of Option 2, estimated to be £9.80 million. Therefore, option 2 has a BCR (benefit cost ratio) of 1.6 whilst Option 3 has a BCR of 2.

7.3.17 Option 3 was considered to be a better value for money and therefore the recommended preferred option for the Portadown Study Area.

## 7.4. Issues during the Design Process

### Amey review

- 7.4.1 In 2019, Amey Consulting were then commissioned to review the reports and the options proposed by RPS and progress the scheme to detailed design and construction.
- 7.4.2 Since the completion of the RPS feasibility study and commencement of the outline design phase of the proposed scheme, the DfI Water & Drainage Policy Division have released a new guidance document "Technical Flood Risk Guidance in relation to Allowances for Climate Change in Northern Ireland" (February 2019) (Ref 7.2) which advises that "a single Climate Change allowance of +20% additional flow is applied to the estimated 'Present Day' 100-year peak flow".
- 7.4.3 The guidance stipulates that any current flood alleviation scheme is required to be hydraulically modelled with the inclusion of climate change to 2080, adding an additional 20% to a Q100 flood event.
- 7.4.4 As a result of adding an additional 20% to a Q100 flood event, the existing defences included within the RPS feasibility report did not meet the flood alleviation standard of preventing flooding for a Q100+20% climate change. As a result, a revised model had to be undertaken by Amey, with support from WaterCo.
- 7.4.5 The revised model undertaken by Amey, which included the 20% additional flows, resulted in the number of proposed flood defence sites increasing from 17 to 21 individual sites (including 1no. Flap Valve). The additional sites are located at Ripley Mews, Corcraun Drive, Fairways Estate and Corcullentragh Road. After analysing the 21 sites, it was found that the affected commercial building located at 170 Obins Street was now derelict and no longer in use. This site was therefore removed, leaving 20 sites (including 1no. flap valve) and an approximate increase in length of flood defences of 50%, from circa 6.5km to 9.5km.
- 7.4.6 Following Amey's review, Option 3 remained the preferred option for the proposed scheme. This was the economically, non-monetary and risk preferred option. The extension of defences to comply with current climate change policy guidance would affect all options equally, therefore, the same rank order and issues assessed in the feasibility study remain.

### Changes during Design

- 7.4.7 Throughout the design process, a number of changes have been made as a result of on-going landowner consultation, identification of services, avoiding tree removal where possible and a desire to maximise retention of existing flood plain.
- 7.4.8 The key changes were to the sites at Ashgrove Road, Bowling Green, Castle Street, Tandragee Road and Derryvore Lane. These changes are summarised below:
- Ashgrove Road - Raising road levels at the layby on Ashgrove Road and providing an access road into the fields.
  - Bowling Green – relocation of flood defence from along the towpath. The amended line of the defence runs between the memorial garden and the bowling green and around the green space between the playground and the Tesco car park. The change to this alignment from the original alignment along the towpath is to avoid tree removal along the boundary of the memorial garden.
  - Castle Street – slight amendment in the line of the defence to run along the boundary of the mound at the slipway instead of through the middle of the mound.
  - Tandragee Road – the original proposals had the line of the flood defence along the boundary of Brackagh Bog. The wall was relocated away from the Brackagh Bog to be located closer to the farm building it protects.
  - Derryvore Lane - the original proposals were for a flood defence along the banks of the stream to the west of the industrial estate on Derryvore Lane, and 2 short sections of wall located at 2 properties to the north of Derryvore Lane. The 2 northern sections were removed and the defence at the industrial estate was relocated to be adjacent to the estate boundary.

## 8. Air Quality

### 8.1. Introduction

- 8.1.1 This Chapter reports the likely significant effects of the scheme in terms of local air quality during the construction stage.
- 8.1.2 This Chapter and its associated figures (**Figures 8.1 to Figure 8.12, Volume 4,**) and appendices, **Appendix 8.1 – 8.4, Volume 3** should be read with Chapters 1 to 6 and Chapter 18: Cumulative Effects.
- 8.1.3 **Appendix 8.1, Volume 3** provides a glossary of abbreviations and terms used in this chapter.

### 8.2. Statutory and Policy Context

- 8.2.1 Legislation, policy and guidance accounted for in this assessment are identified below with relevant details provided in **Appendix 8.2, Volume 3**.

#### Legislation

- 8.2.2 The relevant legislation comprises:

- Air Quality Directive 2008 (Ref 8.1);
- Air Quality Standards Regulations (Northern Ireland) 2010 (Ref 8.2);
- Environment Act 1995 (Ref 8.3);
- Air Quality Regulations (Northern Ireland) 2003 (Ref 8.4);
- Environment (Northern Ireland) Order 2002 (Ref 8.5);
- Clean Neighbourhoods and Environment Act (Northern Ireland) 2011 (Ref 8.6);
- Air Quality (Amendment of Domestic Regulations) (EU Exit) Regulations 2019 (Ref 8.7);
- Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020 (Ref 8.8); and,
- Environment Act 2021 (Ref 8.9).

- 8.2.3 The Air Quality Standards Regulations (Ref 8.4) define limit values, objectives and targets (i.e. criteria) for air pollutants. The relevant standards for this assessment are given in Table 8.1. There are no criteria for dust deposition rates.

Table 8.1 Relevant Air Quality Standards

Pollutant	Objective ( $\mu\text{g}/\text{m}^3$ )	Concentration Measured as	Number of exceedances allowed in a calendar year
Nitrogen dioxide ( $\text{NO}_2$ )	40	Annual mean	None
Fine particulate matter ( $\text{PM}_{10}$ )†	40	Annual mean	None
Fine particulate matter ( $\text{PM}_{2.5}$ ) †	25	Annual mean	None

## Policy

8.2.4 The relevant policy comprises:

- Strategic Planning Policy Statement for Northern Ireland Planning for Sustainable Development 2015 (Ref 8.10);
- Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 (Ref 8.11);
- UK Plan for Tackling Roadside Nitrogen Dioxide Concentrations 2017 (Ref 8.12);
- Clean Air Strategy 2019 (Ref 8.13);
- A Clean Air Strategy for Northern Ireland – Public Discussion Document 2020 (Ref 8.14); and,
- Armagh City, Banbridge and Craigavon Borough Council Local Development Plan Preferred Options Paper and Supporting Documents 2018 (Ref 8.15).

## Guidance:

8.2.5 The relevant guidance comprises:

- Local Air Quality Management Policy Guidance 2010 (LAQM.PGNI(09), Ref 8.16);
- Land Use Planning and Development Control: Planning for Air Quality 2017 (Ref 8.17); and,
- Guidance on the Assessment of Dust from Demolition and Construction 2016 (Ref 8.18).

## 8.3. Methodology

### Scope of the Assessment

8.3.1 The scope of the air quality assessment been determined through:

- Consultation with the Environmental Health Officer (EHO) from Armagh City, Banbridge and Craigavon Borough Council (ABC), see Table 8.2, to discuss the availability of local air quality monitoring data and the assessment methodology to be applied;
- A review of the latest ABC Updating and Screening Assessment for 2018 containing the most recent air quality data for the study area (Ref 8.19); and,
- A desktop study using Ordnance Survey and Google Earth data products, as well as Department of Agriculture, Environment and Rural Affairs (DAERA) natural environment map viewer (Ref 8.20), to confirm the locations of nearby existing receptors (human and designated ecological sites) that may be sensitive to changes in local air quality, particularly dust and PM<sub>10</sub>.

8.3.2 Assessment of the impacts resulting from emissions of PM<sub>10</sub> and NO<sub>2</sub> from vehicles associated with the construction phase of the scheme have been scoped out and have not been assessed. This is consistent with the assessment approach presented in the EIA Scoping Report in March 2021.

8.3.3 As the project involves the construction of flood defences (in the form of a wall or embankment) changes in Light-Duty Vehicle (LDV) and Heavy-Duty Vehicle (HDV) flows are not anticipated, nor are changes that will alter existing road alignments. Consideration of the effect of operational traffic on local air quality has been scoped out of the assessment.



Table 8.2 Consultation and Agreed Methodology

Body / organisation	Individual / statutory body / organisation	Meeting dates and other forms of consultation
Armagh City, Banbridge and Craigavon Borough Council	Sam Mills – Environmental Health Officer	Consultation via email on 9 <sup>th</sup> December 2021.
Agreed Methodology		
<p>Construction Stage Impacts: A qualitative assessment of air quality impacts due to construction to be undertaken in line with the Institute of Air Quality Management's (IAQM) assessment methodology (Ref 8.18).</p> <p>Mitigation Measures: When established, details of the community liaison / point of contact for the scheme, with responsibility for day-to-day supervision, should be provided to the Environmental Health Department at ABC.</p>		

### Extent of the Study Area

- 8.3.4 The scheme itself is comprised of 20 flood defence locations, described below in Table 8.3, which are distributed across the town of Portadown and the surrounding area; consequently, construction will take place in a mix of urban and rural locations, including commercial and residential areas, farms and the surrounding countryside.
- 8.3.5 Based on the information provided by the project team, the 20 flood defences which make up the scheme will be constructed concurrently over a period of 36 months; therefore, the locations have been grouped together based on proximity to one another. The flood defences in each group are also shown in Table 8.3; hereafter, the flood defences will be referred to by their group number.
- 8.3.6 The full extent of the study area is given in **Figure 8.1, Volume 4** and includes the area immediately surrounding the flood defence locations which make up the scheme. **Figure 8.2 to 8.12, Volume 4** show the area surrounding each respective flood defence location.

Table 8.3 Flood Defence Locations and Groupings

Flood Defence	Location Description	Figure
Annagh Hill	Located 180m east of Thomas Street/Tandragee Road (B78) within Portadown. Construction of the proposed flood defence will take place in a rural area adjacent to the residential properties along Burnbrea Avenue.	8.2
Corcullentragh Road	Located approximately 70m north-east of Corcullentragh Road and 2.2km west of Portadown town centre. Construction will occur in an rural area adjacent to two farms.	8.3
Derryvore Lane	Located 400m west of the M12 and Seagoe Road, approximately 2.6km north-east of Portadown town centre. The flood defences will be constructed in a rural location adjacent to commercial premises.	8.4
Ripley Mews	Located 70m south-east of Armagh Road and 1km south-west of the centre of Portadown. The flood defences will be constructed in a residential area.	8.5
Tandragee Road	Located 200m east of the Tandragee Road, approximately 2.5km south of the centre of Portadown. The flood defences will be constructed in a rural location adjacent to Brackagh Bog ASSI, which is also a National Nature Reserve (NNR) and Nature Reserve (NR).	8.6
Group 1	Ashgrove Road	8.7

Flood Defence	Location Description	Figure
Derryanvil Road	Located approximately 1.5km north of Portadown town centre. Ashgrove Road will be constructed adjacent to Island Road and Ashgrove Road, in a residential area. Derryanvil Road, which is another 300m north-east, will be constructed in a field.	
Group 2	<p>Bowling Green</p> <p>Castle Street</p> <p>Health Centre</p> <p>Ulster Carpets</p> <p>Located within Portadown town centre, these will be constructed in commercial areas adjacent to the west bank of the River Bann. Bowling Green is 160m north-east of Meadow Lane, Castle Street is adjacent to Bridge Street (A27), the Health Centre is adjacent to doctors' surgery (Portadown Health Centre) on Meadow Lane and Ulster Carpets is adjacent to Garvaghy Road.</p>	8.8
Group 3	<p>Foundry Street</p> <p>Irwins Mills</p> <p>Located in the centre of Portadown; Foundry Street is immediately south of the Northway (A3) and Irwins Mills is 130m south-west of Goban Street. Both flood defences will be constructed in a commercial area adjacent to the east bank of the River Bann.</p>	8.9
Group 4	<p>Old Golf Links</p> <p>Fairways</p> <p>Located approximately 1.6km south of Portadown town centre, Olde Golf Links is adjacent to Tandragee Road (B78) and The Fairways is 190m east. Both flood defences will be constructed in a residential area.</p>	8.10
Group 5	<p>Rose Cottages</p> <p>Parkside</p> <p>People's Park</p> <p>All three flood defences will be located in the centre of Portadown; Rose Cottages is adjacent to the east bank of the Corcrain River, Parkside is adjacent to Park Road and People's Park is located within the park, with the north-eastern part of the defence adjacent to Garvaghy Road. All three will be constructed in a residential area, the south-west component of the People's Park flood defence will be constructed within the park.</p>	8.11
Group 6	<p>Corcrain Drive</p> <p>Corcrain Mews</p> <p>Located 900m north-west of Portadown town centre, Corcrain Mews is adjacent to Charles Street (A4) and Cocrain Drive is at the south-east boundary of Corcrain Community Woodland. Both flood defences will be constructed in a residential area.</p>	8.12

## Construction Impacts

- 8.3.7 IAQM guidance (Ref 8.18) has been followed in defining the study area for construction stage impacts. This requires consideration of 'human receptors' within 350 metres of the scheme locations, as shown in **Figures 8.2 to 8.12, Volume 4**, or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrances.
- 8.3.8 The guidance also requires consideration of ecological receptors within 50m of the boundary of the site or 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

## Methodology for Assessment of Construction Stage Impacts

- 8.3.9 Dust comprises particles typically in the size range 1-75 micrometres ( $\mu\text{m}$ ) in aerodynamic diameter and is created through the action of crushing and abrasive forces on materials. The larger dust particles fall out of the atmosphere quickly after initial release and therefore tend to be deposited near the source of emission. Therefore, dust is unlikely to cause long-term or widespread changes to local air quality; however, its deposition on property and cars can cause 'soiling' and discolouration. This may result in complaints of nuisance through amenity loss or perceived damage caused, which is usually temporary.

- 8.3.10 The smaller particles of dust (less than 10µm in aerodynamic diameter) are known as particulate matter (PM<sub>10</sub>) and represent only a small proportion of total dust released; this includes a finer fraction, known as PM<sub>2.5</sub> (with an aerodynamic diameter less than 2.5µm). As these particles are at the smaller end of the size range of dust particles they remain suspended in the atmosphere for a longer period than the larger dust particles and can therefore be transported by wind over a wider area. PM<sub>10</sub> and PM<sub>2.5</sub> are small enough to be drawn into the lungs during breathing, which in sensitive members of the public could have a potential impact on health.
- 8.3.11 An assessment of the likely significant impacts on local air quality due to the generation and dispersion of dust and PM<sub>10</sub> during the construction phase has been undertaken using the relevant assessment methodology published by the IAQM (Ref 8.18) the available information for the proposed works provided by the project team; and professional judgement.
- 8.3.12 In accordance with the IAQM's guidance, the assessment considers the risks of dust and PM<sub>10</sub> impacts from four main activities: demolition; earthworks; general construction activities; and the movement of vehicles out of the site (referred to as 'track-out'). The assessment has accounted for the nature and scale of the activities and the sensitivities of the surrounding areas to increased dust and PM<sub>10</sub> levels. Risks have been assigned as 'low', 'medium' or 'high'. Site specific mitigation has been assigned according to the level of risk, and the significance of residual effects determined. A summary of the IAQM assessment methodology is provided in **Appendix 8.3, Volume 3**.
- 8.3.13 In addition to dust impacts, exhaust emissions from construction vehicles and Non-Road Mobile Machinery (NRMM) are likely to impact on local air quality along roads used by construction traffic and in the area surrounding the scheme. In the absence of detailed information on construction traffic and NRMM operations, a commentary has been provided on the potential impacts.

### Assumptions and Limitations

- 8.3.14 As discussed in section 8.3.5, flood defences have been grouped together based on information from the project team and proximity to one another, the flood defences in each group are shown in Table 8.3.
- 8.3.15 It is anticipated that the appointed contractor will set up a semi-permanent, central site office in Portadown and establish satellite construction compounds. Whilst the exact locations of these are not currently known, indicative locations include:
- Annagh Hill;
  - Tandragee Road;
  - DfI carpark at Shillington's factory;
  - Foundry Street car park; and
  - People's Park car park.
- 8.3.16 Therefore, a precautionary approach has been taken for the assessment of trackout and each flood defence location has been assessed separately. The appointed contractor is expected to undertake construction of neighbouring locations concurrently and in reality, journeys will be combined limiting the number of vehicle movements.
- 8.3.17 The site area, i.e., footprint of the works, considered has been based on the data provided by the project team; however, this may increase once a contractor is appointed and more detailed, site-specific plans of work are developed.
- 8.3.18 Professional judgement has been used to determine the dust risk emission magnitude and has been based on scheme data provided by the project team. When a contractor has been appointed and detailed design data becomes available including confirmation of construction compound locations, it may be necessary to review this assessment.

## 8.4. Baseline Conditions

8.4.1 The scheme lies within the ABC Air Quality Management Area (AQMA) as shown in **Figure 8.1, Volume 4**. The AQMA covers the entire administrative area and has been declared for exceedances of the annual NO<sub>2</sub> objective.

### Local Emission Sources

8.4.2 Within the study area, air quality is mainly influenced by vehicle emissions from road traffic as well as emissions from domestic heating.

8.4.3 The UK's Pollutant Release and Transfer Register (Ref 8.21) has been used to identify industrial emissions to air. There were no sources of dust and PM<sub>10</sub> within 350m of each flood defence location.

8.4.4 From reviewing Google Earth imagery, two potential sources of dust emissions have been identified in close proximity to the scheme, these include:

- SBM Contracts Ltd is a site contractor located 40m west of Group 4; and,
- Gerald Hamill and Sons is a licensed waste metal handler (<https://public-registers.daera-ni.gov.uk/waste-licenses>), located approximately 30m south-west of Group 5.

8.4.5 The EHO who confirmed there were no dust complaints relevant to this assessment.

8.4.6 Ty Rock Products is a concrete product supplier situated 200m south of the Tandragee Road location. The EHO has confirmed that the site is operated under a Part C Pollution Prevention Control permit which allows for bulk cement use. Therefore, it is a potential source of fugitive dust emissions.

### Local Monitoring Data

8.4.7 ABC does not monitor fine particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>) within the study area.

### Background Concentrations

8.4.8 The Department for Environment, Food and Rural Affairs (Defra) provides background maps (Ref 8.22) of predicted air pollution concentrations on a 1km x 1km basis for the whole of the UK up to 2030. Modelled background PM<sub>10</sub> concentrations for the study area are shown in Table 8.4.

Table 8.4 Defra Predicted Background PM<sub>10</sub> Concentrations, 2021

Flood Defence	Co-ordinates (based on NIOS grid reference, m)		Annual Mean PM <sub>10</sub> Concentration (µg/m <sup>3</sup> )
	X	Y	
Annagh Hill	301500	352500	10.2
	301500	353500	10.8
Corcullentragh Road	298500	353500	9.7
Derryvore Lane	301500	356500	12.2
	301500	357500	10.6
Ripley Mews	300500	352500	12.3
Tandragee Road	301500	350500	10.2
Group 1	300500	355500	
	301500	355500	11.3

Flood Defence	Co-ordinates (based on NIOS grid reference, m)		Annual Mean PM <sub>10</sub> Concentration (µg/m <sup>3</sup> )
	X	Y	
Group 2 and Group 3	301500	353500	10.8
	301500	354500	12.6
Group 4	301500	352500	10.2
	300500	354500	12.2
Group 5	301500	354500	12.6
	299500	354500	11.0
Group 6	300500	354500	

8.4.9 Background PM<sub>10</sub> concentrations are predicted to be well below the relevant standards given in Table 8.1.

8.4.10 Overall, air quality in terms of PM<sub>10</sub> is good within the construction dust study area.

### Future Baseline

8.4.11 The date when construction of the flood defences will commence has not been confirmed; however, Defra assume that PM<sub>10</sub> concentrations will decrease over time, thus the 2021 PM<sub>10</sub> concentrations given in Table 8.4 provide a conservative estimate of future levels ensuring a robust, 'worst case' assessment.

## 8.5. Evaluation (Value of Resource or Sensitivity of Receptors)

### Sensitive Receptors

8.5.1 Sensitive locations are places where the public or sensitive ecological habitats may be exposed to pollutants resulting from activities associated with the scheme. These will include locations sensitive to increases in dust deposition and PM<sub>10</sub> exposure due to on-site construction activities.

### Human Receptors

8.5.2 The Northern Ireland Air Quality Regulations identify that the air quality objectives for the protection of human health apply at "*locations which are situated outside of buildings or other natural or man-made structures above or below ground; and where members of the public are regularly present*".

8.5.3 All human receptors with relevant exposure including residential properties, schools, hospitals and care homes are regarded as having a high sensitivity to changes in concentrations of ambient air pollutants. Human receptors with relevant exposure are located within 350m of the scheme boundary.

### Designated Ecological Receptors

8.5.4 Designated habitat sites including Ramsar sites (wetlands of international importance), Special Protection Areas (SPAs), Special Areas of Conservation (SACs), ASSIs, NNRs, NRs which are regarded as having high sensitivity where features are sensitive to dust deposition.

8.5.5 Brackagh Bog ASSI and Brackagh Bog NNR and NR are overlapping ecological receptors within 50m of the flood defence at Tandragee Road.

8.5.6 Brackagh Bog ASSI, NNR and NR contain species on the Irish Red List that are sensitive to dust deposition. Brackagh Bog ASSI is an acid bog which is sensitive to the deposition of alkaline dusts. Chapter 11 Terrestrial Biodiversity provides further information on designated habitat sites.

## Significance Criteria

8.5.7 The assessment of potential effects resulting from the scheme accounts for demolition and construction. The significance level attributed to each effect has been assessed based on the magnitude of change due to the scheme and the sensitivity of the affected receptor / receiving environment to change, as well as several other factors that are outlined in more detail in Chapter 2: Approach to the EIA.

## Construction Stage

8.5.8 The IAQM assessment methodology recommends that significance criteria are only assigned to the identified risk of dust impacts occurring from a construction activity with appropriate mitigation measures in place. For almost all construction activities, the application of effective mitigation should prevent any significant effects occurring to sensitive receptors and therefore the residual effect will normally be negligible.

## 8.6. Impact Assessment

### Construction

#### Plant and Non-Road Mobile Machinery Emissions

8.6.1 Details of the plant and equipment to be used will be determined by the appointed contractor. Consideration should be given to electrically powered, rather than diesel powered, plant and equipment, where possible, to minimise construction emissions. The number of plant and their location within the scheme are likely to be variable over the construction period.

#### Dust and PM<sub>10</sub> arising from Site Activities

8.6.2 Without the implementation of best practice industry mitigation, the construction activities that have the potential to generate and / or re-suspend dust and PM<sub>10</sub> include:

- Site clearance and preparation;
- Preparation of temporary access / egress to the site and haulage routes;
- Earthworks;
- Materials handling, storage, stockpiling, spillage and disposal;
- Movement of vehicles and construction traffic within the site (including excavators and dumper trucks);
- Use of crushing and screening equipment / plant;
- Exhaust emissions from site plant, especially when used at the extremes of their capacity and during mechanical breakdown;
- Construction of buildings, roads and areas of hardstanding alongside fabrication processes;
- Internal and external finishing and refurbishment; and
- Site landscaping after completion.

8.6.3 Releases are likely to occur during the 'working week'; however, for some potential release sources, e.g., exposed soil produced from significant earthwork activities, in the absence of dust control mitigation measures, dust generation has the potential to occur 24 hours per day over the period during which such activities are to take place.

#### Assessment of Potential Dust Emission Magnitude

8.6.4 The IAQM assessment methodology has been used to determine the potential dust emission magnitude for the following four sources of dust and particulate matter: demolition; earthworks; construction; and

trackout. The criteria to determine the dust emission magnitude across the scheme is detailed in **Appendix 8.3, Volume 3** and results of the assessment are summarised below.

### Demolition

- 8.6.5 Demolition activities will only occur at the Ulster Carpets location and has been classified as 'medium' as there will be <20,000m<sup>3</sup> of material demolished.

### Earthwork

- 8.6.6 For all flood defence locations, earthworks have been classified as 'large', as although the earthwork areas are approximately <10,000m<sup>2</sup>, the works may be carried out at any time during the year, as both a contractor has not been appointed nor a programme defined. This provides a conservative approach should earthwork activities take place during the drier summer months.

### Construction

- 8.6.7 Construction has been classified as 'medium' for all flood defences, as the total volume to be constructed is <100,000m<sup>3</sup>. No concrete batching or sandblasting will occur and is anticipated reinforced concrete walls will be pre-cast where appropriate and achievable. Ready mix concrete will be poured on site. Embedded walls used to retain the earth will be constructed of steel, reinforced concrete or timber, as appropriate. These materials have a low potential for dust release.

### Trackout

- 8.6.8 Trackout has been classified as 'large' for all flood defences as there will be <50 HDV movements at each location. Due to the size of the scheme and the remote location of the majority of the flood defence locations, >100m unpaved access roads will need to be constructed between the existing local road network and each location.
- 8.6.9 The dust emission magnitude is summarised for each source in Table 8.5.

Table 8.5 Potential Dust Emission Magnitude

Activity	Dust Emission Magnitude
Demolition	Medium (for Group 2 only)
Earthworks	Large
Construction	Medium
Trackout	Large

### Dust Study Area

- 8.6.10 As stated in section 8.3.7 the study area has been defined using the IAQM guidance. At all flood defence locations there are human receptors within 350m of the site boundary and within 50m of trackout routes.
- 8.6.11 As stated in section 8.5.5, at Tandragee Road there are ecological receptors within 50m of the boundary of the site and 50m of the route(s) used by construction vehicles.
- 8.6.12 For all other locations, there are no ecological receptors within 50m of the boundary of the site or 50m of the route(s) used by construction vehicles for all other sites; therefore, consideration of the impact of dust and PM<sub>10</sub> on ecological receptors has been screened out of the assessment and will not be considered further at these locations.

### Assessment of the Sensitivity of the Study Area

- 8.6.13 Meteorological data from the observation station at Glennane have been used to determine the local wind field. A wind rose based on the last five years (2016-2020) of data is given in **Appendix 8.4, Volume 3**.

- 8.6.14 The wind rose shows that the prevailing wind direction is from the south-west and north-west. This means that receptors to the north-east and south-east may be more commonly affected by dust impacts.
- 8.6.15 Background PM<sub>10</sub> concentrations for the dust study area are between 10.2 µg/m<sup>3</sup> and 12.6µg/m<sup>3</sup>, as given in section 8.4.8, which are well below the annual mean PM<sub>10</sub> objective of 40µg/m<sup>3</sup>. Air quality, in terms of particulate matter, can therefore be considered to be good.
- 8.6.16 The sensitivity of the area to dust soiling effects and to human health impacts for each activity is assessed according to the criteria in Boxes 6, 7 and 9 in the IAQM guidance, taking into account the cumulative number of receptors in each distance banding shown in Tables 2 and 3 in the guidance. The sensitivity of the area is shown in Table 8.6.

Table 8.6 Overall Sensitivity of the Area

Potential Impact	Sensitivity of the Surrounding Area	Flood Defence										
		AH	CR	DL	RM	TR	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Dust Soiling	Demolition							M				
	Earthworks	M	M	L	M	L	H	M	L	H	H	H
	Construction	M	M	L	M	L	H	M	L	H	H	H
	Trackout	M	L	M	M	L	M	H	M	H	H	H
Human Health	Demolition							L				
	Earthworks	L	L	L	L	L	L	L	L	L	L	L
	Construction	L	L	L	L	L	L	L	L	L	L	L
	Trackout	L	L	L	L	L	L	L	L	L	L	L
Ecological	Demolition											
	Earthworks			-		M				-	-	-
	Construction			-		M				-	-	-
	Trackout	-	-	-	-	M				-	-	-

**Notes:**

-: denotes assessment of activity not applicable/required.

Flood Defence:

AH – Annagh Hill

CR – Corcullentragh Road

DL – Derryvore Lane

RM – Ripley Mews

TR – Tandragee Road

Sensitivity: L – low; M – medium; H – high

- 8.6.17 Table 8.6 shows that for dust soiling effects of earthworks and construction activities, the area surrounding Groups 1 and 4 to 6 have a 'high' sensitivity. As the construction programme has not been agreed it is anticipated earthwork and construction activities could take place at any time of the year. For construction activities, the area surrounding these Groups have a 'high' sensitivity, as there are more than 10 'high' sensitivity receptors within 20m of the flood defence locations. The area surrounding Groups 2 and 4 to 6 have a 'high' sensitivity to dust soiling effects from trackout.



8.6.18 Background PM<sub>10</sub> concentrations are, according to the Defra background maps, below the 24µg/m<sup>3</sup> threshold outlined in the guidance and there are less than 100 'high' sensitivity receptors within 20m of each flood defence; therefore, for human health impacts, the flood defence locations are surrounded by areas with 'low' sensitivity.

8.6.19 Brackagh Bog ASSI, NNR and NR at Tandragee Road has 'medium' sensitivity to earthworks, construction and trackout activities as it is only within 50m of the construction footprint.

**Dust Risk**

8.6.20 The overall dust risk for the proposed works has been obtained by combining the sensitivity of the area with the dust emission magnitude, the results are shown in Table 8.7.

Table 8.7 Overall Dust Risk

Potential Impact	Risk	Flood Defence										
		AH	CR	DL	RM	TR	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Dust Soiling	Demolition	-	-	-	-	-	-	MR	-	-	-	-
	Earthworks	MR	MR	LR	MR	LR	HR	MR	LR	HR	HR	HR
	Construction	MR	MR	LR	MR	LR	MR	MR	LR	MR	MR	MR
	Trackout	MR	LR	MR	MR	LR	MR	HR	MR	HR	HR	HR
Human Health	Demolition	-	-	-	-	-	-	LR	-	-	-	-
	Earthworks	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR
	Construction	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR
	Trackout	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR
Ecological	Demolition	-	-	-	-	-	-	-	-	-	-	-
	Earthworks	-	-	-	-	MR	-	-	-	-	-	-
	Construction	-	-	-	-	MR	-	-	-	-	-	-
	Trackout	-	-	-	-	MR	-	-	-	-	-	-

Notes:

'-': denotes dust risk not assessed.

Flood Defence:

AH – Annagh Hill

CR – Corcullentragh Road

DL – Derryvore Lane

RM – Ripley Mews

TR – Tandragee Road

Risk: LR – low risk; MR – medium risk; HR – high risk

8.6.21 Table 8.7 shows there is a 'high' risk of dust soiling due to earthworks at Groups 1 and 4 to 6. For trackout activities, there is a 'high' risk of dust soiling at Groups 2 and 4 to 6. There is 'low' to 'medium' risk for all activities at all other locations.

8.6.22 There is 'low' risk of human health impacts due to demolition, earthworks, construction and trackout at all locations.

8.6.23 For ecological impacts, there is a 'medium' risk of dust due to all construction activities at Tandragee Road, as the footprint is within 50m of Brackagh Bog ASSI, NNR and NR.

## 8.7. Mitigation

### Construction

- 8.7.1 For each location, mitigation measures for the different construction stage activities have been derived based on the dust risk category in Table 8.7 and are presented in Table 8.8 below. Consistent with the IAQM guidance, general mitigation measures for each location have been determined using the highest risk category as given in Table 8.7.
- 8.7.2 In accordance with Part 4 of the IAQM's Guidance on the Assessment of Dust from Demolition and Construction, plant and NRMM need to adhere to the appropriate engine emissions standards for oxides of nitrogen (NO<sub>x</sub>) and fine particulate matter given in LAQM.TG(16).
- 8.7.3 Further mitigation measures for the protection of Brackagh Bog ASSI, NNR and NR at Tandragee Road are given in section 11.7 in **Chapter 11: Terrestrial Biodiversity**.

Table 8.8 Site Specific Mitigation Measures

Mitigation Measure	Flood Defence										
	AH	CR	DL	RM	TR	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
<b>Communication</b>											
1. Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.	H	H	H	H	N	H	H	H	H	H	H
2. Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.	H	H	H	H	H	H	H	H	H	H	H
3. Display the head or regional office contact information.	H	H	H	H	H	H	H	H	H	H	H
4. Develop and implement a DMP, which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk and should include as a minimum the highly recommended measures in the IAQM Guidance. The desirable measures should be included as appropriate for the site. The DMP may include monitoring of dust deposition, dust flux, real-time PM <sub>10</sub> continuous monitoring and/or visual inspections.	H	H	H	H	D	H	H	H	H	H	H
<b>Site management</b>											
5. Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.	H	H	H	H	H	H	H	H	H	H	H
6. Make the complaints log available to the local authority when asked.	H	H	H	H	H	H	H	H	H	H	H
7. Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.	H	H	H	H	H	H	H	H	H	H	H
8. Hold regular liaison meetings with other high risk construction sites and / or sources of fugitive dust emissions (as detailed in section 18) within 500m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport / deliveries which might be using the same strategic road network routes.	N	N	N	N	H	H	H	N	H	H	H

Mitigation Measure	Flood Defence										
	AH	CR	DL	RM	TR	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
<b>Monitoring</b>											
9. Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100m of site boundary, with cleaning to be provided if necessary.	H	H	H	H	H	H	H	H	H	H	H
10. Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked	H	H	H	H	H	H	H	H	H	H	H
11. Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.	H	H	H	H	H	H	H	H	H	H	H
12. Agree dust deposition, dust flux, or real-time PM <sub>10</sub> continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.	H	H	D	H	D	H	H	H	H	H	H
<b>Preparing and maintaining the site</b>											
13. Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.	H	H	H	H	H	H	H	H	H	H	H
14. Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.	H	H	H	H	H	H	H	H	H	H	H
15. Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.	H	H	H	H	D	H	H	H	H	H	H
16. Avoid site runoff of water or mud.	H	H	H	H	H	H	H	H	H	H	H
17. Keep site fencing, barriers and scaffolding clean using wet methods.	H	H	H	H	D	H	H	H	H	H	H

	Flood Defence										
18. Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.	H	H	H	H	D	H	H	H	H	H	H
19. Cover, seed or fence stockpiles to prevent wind whipping.	H	H	H	H	D	H	H			H	
20. Ensure all vehicles switch off engines when stationary – no idling vehicles.	H	H	H	H	H	H	H	H	H	H	H
21. Avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment where practicable.	H	H	H	H	H	H	H	H	H	H	H
22. Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).	D	D	D	D	D	H	H	D	H	H	H
23. Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.	H	H	H	H	N	H	H	H	H	H	H
24. Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).	D	D	D		N	H	H	D	H	H	H
<b>Operations</b>											
25. Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g., suitable local exhaust ventilation systems.	H	H	H	H	H	H	H	H	H	H	H
26. Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.	H	H	H	H	H	H	H	H	H	H	H
27. Use enclosed chutes and conveyors and covered skips.	H	H	H	H	H	H	H	H	H	H	H

	Flood Defence										
28. Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.	H	H	H	H	H	H	H	H	H	H	H
29. Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.	H	H	H	H	D	H	H	H	H	H	H
30. Avoid bonfires and burning of waste materials.	H	H	H	H	H	H	H	H	H	H	H
<b>Measures specific to demolition</b>											
31. Ensure effective water suppression is used during demolition operations. Hand-held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.	N	N	N	N	N	N	H	N	N	N	N
33. Bag and remove any biological debris or damp down such material before demolition.	N	N	N	N	N	N	H	N	N	N	N
34. Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.	D	D	D	D	D	H	D	N	H	H	H
35. Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.	D	D	D	D	D	H	D	N	H	H	H
36. Only remove the cover in small areas during work and not all at once.	D	D	D	D	D	H	D	N	H	H	H
<b>Measures specific to construction</b>											

	Flood Defence										
37. Avoid scabbling (roughening of concrete surfaces) if possible.	D	D	D	D	D	D	D	D	D	D	D
38. Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.	H	H	D	H	D	H	H	D	H	H	H
39. Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.	H	H	H	H	H	H	H	H	H	H	H
40. For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.	D	D	D	D	D	D	D	D	D	D	D
<b>Measures specific to trackout</b>											
41. Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.											
42. Avoid dry sweeping of large areas.	H	H	H	H	H	H	H	H	H	H	H
44. Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.	H	N	H	H	N	H	H	H	H	H	H
45. Record all inspections of haul routes and any subsequent action in a site log book.	H	D	H	H	D	H	H	H	H	H	H
46. Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.	H	D	H	H	D	H	H	H	H	H	H
47. Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).	H	D	H	H	D	H	H	H	H	H	H

Mitigation Measure	Flood Defence										
	AH	CR	DL	RM	TR	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
48. Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.	H	D	H	H	D	H	H	H	H	H	H
49. Access gates to be located at least 10m from receptors where possible.	H	H	H	H	H	H	H	H	H	H	H
<b>Notes:</b>											
Flood Defence:											
AH – Annagh Hill											
CR – Corcullentragh Road											
DL – Derryvore Lane											
RM – Ripley Mews											
TR – Tandragee Road											
Mitigation Measures:											
H – Highly recommended											
D – Desirable											
N – Not required											



## 8.8. Residual Effects

### Cumulative Effects

8.8.1 Committed developments within 350m of the scheme are given in Chapter 18: Cumulative Effects, this data has been taken from the ABC planning portal. The combined impact of construction traffic, plant and NRMM, as well as dust and PM<sub>10</sub> generated by construction activities associated with these developments and the scheme on local air quality have been qualitatively assessed and are summarised in Chapter 18.

### Construction

8.8.2 Following the implementation of the mitigation measures for plant and NRMM given above in section 8.7.2, the residual effects are anticipated to be not significant.

8.8.3 The residual effects of dust and PM<sub>10</sub> generated by construction activities following the application of the mitigation measures described above in Table 8.8 and good site practice are not significant.

## 8.9. Monitoring

### Construction

8.9.1 The monitoring requirements are stated in Table 8.8 and should comply with the measures outlined in the DMP. Regular site inspections (both on and off site) are highly recommended at all locations and should be undertaken by the 'site responsible person' (site manager) and / or the community liaison / point of contact for the scheme. Details of the site inspections should be recorded in the site log book.

8.9.2 The need for real-time dust monitoring is not anticipated and would be determined by the Department for Infrastructure (DfI), in consultation with the EHO, on a site-by-site basis as part of the application process. If required, this would be secured through the contract document between the DfI and the appointed contractor.

## 8.10. Summary

8.10.1 A qualitative assessment of the potential impacts on local air quality from construction activities has been carried out for each of the 20 constituent flood defence locations within the scheme using the IAQM methodology.

8.10.2 This identified that overall, there is a **high to medium risk** of dust soiling impacts and a **low risk** of increases in health impacts as a result of increased particulate matter concentrations due to construction activities, mostly through earthworks and trackout. However, through good site practice and the implementation of suitable mitigation measures, the impacts of dust and PM<sub>10</sub> releases would be substantially reduced.

8.10.3 The residual effects of dust and PM<sub>10</sub> generated by construction activities on air quality and the effects of emissions to air from construction vehicles and plant on local air are direct, temporary, short to medium term and of **negligible negative** significance.

## 9. Cultural Heritage

### 9.1. Introduction

- 9.1.1 This assessment provides a survey of sites of cultural heritage value within and surrounding the proposed Portadown Flood Alleviation Scheme in County Armagh, an assessment of the potential effects of the proposed development upon these sites, and advice on the appropriate mitigation measures.
- 9.1.2 This assessment has been undertaken by Christine Rennie of GUARD Archaeology Ltd. All elements of the assessment have been undertaken in line with the following policies and guidelines of the Chartered Institute for Archaeologists (CIfA) of which GUARD Archaeology Ltd is a Registered Organisation.
- By-laws: Code of Conduct (2021) (Ref 9.1);
  - Standards and Guidance for commissioning work on, or providing consultancy advice on, archaeology and the historic environment (2020) (Ref 9.2), and
  - Standard and Guidance for historic environment desk-based assessment (2020) (Ref 9.3).

### 9.2. Statutory and Policy Context

#### Statutory Consultees

- 9.2.1 The Statutory Consultees for cultural heritage are the Department for Communities (DfC) Historic Environment Division Historic Buildings (HEDHB) and DfC Historic Environment Division Historic Monuments (HEDHM). The key points raised by the statutory consultees during Scoping are presented in Table 9.1.

Table 9.1: Scoping responses

Consultee	Consultee Comment	Response/ Action	Section Cross-Reference
HED Historic Buildings	<ul style="list-style-type: none"> <li>· HEDHB notes that the proposal directly impacts on The Shillington Building, a Grade B1 listed building.</li> <li>· HEDHB have requested further information on the potential direct effects upon this Grade B1 listed building.</li> <li>· HEDHB noted that high-quality materials are used in the vicinity of listed buildings and suggested that this should be extended to Portadown town centre to provide a coherent backdrop to the town and that the wider setting of listed buildings is considered. HEDHB further considered that an appropriate material which should reflect the industrial heritage of the River Bann and complement finishes of listed and historic buildings within Portadown be used.</li> </ul>	<ul style="list-style-type: none"> <li>· Potential direct effects upon The Shillington Building (<b>CHS 33</b>) have been considered.</li> <li>· The assessment has found that indirect effects upon the settings of The Shillington Building (<b>CHS 33</b>) and WWII Pillbox - DHP no.221 Scheduled Monument (<b>CHS 71</b>) could be reduced or removed through appropriate design of the scheme.</li> </ul>	<ul style="list-style-type: none"> <li>· The results of the assessment are at Section 9.6.7.</li> <li>· Mitigation of indirect effects is at Section 9.7.6 to 9.7.7 and 9.7.9.</li> </ul>
HED Historic Monuments	<ul style="list-style-type: none"> <li>· HEDHM raised concerns that the proposal could have the potential to impact both on below-ground archaeological remains, particularly those relating to the historic development of Portadown as a</li> </ul>	<ul style="list-style-type: none"> <li>· The assessment identified four cultural heritage sites where the proposal has the potential to adversely affect sub-surface remains of known cultural heritage sites.</li> </ul>	<ul style="list-style-type: none"> <li>· The results of the direct impact assessment are at Section 9.6.1 to 9.6.13 and on Table 9.6.</li> </ul>

Consultee	Consultee Comment	Response/ Action	Section Cross-Reference
	<p>settlement and industrial centre, and on extant industrial and defence heritage assets, including their settings.</p> <p>HEDHM also noted that the proposal could affect two designated LLPAs - the People's Park (P/LLPA/1) and the designed landscape of a former plantation estate and the River Bann (P/LLPA/4).</p>	<p>The assessment included the two designated LLPAs.</p>	<p>Assessment of the direct and indirect effects upon the LLPAs is at Sections 9.6.12 to 9.6.13, 9.6.19, 9.6.23 and on Table 9.7.</p>

## Planning Policy

9.2.2 The statutory framework for heritage in Northern Ireland is outlined in the Planning Act (Northern Ireland) 2011.

9.2.3 Cultural heritage resources consist of designated and non-designated sites, including individual monuments, related settings and the wider cultural landscape. Sites with statutory designations are defined in the Historic Environment Division's *Services and Standards Framework* (2019) (Ref 9.4) and comprise:

- Scheduled Monuments;
- Monuments in State Care;
- Listed Buildings;
- Register of Historic Parks and Gardens, and
- World Heritage Sites.

## National Planning Policy and Guidelines

9.2.4 Three paragraphs of the Strategic Planning Policy Statement for Northern Ireland (SSPS) (2015) (Ref 9.5) are pertinent to this assessment of the proposed development area.

## Archaeology

9.2.5 SSPS paragraphs 6.8 to 6.11 state: 'Archaeological remains of regional importance include monuments in State Care, scheduled monuments and Areas of Significant Archaeological Interest (ASAIs). Such sites (or constituent parts of them) benefit from statutory protection. Development which would adversely affect such sites or the integrity of their settings must only be permitted in exceptional circumstances. The scheduling programme is an ongoing process and there are archaeological remains of regional importance yet to be scheduled. In order to make sure that the most up to date information is taken into account when determining applications, this policy approach should also apply to such sites which, whilst not scheduled presently, would otherwise merit such statutory protection.

Development proposals which would adversely affect archaeological remains of local importance or their settings should only be permitted where the planning authority considers that the need for the proposed development or other material considerations outweigh the value of the remains and/or their settings.

Planning authorities should seek all necessary information from applicants in making well informed planning judgements, particularly where the impact of a development proposal on archaeological remains is unclear, or the relative significance of such remains is uncertain. Should an applicant fail to provide a suitable assessment or evaluation on request, the planning authority should adopt a precautionary approach and refuse planning permission.

Where a planning authority is minded to grant planning permission for development which will affect sites known or likely to contain archaeological remains, it should ensure that appropriate measures are taken for the identification and mitigation of the archaeological impacts of the development. Where appropriate, this may involve the preservation of remains in situ, or a licensed excavation, recording examination and archiving of the archaeology by way of planning conditions.'

### Listed Buildings

- 9.2.6 SSPS paragraph 6.12 states: 'Listed Buildings of special architectural or historic interest are key elements of our built heritage and are often important for their intrinsic value and for their contribution to the character and quality of settlements and the countryside. It is important therefore that development proposals impacting upon such buildings and their settings are assessed, paying due regard to these considerations, as well as the rarity of the type of structure and any features of special architectural or historic interest which it possesses.'

### Local Planning Policy and Guidelines

- 9.2.7 Local planning policy is defined in the Armagh City, Banbridge and Craigavon Borough Council's Local Development Plan (2018) (Ref 9.6). The LDP's Summary of our Preferred Options Paper includes one policy relating to cultural heritage that is pertinent to this assessment.

#### *Preferred Option ENV 1A*

"An approach in line with existing policy with regards to protecting, conserving and enhancing built heritage and archaeological assets within the Borough; and review existing areas / designations and identify new areas / designations as appropriate."

## 9.3. Methodology

- 9.3.1 Baseline studies for the proposed development area comprised a desk-based assessment and field survey (in the form of a walkover survey) of all known sites within both the proposed development area and a 300m buffer zone surrounding it. Within this buffer, all designated sites were recorded, researched and the impact of the proposed development assessed. Study of this surrounding landscape provides the local archaeological and historical context of the development area giving a broader understanding of the historical development of the area and the potential for as-yet-unidentified archaeological remains within that area, as well as assessing the potential impact of the development upon the settings of designated sites in the vicinity.
- 9.3.2 The desk-based assessment of the proposed development area and its immediate surrounding landscape comprised the following:
- GIS data on the historic environment was obtained from the Historic Environment Record of Northern Ireland (HERoNI) (Ref 9.7);
  - Digital versions of the Pre-Ordnance Survey maps and NI Ordnance Survey maps at 1:2500 and 1:10560 scales, held by the Public Record office of Northern Ireland (PRONI), were identified online and examined. Relevant maps range in date from the seventeenth to the early twentieth century;
  - Readily accessible primary and secondary historical sources were consulted for information on its history and past land use, and
  - One set of vertical aerial photographs from the National Collection of Aerial Photographs (NCAP) held by Historic Environment Scotland (Ref 9.8) were examined on-line. These dated from 1994. The aerial photographs were supplemented by satellite images from the twentieth and twenty-first centuries.
- 9.3.3 The walkover survey of the proposed development area was undertaken on 5th November 2021 in dry conditions. A Global Positioning System (GPS) was available to record the locations of any features identified; any such features were also to be recorded by written description and, if appropriate, measured sketches and digital photography. Previously recorded sites noted through the desk-based assessment were visited to assess their current condition.

9.3.4 No difficulties or limitations were encountered during the desk study or walkover survey.

### Assessment methodology

9.3.5 The methodology for the assessment of potential effects has two strands – a methodology for assessing the potential direct effects of the proposed development, where the effects relate to the physical effect of the development on cultural heritage features; and a methodology for assessing the potential effects of the development on the settings of statutorily designated cultural heritage features. In both cases, effects can be adverse or beneficial.

### Direct Effect

9.3.6 The significance of a potential effect resulting from a direct effect related to the proposed development is assessed by considering the sensitivity of the cultural heritage feature and the magnitude and nature of the impact.

9.3.7 The sensitivity of the feature is determined with reference to any designation and, especially for non-designated archaeological remains, by professional judgement made with reference to criteria such as those set out in Planning Policy Statement 6 (PPS 6): Planning, Archaeology and Built Heritage (1999). Non-designated cultural heritage features can be assigned equivalent levels of importance, with reference, for example, to the criteria for designating Listed Buildings, as outlined in *Revised Annex C of Planning Policy Statement 6 (PPS 6): Planning, Archaeology and Built Heritage (1999)* (Ref 9.9). Table 9.2 represents a guide used in assigning levels of sensitivity to designated and non-designated cultural heritage features.

Table 9.2: Sensitivity/Importance of Cultural Heritage and Archaeology

Sensitivity	Importance	Feature Examples
High	National	Scheduled Monuments or sites of schedulable quality; category A and B+ listed buildings or buildings of equivalent quality; some Conservation Areas
Medium	Regional	Category B1 and B2 listed buildings or buildings of equivalent quality; Historic Parks, Gardens and Demesnes; some Conservation Areas; archaeological remains of regional importance
Lesser	Lesser	Archaeological remains of lesser importance
		Archaeological remains of unknown character and importance

9.3.8 The magnitude of the impact is determined with reference to the scale and type of the potential change to the feature:

Table 9.3: Definitions of Magnitude of Impact

Magnitude	Definition
Substantial	Total loss of or major alteration to key elements or features of the pre-project conditions, such that the post-project character or composition of the feature would be fundamentally changed.
Moderate	Partial loss of or alteration to key elements or features of the pre-project conditions, such that the post-project character of the feature would be partially changed.
Slight	Minor alteration from pre-project conditions.

Magnitude	Definition
Negligible/ No change	No or slight change to pre-project conditions.

9.3.9 The significance of any potential effect on a feature has been assessed as major, moderate, minor, negligible or none. Judgement of the significance of an effect was made with reference to the assessment matrix in Table 9.4.

Table 9.4: Matrix for the Assessment of Significance of Effect

		Significance of Effect			
		Minor/unknown	Minor to Moderate	Moderate to Major	Major
Magnitude of Impact	Substantial	Minor/unknown	Minor to Moderate	Moderate to Major	Major
	Moderate	Negligible/unknown	Minor	Moderate	Moderate to Major
	Slight	None/unknown	Negligible	Minor	Minor to Moderate
	Negligible/No change	None/unknown	None	None	None

9.3.10 Where the effect on a feature is classified as major or moderate, this is considered to be equivalent to likely significant effects referred to in the Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2015.

### Indirect Effect (Setting)

9.3.11 In the context of the current assessment, potential effects on the settings of cultural heritage features are visual in nature although less tangible elements such as perceived social, spiritual, historic, artistic, aesthetic, natural, scientific or other cultural values can also contribute to the setting of a cultural heritage feature (HED 2018, 7).

9.3.12 The assessment of such effects is based on the significance of a cultural heritage site, as defined in Table 9.4, an analysis of its current surroundings and an assessment of the extent to which change can be accommodated without detriment to the cultural heritage site. The assessment takes account of a wide variety of elements of setting, including intervisibility with other sites, buildings or landscape features, key viewpoints to, from and across the cultural heritage site, and potential effects from noise, dust and vibration that may be associated with a development proposal. The HED's *Guidance on Setting and the Historic Environment* (2018) (Ref 9.10) is used to further define the current setting and to evaluate the potential effect resulting from the proposed development.

9.3.13 Having defined the current setting and quantified the potential magnitude of the proposal upon the cultural heritage site, the sensitivity and magnitude are, in each case, combined to determine the significance of the potential effect. The assessment of potential effects on setting is based on professional judgements concerning the sensitivity, magnitude and significance of the effect in each case. These professional judgements were made in the context of the following structure.

9.3.14 The sensitivity of a feature in this context relates to the degree to which change can be accommodated without detrimental effects on the relationship between the feature and its setting. The sensitivity of each

feature subject to assessment is defined as high, medium, low or not sensitive. Unless otherwise justified by specific factors in an individual case, the sensitivity of each feature was determined as shown on Table 9.5.

Table 9.5: Sensitivity of Cultural Heritage Features to Setting Effects

Sensitivity	Importance	Feature Examples
High	National	Scheduled Monuments or sites of schedulable quality; A-listed buildings or buildings of equivalent quality; Inventory Gardens and Designed Landscapes; Inventory Battlefields, some Conservation Areas
Medium	Regional	B-listed buildings or buildings of equivalent quality; some Conservation Areas; archaeological remains of regional importance
Low	Local	C-listed buildings or buildings of equivalent quality; some Conservation Areas; archaeological remains of local importance
Lesser	Lesser	Archaeological remains of lesser importance

9.3.15 The magnitude of impact arising from the proposed development in relation to a given feature and its setting is described as substantial, moderate, slight or negligible/no change based on the definitions at Table 9.2, on the detailed setting analysis and on the HED's *Guidance on Setting and the Historic Environment* (2018).

9.3.16 The significance of any potential effect on the setting of a feature is assessed as major, moderate, minor, negligible or none. The professional judgement of the significance of an effect was made with reference to the assessment matrix in Table 9.6.

Table 9.6: Matrix for the Assessment of the Significance of Potential Setting Effects

		Sensitivity of Feature			
		Not sensitive	Low	Medium	High
Magnitude of Impact	Substantial	None	Minor to Moderate	Moderate to Major	Major
	Moderate				
	Slight	None	Negligible	Minor	Minor to Moderate
	Negligible/No change	None	None	None	None

9.3.17 Where the effect on the relationship of a feature to its setting is classified as major or moderate, this is considered to be equivalent to likely significant effects referred to in the Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2015.

## 9.4. Baseline Conditions

### Baseline Condition of the Proposed Development Area

9.4.1 A total of 74 cultural heritage sites were recorded within the study area (**Figures 9.1a to 9.1e, Volume 4;** and **Appendix 9.1, Volume 3**). Eight sites of cultural heritage interest are located on or in very close proximity to the proposed flood alleviation locations. These comprise a grade B1 Listed warehouse, a brick hole, a sawmill, two road bridges, a WWII Pillbox, which is a Scheduled Monument and two Designed Landscapes.

- 9.4.2 A further sixty-six cultural heritage sites, including one Scheduled Monument, one B+ Listed Building, seven B1 Listed Buildings, two B2 Listed Buildings and four B Listed Buildings, are located within 300m of the proposed development.
- 9.4.3 The HERoNI was checked on 3<sup>rd</sup> November 2021 and the assessment does not take account of any additions or alterations to this record after that date.
- 9.4.4 In the following paragraphs, the code in parenthesis (CHS and number) refers to the cultural heritage assets as listed on the gazetteer at **Appendix 9.1** and shown on **Figure 9.1a-e, Volume 4**.

#### **Prehistoric and Early Medieval Sites (8000 BC – AD 600)**

- 9.4.5 There are no known cultural heritage sites of prehistoric or early Medieval date within the site or within the surrounding 300m buffer.

#### **Medieval Sites (AD 600 – AD 1600)**

- 9.4.6 There are no known cultural heritage sites of Medieval date within the site or within the surrounding 300m buffer.

#### **Post-medieval and Modern Sites (AD 1600 – 2000)**

- 9.4.7 All 74 of the cultural heritage sites identified for this assessment date from the post-medieval and modern periods. Eight of these are located on or immediately adjacent to the site and the remaining 66 are within the 300m buffer zone.
- 9.4.8 The Ordnance Survey Northern Ireland (OSNI) first edition map of 1835 depicted a largely rural landscape with only the area in and around High Street having been developed. The map recorded two brick holes (**CHS 2** and **CHS 43**), a linen factory (**CHS 28**), a corn mill (**CHS 72**), three bridges (**CHS 29**, **CHS 40** and **CHS 44**) and a distillery (**CHS 35**).
- 9.4.9 By 1860, Portadown had grown substantially and many of the new buildings represented the increased industrialisation of the town. The industries included textiles (**CHS 8**) and other amenities in the town were a gasworks (**CHS 9**) and a bank (**CHS 52**). Two buildings of unknown function, possibly 17 and 17A High Street, (**CHS 55**, **CHS 57**) were also recorded. The 1860 map also depicted Portadown Railway Station (**CHS 49**) and the associated infrastructure of bridges (**CHS 37**, **CHS 38**, **CHS 45**, **CHS 46**, **CHS 67** and **CHS 69**), a level crossing (**CHS 70**) and a tunnel (**CHS 6**).
- 9.4.10 The 1905/1906 OSNI maps demonstrate the continued expansion of Portadown with a growth in industry exemplified by the number of textile and textile-related factories in the town (**CHS 1**, **CHS 18**, **CHS 27**, **CHS 39**, **CHS 42**, **CHS 50**, **CHS 56**, **CHS 60**, **CHS 63** and **CHS 66**). The growth of the textile industry led to a population increase and brickworks (**CHS 25** and **CHS 26**) were built to construct the additional housing on Bridge Street (**CHS 11** to **CHS 17**) and Carrickblacker Avenue (**CHS 19** to **CHS 23**) and the warehouses (**CHS 32** and **CHS 33**). An expanding town meant that civic buildings were required and the 1905/1906 map recorded new churches and meeting houses (**CHS 10**, **CHS 61** and **CHS 62**), banks (**CHS 53** and **CHS 54**), a town hall (**CHS 58**), a library (**CHS 59**) and a road bridge (**CHS 68**) as well as other amenities such as a motor works (**CHS 24**), a sawmill (**CHS 34**), a bacon factory (**CHS 48**) and a flour and corn mill (**CHS 51**). The People's Park (**CHS 73**) has its origins in Woodside Estate and was first recorded as a park on the 1900 OSNI map; by 1905 the park had amenities such as a tennis ground and pavilion. The designed landscape around Ashgrove House (**CHS 74**) had been established by 1905.
- 9.4.11 By the middle of the twentieth century, the OSNI maps additionally recorded a linen factory (**CHS 3**), a foundry (**CHS 7**) and defensive structures relating to WWII (**CHS 4**, **CHS 30** and **CHS 71**).
- 9.4.12 None of the maps consulted recorded the corn kilns (**CHS 5** and **CHS 36**), the sawmill (**CHS 31**), the house and bawn at Ballynevoran (**CHS 41**), the threshing machine (**CHS 64**) or the brickfield (**CHS 65**).

#### **Vertical Aerial Reconnaissance**

- 9.4.13 One set of aerial photographs (APs) dating from 1994 was studied.



9.4.14 The aerial photographs generally recorded the mixed urban townscape and rural landscape in and around Portadown.

9.4.15 No previously unknown cultural heritage sites were noted.

9.4.16 Satellite images from the late twentieth and twenty-first centuries recorded no previously unknown cultural heritage sites.

### **Walkover Survey**

9.4.17 The walkover survey consisted of an inspection of the proposed flood alleviation route and an assessment of potential direct effects upon cultural heritage sites on and immediately adjacent to the route.

9.4.18 The locations of all cultural heritage sites potentially affected by the proposal were visited and their condition noted. A setting appraisal of the designated cultural heritage sites was carried out in accordance with HED's *Guidance on Setting and the Historic Environment* (2018).

9.4.19 No previously unknown cultural heritage remains were observed during the survey.

## **9.5. Evaluation (Value of Resource or Sensitivity of Receptors)**

### **Designated Cultural Heritage Sites**

9.5.1 Of the 72 cultural heritage sites identified within the study area, 18 are designated:

- WWII Pillbox – DHP No. 226; Scheduled Monument (**CHS 4**);
- First Presbyterian Church, Bridge Street; B Listed Building (**CHS 10**);
- 12 Carrickblacker Avenue, Portadown; B1 Listed Building (**CHS 19**);
- 14 Carrickblacker Avenue, Portadown; B1 Listed Building (**CHS 20**);
- 16 Carrickblacker Avenue, Portadown; B1 Listed Building (**CHS 21**);
- 18 Carrickblacker Avenue, Portadown; B2 Listed Building (**CHS 22**);
- 20 Carrickblacker Avenue, Portadown; B1 Listed Building (**CHS 23**);
- The Shillington Building, Castle Street; B1 Listed Building (**CHS 33**);
- (Former) Bank of Ireland, High Street; B Listed Building (**CHS 52**);
- Ulster Bank, 20 High Street; B1 Listed Building (**CHS 53**);
- 17A High Street; B1 Listed Building (**CHS 57**);
- Town Hall, Edward Street; B1 Listed Building (**CHS 58**);
- Carnegie Library, Edward Street; B1 Listed Building (**CHS 59**);
- Methodist Church, Thomas Street; B+ Listed Building (**CHS 61**);
- Former Quaker Meeting House, 24 Portmore St; B2 Listed Building (**CHS 62**);
- WWII Pillbox - DHP no.221; Scheduled Monument (**CHS 71**);
- The People's Park Designed Landscape (**CHS 73**), and
- The River Bann Designed Landscape (**CHS 74**).

- 9.5.2 The two Scheduled Monuments, WWII Pillbox – DHP No. (**CHS 2**),) and 226 WWII Pillbox - DHP no.221 (**CHS 71**) and the category B+ Listed Building (**CHS 61**) are of National cultural heritage importance and high sensitivity. In addition, HED has stated that The Shillington Building (**CHS 33**) is also of National cultural heritage importance and high sensitivity.
- 9.5.3 The category B1 and B2 Listed Buildings (**CHS 19 to CHS 23, CHS 52, CHS 53, CHS 57, CHS 58, CHS 59 and CHS 62**) are of Regional cultural heritage importance and medium sensitivity. The historic settlement of Ballevoran/Ballyoran (**CHS 47**) is also assessed as being of Regional cultural heritage importance and medium sensitivity.
- 9.5.4 The category B Listed Buildings (**CHS 10 and CHS 52**) and the Designed Landscapes (**CHS 73 and CHS 74**) are of Local cultural heritage importance and low sensitivity. Also of Local cultural heritage importance and low sensitivity are the linen factory with Belfast roof truss (**CHS 3**), Nos. 109 to 119 Bridge Street (**CHS 11 to CHS 17**), the public quay and warehousing (**CHS 32**) and the house and bawn at Ballynevoran (**CHS 41**).
- 9.5.5 The remainder of the cultural heritage sites identified by this assessment are considered to be of Lesser cultural heritage importance and lesser sensitivity (**CHS 1, CHS 2, CHS 5, CHS 6, CHS 7, CHS 8, CHS 9, CHS 18, CHS 24, CHS 25, CHS 26, CHS 27, CHS 28, CHS 29, CHS 30, CHS 31, CHS 34, CHS 35, CHS 36, CHS 37, CHS 38, CHS 39, CHS 40, CHS 42, CHS 43, CHS 44, CHS 45, CHS 46, CHS 48, CHS 49, CHS 50, CHS 51, CHS 55, CHS 56, CHS 60, CHS 63, CHS 64, CHS 65, CHS 66, CHS 67, CHS 68, CHS 69, CHS 70 and CHS 72**).

## 9.6. Impact Assessment

### Construction

#### Direct Effects

- 9.6.1 Potential adverse direct impacts on known cultural heritage features can occur within the boundary of the proposed development area, where avoidance of such features is not possible. There is also the potential for direct impacts on as-yet-undiscovered archaeological remains, which may occur where, for example, sub-surface remains are present but have not yet been identified because they have no visible, above-ground elements.
- 9.6.2 Direct impacts on known or as-yet-unidentified cultural heritage features may result from:
- Ground-breaking and demolition works related to the construction of the proposed development;
  - Movement of machines over or near to sensitive areas, resulting in the disturbance of elements of a feature, including through the rutting and/or compaction of archaeological deposits.
- 9.6.3 Potential direct impacts on the archaeological resource are typically adverse, permanent and irreversible.
- 9.6.4 The assessment has identified eight cultural heritage sites on or in close proximity to the locations of the proposed flood alleviation scheme that could potentially be directly affected by the proposals. The following direct impact assessment is based on the methodology outlined in Tables 9.2 – 9.4.

Table 9.6: Direct Impact Assessment without mitigation

Site #	Site Name	Site Sensitivity	Magnitude of Impact	Significance of Effect
2	Brick hole	Lesser	Slight	None
33	The Shillington Building	National		<b>Minor to Moderate</b>
34	Sawmill	Lesser	Slight	None

Site #	Site Name	Site Sensitivity	Magnitude of Impact	Significance of Effect
40	Castle Island Bridge	Lesser	Negligible/No Change	None
44	Charles Street Bridge	Lesser	Slight	None
71	WWII Pillbox - DHP no.221	National	Negligible/No Change	None
73	People's Park Designed Landscape	Local	Moderate	Minor
74	River Bann Designed Landscape	Local	Slight	Negligible

- 9.6.5 The archaeological remains that could potentially be directly affected by the proposals consist of a brick hole, a warehouse, a sawmill, two bridges, a WWII Pillbox and two designed landscapes.
- 9.6.6 The HERoNI location for the brick hole (**CHS 2**) is approximately 6m from the route of the proposed flood alleviation scheme. However, no dimensions for this feature are included in the online HER and it is possible that the brick hole may extend onto the route of the proposed flood alleviation scheme. The brick hole is not visible on the ground surface but sub-surface elements of the feature may survive and could be disturbed by the proposal. It is assessed that the proposed flood alleviation scheme could constitute a slight alteration from pre-project conditions resulting in no significant direct effect upon this cultural heritage site.
- 9.6.7 The Shillington Building (**CHS 33**) is a grade B1 Listed Building that is located close to the bank of the River Bann. The route of the proposed flood alleviation scheme passes some 16m to the north of The Shillington Building before turning south and passing the east facing elevation at a distance of approximately 4m from the building. Given that the distance between the grade B1 Listed Building and the proposed groundworks is relatively narrow, there is some potential for the proposal to directly affect the fabric of The Shillington Building. It is, therefore, assessed that the proposal could constitute a slight alteration to the pre-project conditions, resulting in a Minor to Moderate, and therefore significant, direct effect upon the fabric of this grade B1 Listed Building.
- 9.6.8 The sawmill (**CHS 34**) was recorded on the 1905-1906 OSNI map but no above-ground remains of the building are visible today. However, sub-surface elements of the sawmill may survive and could be disturbed by the proposal. It is assessed that the proposed flood alleviation scheme could constitute a slight alteration from pre-project conditions resulting in no significant direct effect upon this cultural heritage site.
- 9.6.9 It is difficult to be certain which bridge (**CHS 40**) this HERoNI entry refers to as there is no bridge at this ING reference and none of the historic maps recorded such a feature at this location. Assuming that the entry refers to Castle Island Bridge which is located approximately 36m ENE of this point, the proposal would result in no direct effect upon the bridge.
- 9.6.10 Charles Street Bridge (**CHS 44**) is located on the route of the proposed flood alleviation scheme and, depending on the final design of the scheme, could be directly affected by the proposal. It is assessed that the proposed flood alleviation scheme could constitute a slight alteration from pre-project conditions resulting in no significant direct effect upon this cultural heritage site.
- 9.6.11 The WWI Pillbox (**CHS 71**) is a Scheduled Monument that is located at the south end of a terrace of houses and is approximately 8m from the route of the proposed flood alleviation scheme. At this distance, it is unlikely that the proposal would result in any direct effect upon the fabric of the structure. It is, therefore, assessed that the proposal would constitute a negligible change to the pre-project conditions, resulting in no significant direct effect upon the fabric of this Scheduled Monument.
- 9.6.12 Two sections of the proposed flood alleviation scheme are located within the People's Park Designed Landscape (**CHS 73**), both of which would directly affect the cultural heritage site during the construction phase. While some of the proposed flood alleviation scheme would be at the north-east and south-west extents of the park, approximately 350m of the scheme would cross the central open area of the park. It is

assessed that the proposal would constitute a moderate change to the pre-project conditions, giving rise to a Minor direct effect upon this cultural heritage site. Depending upon the final design of the scheme, this direct effect could be mitigated.

9.6.13 One section of the proposed flood alleviation scheme is located within the Riven Bann Designed Landscape (**CHS 74**) at Ashgrove House. The section is at a field boundary and would constitute a slight alteration to the pre-project conditions resulting in a Negligible direct effect upon this cultural heritage site.

### Indirect Effects

9.6.14 Potential indirect impacts comprise potential effects on the settings of cultural heritage sites that have statutory designation. These include Listed Buildings, Scheduled Monuments, Conservation Areas, Gardens and Designed Landscapes. While the potential effects are primarily visual in nature, there are instances where the setting of a cultural heritage feature may be affected even when important views to or from that feature are not affected.

9.6.15 In addition to visual effects, factors such as dust and noise from the proposed development could potentially constitute adverse effects on the settings of designated cultural heritage sites. Noise from the site would occur during the groundworks and construction phases and would be restricted to the working hours of the construction company. The existing tree belts to the south and east of the site would provide a barrier to the effects of noise as they do, for example, on sections of motorway that are adjacent to residential properties. Potential adverse impacts from dust could also arise during the groundworks and construction phases and could be minimised by measures such as dampening the ground during dry weather. Where impacts from noise or dust could potentially affect the setting of a designated cultural heritage site, this is included in the assessment of that cultural heritage asset.

9.6.16 The setting of a cultural heritage site can incorporate a range of factors including:

- the current landscape or townscape context;
- views to, from and across or beyond the cultural heritage asset;
- key vistas;
- relationships with other built and natural features;
- non-visual factors such as historical, artistic, literary, place name, or scenic associations, intellectual relationships or sensory factors, and
- aesthetic qualities.

9.6.17 In addition to effects from a development, effects on setting may result from:

- Changes in views associated with the construction phase of development;
- Changes in views resulting from the operation of the proposed development.

9.6.18 The assessment has identified 18 designated cultural heritage sites that could potentially be indirectly affected by the proposal. The following indirect impact assessment is based on the methodology outlined in Tables 9.2, 9.4 and 9.5.

Table 9.7: Indirect Impact Assessment without mitigation

Site #	Site Name	Site Designation	Site Sensitivity	Magnitude of Impact	Significance of Effect
4	WWII Pillbox – DHP No. 226	Scheduled	High	Negligible/ No change	None
10	First Presbyterian Church	B Listed	Local	Negligible/	None

Site #	Site Name	Site Designation	Site Sensitivity	Magnitude of Impact	Significance of Effect
				No change	
19	12 Carrickblacker Avenue	B1 Listed	Medium	Negligible/ No change	None
20	14 Carrickblacker Avenue	B1 Listed	Medium	Negligible/ No change	None
21	16 Carrickblacker Avenue	B1 Listed	Medium	Negligible/ No change	None
22	18 Carrickblacker Avenue	B2 Listed	Medium	Negligible/ No change	None
23	20 Carrickblacker Avenue	B1 Listed	Medium	Negligible/ No change	None
33	The Shillington Building	B1 Listed	High*	Slight	<b>Minor to Moderate</b>
52	(Former) Bank of Ireland	B Listed	Local	Negligible/ No change	None
53	Ulster Bank, 20 High Street	B1 Listed	Medium	Negligible/ No change	None
57	17A High Street	B1 Listed	Medium	Negligible/ No change	None
58	Town Hall, Edward Street	B1 Listed	Medium	Negligible/ No change	None
59	Carnegie Library, Edward Street	B1 Listed	Medium	Negligible/ No change	None
61	Methodist Church, Thomas Street	B+ Listed	High	Negligible/ No change	None
62	Former Quaker Meeting House	B2 Listed	Medium	Negligible/ No change	None
71	WWII Pillbox - DHP no.221	Scheduled	High	Slight	<b>Minor to Moderate</b>
73	People's Park Designed Landscape	Designed Landscape	Low	Moderate	Minor
74	River Bann Designed Landscape	Designed Landscape	Low	Negligible/ No change	None

\*HED considers that The Shillington Building is of National cultural heritage significance.

#### *Cultural heritage sites where no indirect effect is anticipated*

9.6.19 The setting assessment established that intervening buildings and/or woodland or tree belts means that there would be no intervisibility between the site and 15 designated cultural heritage sites within the 300m buffer. The flood alleviation scheme would, therefore, have no indirect effect upon the settings of WWII Pillbox

– DHP No. 226 Scheduled Monument (**CHS 4**), First Presbyterian Church (**CHS 10**), Nos. 12 to 20 Carrickblacker Avenue (**CHS 19 to CHS 23**), (Former) Bank of Ireland (**CHS 52**), Ulster Bank, 20 High Street (**CHS 53**), 17A High Street (**CHS 57**), Town Hall, Edward Street (**CHS 58**), Carnegie Library, Edward Street (**CHS 59**), Methodist Church, Thomas Street (**CHS 61**), the Former Quaker Meeting House (**CHS 62**) or the River Bann Designed Landscape (**CHS 74**).

9.6.20 No mitigation of indirect effects is required for these designated cultural heritage sites.

*Cultural heritage sites where a Minor indirect effect is anticipated*

9.6.21 Within the People's Park Designed Landscape (**CHS 73**), the proposed flood alleviation scheme would be visible during the construction phase, most especially in the central area of the park. This phase of the proposal would constitute a moderate alteration from the pre-project conditions giving rise to a **Minor** adverse indirect effect upon the setting of this locally important Designed Landscape.

*Cultural heritage sites where a Minor to Moderate indirect effect is anticipated*

9.6.22 The Shillington Building (**CHS 33**) is located on the west bank of the River Bann and a small retail park lies to the south. The land to the north and east of the building has been landscaped to create a walkway along the riverbank. The building itself did not appear to be in use in November 2021. During the construction phase, the proposed flood alleviation scheme would be visible to the north and east of The Shillington Building. The temporary nature of this phase of the proposal would constitute a slight alteration from the pre-project conditions at The Shillington Building resulting in a **Minor to Moderate** adverse indirect effect upon the setting of this nationally important grade B1 Listed Building.

9.6.23 WWII Pillbox - DHP no.221 Scheduled Monument (**CHS 71**) is located at the south end of a terrace of houses and the proposed flood alleviation scheme would be visible to the south and south-east of the Pillbox. The temporary nature of this phase of the proposal would constitute a slight alteration from the pre-project conditions at WWII Pillbox - DHP no.221 resulting in a **Minor to Moderate** adverse indirect effect upon the setting of this nationally important Scheduled Monument.

## Operation

### Direct Effects

9.6.24 It is anticipated that any direct effects of the proposal upon the cultural heritage sites identified will have been mitigated during the design or construction phases of the proposal. Consequently, **no direct effects** are anticipated during the operation phase of the proposal.

### Indirect Effects

9.6.25 Indirect effects during the operation of the proposed flood alleviation scheme will be largely dependent upon the final design of the scheme. An intrusive design could result in indirect effects upon the settings of The Shillington Building (**CHS 33**), WWII Pillbox - DHP no.221 Scheduled Monument (**CHS 71**) and the People's Park Designed Landscape (**CHS 73**).

## 9.7. Mitigation

### Construction

#### Mitigation of Direct Effects

9.7.1 Where possible any cultural heritage remains should be preserved in-situ through avoidance of direct effects. Where this is not possible, preservation through record, using some or all of the following methods; archaeological survey, building recording, evaluation, excavation, post-excavation analyses and publication, should be achieved following consultation with HED.

9.7.2 Mitigation for direct effects will be required for six cultural heritage sites on or very close to the sites of the proposed flood alleviation scheme.

- 9.7.3 For the cultural heritage sites where sub-surface remains may survive, a watching brief during the ground-breaking work would allow any surviving remains to be recorded prior to their removal. This mitigation would apply to the brick hole (**CHS 2**), the sawmill (**CHS 34**) and the People's Park Designed Landscape (**CHS 73**) where elements of the earlier formal landscape of Woodside may survive below ground.
- 9.7.4 Any potential accidental damage to the Shillington Building (**CHS 33**) and WWII Pillbox - DHP no.221 Scheduled Monument (**CHS 71**) could be prevented by fencing the buildings off during the construction works.
- 9.7.5 The groundworks on Charles Street Bridge (**CHS 44**) has the potential to uncover earlier iterations of the bridge and a watching brief at this location would allow any earlier remains to be recorded in line with national policy.

#### **Mitigation of Indirect Effects**

- 9.7.6 Where possible the settings of any designated cultural heritage sites should be preserved through avoidance or mitigation of indirect effects.
- 9.7.7 During the construction phase, the mitigation of indirect effects upon the settings of The Shillington Building (**CHS 33**) and WWII Pillbox - DHP no.221 Scheduled Monument (**CHS 71**) will not be possible as preventing direct effects upon these designated cultural heritage sites will take precedence and the structures will be fenced-off.

#### **Operation**

#### **Mitigation of Direct Effects**

- 9.7.8 Following the implementation of mitigation during the construction phase of works, no direct effects upon cultural heritage sites is anticipated during the operation phase of the scheme.

#### **Mitigation of Indirect Effects**

- 9.7.9 The mitigation of indirect effects upon the settings of The Shillington Building (**CHS 33**) and WWII Pillbox - DHP no.221 Scheduled Monument (**CHS 71**) will be largely dependent upon the design of the proposed flood alleviation scheme. In order to prevent or minimise adverse effects upon the setting of these designated cultural heritage sites, the preferred design should not be overly intrusive upon the settings and should allow views to and across the structures to be maintained and, if possible, enhanced.

## **9.8. Residual Effects**

#### **Construction**

- 9.8.1 Following the implementation of mitigation measures, no direct or indirect residual effects relating to the construction phase of the proposal are anticipated.

#### **Operation**

- 9.8.2 Following the implementation of mitigation measures, no direct or indirect residual effects relating to the operation phase of the proposal are anticipated.

## **9.9. Monitoring**

#### **Construction**

- 9.9.1 Groundwork that is likely to affect surviving sub-surface remains relating to the brick hole (**CHS 2**), the sawmill (**CHS 34**), Charles Street Bridge (**CHS 44**) and the earlier iteration of the People's Park Designed Landscape (**CHS 73**) will require archaeological monitoring. This could take the form of an archaeological watching brief on all groundworks at these locations.

## Operation

9.9.2 Following the implementation of mitigation measures, no further monitoring of direct or indirect effects relating to the operation phase of the proposal is anticipated.

### 9.10. Summary

- 9.10.1 The assessment has found that the proposed flood alleviation scheme could result in direct effects upon three cultural heritage sites on or very close to the route of the proposed flood alleviation scheme. These are The Shillington Building (**CHS 33**), WWII Pillbox - DHP no.221 Scheduled Monument (**CHS 71**) and the People's Park Designed Landscape (**CHS 73**). These potential adverse direct effects upon these cultural heritage sites could be removed through the implementation of mitigation measures.
- 9.10.2 The assessment has also found that the proposed flood alleviation scheme could have an adverse indirect effect upon the settings of two designated cultural heritage sites. These are the grade B1 Listed Shillington Building (**CHS 33**) and WWII Pillbox - DHP no.221 Scheduled Monument (**CHS 71**). Mitigation for these indirect effects would be dependent upon a sympathetic design of the flood alleviation scheme that does not intrude unduly upon the settings of these designated cultural heritage sites.



## 10. Landscape and Visual Effects

### 10.1. Introduction

- 10.1.1 This chapter presents the Landscape and Visual Impact Assessment (LVIA) findings likely to arise from the construction and operation of the Portadown Flood Alleviation Scheme in County Armagh. The purpose of this undertaking, hereafter referred to as the scheme, or individual schemes, is to reduce the risk of flooding from the River Bann, Ballybay River, Corcrair River and Annagh River.
- 10.1.2 This LVIA includes a review of the existing baseline conditions and identifies likely significant effects on landscape and visual receptors whilst identifying appropriate mitigation and enhancement. The approach to this assessment follows the findings of the Scoping Report (October 2020) (CO401635 / EIA Sc Revision 01), (Appendix 2.1, Volume 3) and the methodology set out in Guidelines for Landscape and Visual Impact Assessment 3rd Edition (GLVIA3) (Ref 10.1). The previous scoping report identified a number of sites and receptors, including regional and local landscape character, where no significant effects were predicted and were subsequently scoped out. Potential impacts on landscape in the immediate proximity of the various schemes is discussed within Section 10.7 of the assessment. Given that more detailed information on the proposals has since become available, including the proposed make-up of flood defences for each scheme, this report has assessed a number of sites and receptors previously scoped out in order to provide a robust assessment in line with GLVIA3 guidance.
- 10.1.3 The identified potential landscape and visual effects may be related to the potential effects identified by other disciplines. Therefore, please also refer to the following chapters:
- Chapter 9: Cultural Heritage
  - Chapter 11: Terrestrial Biodiversity
  - Chapter 14: Noise and Vibration
- 10.1.4 The competent landscape professional has a Bachelor's degree with Honours (BSc Hons) in Landscape Architecture and is an Associate Member of the Landscape Institute (AMLI). He has 7 years' experience in LVIA and landscape planning and has worked on numerous large-scale infrastructure, renewables, commercial and residential projects across the UK.

### 10.2. Statutory and Policy Context

#### International Policy and Guidance

#### European Landscape Convention

- 10.2.1 The European Landscape Convention (ELC) (Ref. 10.9) was adopted by the Council of Europe in 2000 and has been signed and ratified by the UK since 2006. The ELC defines landscape as:
- "an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors."
- 10.2.2 The ELC also identifies that landscape:
- "covers natural, rural, urban and peri-urban areas. It includes land, inland water and marine areas. It concerns landscapes that might be considered outstanding as well as everyday or degraded landscapes."
- 10.2.3 This Convention recognises that all landscapes are potentially important, irrespective of designation, location and condition and should be considered in the assessment of effects. It states that:
- "the landscape is an important part of the quality of life for people everywhere: in urban areas and in the countryside, in degraded areas as well as areas of high quality, in areas recognised as being of outstanding beauty as well as everyday areas."

## Northern Ireland National Policy and Guidance

### Strategic Planning Policy Statement

10.2.4 The Strategic Planning Policy Statement (SPPS) (Ref 10.10) outlines how sustainable development should conserve, protect, and enhance the natural, built and historic environment. The SPPS states that developments should protect and enhance public rights of way and access (paragraph 100). This policy framework places great weight on conserving and enhancing the landscape and places of scenic beauty in Areas of Outstanding Natural Beauty, which have the highest protection status in relation to these issues. The SPPS also makes a reference to a scale and extent of development within these designations:

“The scale and extent of development within all these designated areas should be limited, while development within their setting should be sensitively located and designed to avoid or minimise adverse impacts on the designated areas” (paragraph 176).

10.2.5 The SPPS requires that development that is not well designed should be refused, and that significant weight should be given to development, reflecting local design policies and government guidance (paragraph 132). A number of policies have ‘retained’ status, meaning policies which were retained during the transitional period between previous Planning Policy Statements and the adoption of SPPS remain valid. These retained policies include PPS 2: Natural Heritage, which contains the following relevant policy objectives:

- “To seek to further the conservation, enhancement and restoration of the abundance, quality, diversity and distinctiveness of the region’s natural heritage
- To further sustainable development by ensuring that biological and geological diversity are conserved and enhanced as an integral part of social, economic and environmental development
- To protect and enhance biodiversity, geodiversity and the environment
- To take actions to reduce our carbon footprint and facilitate adaptation to climate change.”

10.2.6 These statements are supported by Policy NH5 – Habitats, Species or Features of Natural Heritage Importance.

### Regional Planning Policy

#### The Regional Development Strategy (2035) – Building a Better Future

10.2.7 The Regional Development Strategy (RDS) – 2035: building a better future (Ref. 10.11) was published in 2012 to supersede the RDS for Northern Ireland 2025 (DRDNI, 2001) (Ref 10.12). The document sets out the development strategy for future development “addressing economic, social and environmental issues aimed at achieving sustainable development and social cohesion.”

10.2.8 The RDS recognises that flooding events are more likely as a result of climate change, and states that “RDS should steer new developments away from sensitive landscapes and focus most development within existing urban areas. Development in rural locations should be sensitive to its setting.” (RDS Environmental Report, Vol 1, 2010, pg.8).

10.2.9 Policy RG12: Promote a more sustainable approach to the provision of water and sewerage services and flood risk management, states that; “The planning for the provision of water and sewerage infrastructure and treatment facilities is both a practical and environmental necessity for regional development.”

### Local Policy and Guidance

10.2.10 The scheme lies entirely within the Armagh City, Banbridge and Craigavon Borough Council (ABCBC) area. The council prepared a Preferred Options Paper (POP), which was the first of three public consultation documents. These will ultimately culminate in the adoption of a Local Development Plan (LDP). Consultation on the POP closed on the 30th May 2018.

10.2.11 As the latest iteration of the LDP has not yet been adopted, the previous LDP for the area, namely the Armagh Area Plan Alteration No. 1: Armagh Countryside Proposals (AAP,2004) (Ref 10.13) remains in force and has been considered within this assessment.

10.2.12 Policies within the AAP considered relevant to this assessment are as follows:

- CPA 1 Countryside Policy Area. The strategic objectives of the policy areas are to: “protect areas of countryside under pressure from development; to protect the visual amenity of areas of landscape quality, and; to maintain the rural character of the countryside.”

10.2.13 In addition to the Armagh Area Plan, the Craigavon Area Plan 2010 (Ref. 10.14) was also adopted in 2004. The document contains further policies in relation to development within the area, including Portadown. Although the plan focusses mainly on development such as housing, retail and commercial it also contains policies relevant to this report, such as Plan Policy CON 3: Development Affecting Local Landscape Policy Areas, although this policy does not apply to P/LLPA 4 – River Bann Local Landscape Policy Area.

### **Local Landscape Policy Areas**

10.2.14 Designation P/LLPA 1 People’s Park Local Landscape Policy Area: This policy iterates that People’s Park “contributes diversity of use to this part of the town and provides local open space. The LLPA is designated to protect the planned landscape and the important tree groups and is an important visual amenity.”

10.2.15 Designation P/LLPA 4&4(a) River Bann Local Landscape Policy Area: The policy iterates that “A Local Landscape Policy Area is designated at the northwest floodplain of the River Bann.”

## **10.3. Methodology**

### **Introduction**

10.3.1 The aim of the LVIA is to identify, predict and evaluate the likely significant effects arising from the proposed scheme. Wherever possible, identified effects are quantified, in accordance with best practice guidance, but the nature of LVIA requires interpretation by professional judgement.

10.3.2 The most relevant best practice guidance referred to in the preparation of this LVIA is GLVIA3. Direct quotes are italicised.

10.3.3 GLVIA3 states that “Professional judgement is a very important part of LVIA” (paragraph 2.23) and that “In all cases there is a need for the judgements that are made to be reasonable and based on clear and transparent methods so that the reasoning applied at different stages can be traced and examined by others” (paragraph 2.24). GLVIA3 further states that “There are no hard and fast rules about what effect should be deemed ‘significant’ but LVIA’s should always distinguish clearly between what are considered to be the significant and non-significant effects” (paragraph 3.32).

### **Guidance and Figures**

10.3.4 Baseline data for the LVIA has been gathered by desk-based study and context photographs taken during a site visit by Landscape Architects in November 2021.

10.3.5 Data sources used to inform the landscape and visual assessment include:

- Northern Ireland Regional Landscape Character Assessment (Northern Ireland Environment Agency) (Ref. 10.2)
- Northern Ireland Landscape Character Assessment 2000 (Northern Ireland Environment Agency) (Ref 10.3)
- NIEA Natural Environment Map Viewer (Northern Ireland Environment Agency) (Ref 10.4)
- Getactiveabc.com (ABCBC) (Ref 10.5)
- Ordnance Survey Mapping

- Online aerial imagery.

10.3.6 Additional guidance which has been used to inform this assessment includes:

- Landscape Character Assessment, 2016 (Landscape Institute Technical Information Note 08/2015) (Ref. 10.6)
- Townscape Character Assessment, 2017 (Landscape Institute Technical Information Note 05/2017) (Ref. 10.7)
- Visual Representation of Development Proposals (Landscape Institute Technical Guidance Note 06/19 17 September 2019) (Ref. 10.8).

10.3.7 The figures listed below illustrate the context of the scheme and provide information about recreational routes, landscape character, visual amenity and views.

- Figure 10.1: Regional Landscape Character Assessment Areas
- Figure 10.2: Local Landscape Character Areas
- Figure 10.3: Recreational Routes and Local Landscape Policy
- Figure 10.4: Topography
- Figure 10.5: Viewpoint Locations
- Figure 10.6 a-v: Photosheets
- Figure 10.7: Landscape Mitigation Overview Plan

10.3.8 **Figure 10.7: Landscape Mitigation Overview Plan, Volume 4**, illustrates an overview of the location of the mitigation proposals per scheme, which are also discussed in section 10.8 of this assessment and illustrated on Drawings CO401635A-AMEY-A1&S-XX-L-3000-01 to CO401635-AMEY-R-XX-I-3000-01 (see **Appendix 10.1, Volume 3**).

### Assessment Procedures

10.3.9 Landscape assessment and visual impact assessments are separate, though linked, procedures. Assessment of likely effects on the landscape considers the potential for effects on the environmental resource (i.e. the landscape), whereas assessment of likely visual effects considers the potential for inter-related effects on visual receptors. The visual assessment is receptor based, that is, the viewpoint photographs included are intended to provide the reader with an indication of the views possible for those receptors. The viewpoints themselves are therefore not assessed individually.

10.3.10 Landscape effects derive from changes in the physical landscape which may give rise to changes in its character and how this is experienced, including consideration of landscape perception, which may in turn affect the perceived value ascribed to the landscape. Visual effects meanwhile relate to changes that arise in the composition of available views as a result of changes: to the landscape; to people's responses to the changes; and to the overall effects with respect to visual amenity.

10.3.11 Given that landscape effects were scoped out in the previous report (CO401635 / EIA Sc Revision 01, **Appendix 2.1, Volume 3**), and the additional information following design updates will not constitute a material change, they will not be assessed within this chapter. Conversely, schemes F: Rose Cottages, M: Annagh Hill and N: Olde Golf Links have been scoped in following design updates including construction methods, embankment heights etc. given their proximity to residential properties and subsequent potential for significant visual effects.

10.3.12 It should be noted at this stage that although landscape has been scoped out of this assessment, the report provides a view on whether or not policies related to LLPAs have been complied with following implementation of the proposals.

## Relevant Terminology

10.3.13 Key terms and definitions used in the assessment, as provided in (GLVIA3), are listed below.

- Cumulative effects are those that result from additional changes to the landscape or visual amenity caused by the proposed scheme in conjunction with other developments (associated with or separate to it), or actions that occurred in the past, present or are likely to occur in the foreseeable future
- Direct effects are those resulting directly from the proposed scheme, generally within the site boundaries
- Indirect effects are those resulting indirectly from the proposed scheme as a consequence of the direct effects, often occurring away from the site, or as a result of a sequence of interrelationships or a complex pathway. They may be separated by distance or in time from the source of the effects
- Landscape character is the distinct and recognisable pattern of elements that occur consistently in a particular type of landscape that makes one landscape different from another, rather than better or worse
- Landscape receptors are aspects of the landscape resource that have the potential to be affected by the proposed scheme
- Magnitude (of change) combines judgements about the size and scale of the potential effect, the extent of the area over which it occurs, whether it is reversible or irreversible and whether it is short or long term in duration
- Residual effects are those attributable to the proposed scheme taking cognisance of any proposed design mitigation/ enhancements
- Sensitivity is related to the specific receptors' (landscape or visual) vulnerability to change. Sensitivity is assessed by combining judgements of the susceptibility of the receptor to the specific type of change or development proposed and the value related to that receptor. Viewpoint sensitivity depends on the context of the viewpoint, its importance, the current occupation and viewing opportunity of the people and groups of people being considered, and the number of people affected. It should be noted that sensitivity towards the proposals is based on professional opinion with regard to the receptors themselves, and in the case of landscape, it's immediate surroundings
- Significance of effect is a measure of the importance or gravity of the environmental effect, defined by significance criteria specific to the environmental topic
- Visual amenity refers to the overall pleasantness of views enjoyed by people of their surroundings or to the visual setting or backdrop to the activities they enjoy whilst living, working, recreating, visiting or travelling through an area
- Visual receptors are individuals and/ or groups of people who have the potential to be affected by the proposed scheme.

## Key Steps in the Methodology

10.3.14 The key steps in the methodology were as follows:

- Identification of planning policy and designations which are of relevance to visual amenity
- Selection of viewpoints to best represent the range of views and types of viewers likely to be affected by the proposed scheme
- Production of photosheets/visualisations of the proposed scheme from various viewpoints
- Prediction of likely effects on visual amenity resulting from the proposed scheme
- Identification of measures to mitigate potential impacts attributable to the proposed scheme

- Prediction of the magnitude of impact in visual amenity for identified receptors represented by the viewpoints
- Evaluation of the level of significance of residual effects (assuming the identified mitigation measures are adopted) upon selected visual receptors.

10.3.15 Findings of desk and field-based research, and initial assessment have been fed into the design evolution with mitigation measures refined and adapted in order to develop the best possible proposal for the proposed scheme.

### Study Area

10.3.16 The study area for the ES chapter has been taken to be 500m from each site. The reason for this is that beyond 500m significant effects are unlikely to occur on visual receptors due to the relatively small scale, size and height of the proposals which are often at ground level or below. Additionally, a combination of screening from built form, existing vegetation, viewing angle and distance all combine to reduce the magnitude of change so any perceptible change is likely to be at best, negligible or barely perceptible from more than 500m away.

### Assessment of Sensitivity, Magnitude of Change and Significance of Effects

10.3.17 The assessment of visual effects is typically based on three stages:

- Classification of the sensitivity of visual receptors to the proposed scheme
- Prediction of the magnitude of change in the view
- Evaluation of the significance of visual effects depending on the sensitivity of the viewer to change and the magnitude of change resulting from the proposed scheme.

### Sensitivity of Visual Receptors

10.3.18 Sensitivity varies according to the type of development proposed, and the sensitivity of visual receptors is arrived at through a combination of susceptibility and value.

10.3.19 Susceptibility is broadly defined as "*the susceptibility of the receptor to the type of change arising from the specific proposal*" (GLVIA3, Para. 3.26, pg.38).

10.3.20 Value attached to views may be related to heritage assets or planning designations but may also be valued for their inclusion in guidebooks, provision of facilities for enjoyment such as interpretation boards or references to literature or art. Views may also be valued locally by recreational users utilising walking routes, both formal and informal.

10.3.21 The sensitivity of a visual receptor at a given location depends on the extent to which the receptor can accept change without adverse effects occurring upon the view. This is influenced by: the context of the view; its importance; viewing opportunity; the activity the viewer may be engaged in; and the number of people/ groups of people that may be affected by the proposed changes in the view.

10.3.22 The sensitivity of visual receptors can be described as:

- **High** – When viewers have a proprietary interest and prolonged viewing opportunities (such as experienced by residential receptors or visitors to popular recreational/ scenic destinations);
- **Medium** – When viewers have a moderate interest in their environment (for example when travelling along local routes or engaged in recreational activities); or
- **Low** – When viewers have a passing interest in their surroundings or when their interest is not specifically focussed on the landscape, for example at working premises or when travelling along key roads or railway routes.

10.3.23 As the susceptibility of visual receptors can vary depending on the correlation of several factors, the determined sensitivity of each receptor is determined by the assessor on a case-by-case basis. As such, intermediate grades such as high/medium are possible.

### Magnitude of Impact

10.3.24 The change experienced in a view would depend on the extent of visibility; the nature of a view (e.g. framed/ open or back clothed/ skyline view) and its context; degree of obstruction by existing features and contrast with the existing view; the angle of view; the duration of the view; and the distance from the proposed scheme.

10.3.25 The magnitude of impact in views and visual amenity is described as:

- **High** – Where there are predicted to be substantial changes in the view, which may be visible for a long duration, facing the change, or which may be in stark contrast with the existing view, or obstruction of a substantial part or important elements of views beyond the proposed scheme area
- **Medium** – Where there are predicted to be moderate changes in the view, or visible for a moderate duration, perhaps at a slight angle, where changes may be in contrast with the existing view, or obstruction of a noticeable part or elements of views beyond the proposed scheme area
- **Low** – Where there are predicted to be slight changes in the view, or visible for a short duration, perhaps at an oblique angle, or which may blend to an extent with the existing view
- **Negligible** – Where the change in view is barely visible, or visible for a very short duration, perhaps at an oblique angle, or which may blend with the existing view, usually at some distance from the proposed scheme
- **No Change** – Where there is no discernible change in view or visual amenity

10.3.26 Judgements on the magnitude of change rely, to a great extent, on professional judgement. The magnitude of impact is determined on a case-by-case basis with consideration given to the weighting of the variable parameters described above. As a result, intermediate grades such as high/medium are possible.

### Significance of Effects and Significance of Residual Effects

10.3.27 The significance of effect is determined by consideration of each effect that has been identified; its magnitude of change; and the sensitivity of the affected receptor. Whilst similar in approach, assessments on the significance of residual effects appraise the resultant effects following the establishment of the proposed design mitigation/ enhancements.

10.3.28 Effects are described as being:

- **Major** – When the proposed scheme results in changes that substantially affect the views of the landscape or the elements therein. For example, a major effect is likely when a receptor of high sensitivity is affected by a high magnitude of change
- **Moderate** – When the proposed scheme results in changes that affect, to a lesser degree, the views of the landscape or the elements therein. For example, a moderate effect is likely when a receptor of medium sensitivity is affected by a medium magnitude of change
- **Minor** – When the proposed scheme results in a slight change that affects the views of the landscape or specific elements therein. For example, a minor effect is likely when a receptor of low sensitivity is affected by a low magnitude of change
- **Negligible** – When the proposed scheme results in barely perceptible change, that affects the views of the landscape or specific elements therein
- **Neutral** – When the proposed scheme results in no perceptible change that affects the views of the landscape or specific elements therein.

- 10.3.29 There are gradual transitions between levels of effects, which reflect the complex relationship between the different variables under consideration. Professional judgement and experience are applied in order to identify those effects that are likely to be significant. Each case is assessed on its own merits as factors unique to each circumstance, are considered.
- 10.3.30 Effects which are graded as being major are considered significant within the context of this assessment and should be given greatest weight in decision-making. They usually concern close views from sensitive locations nearby. Effects regarded as moderate may be either significant or not significant depending on the factors considered in the determination of the sensitivity of the receptor and the magnitude of change. These effects are of progressively reducing importance in the decision-making process. Effects graded as minor or negligible are those which the decision maker should be aware of, but are of lesser concern, and are not considered significant in the context of this assessment.
- 10.3.31 This LVIA includes assessments of likely significant visual effects as a result of the proposed scheme:
- When the construction phase is being undertaken but before the additional landscape mitigation and enhancement measures have established (construction phase)
  - Once the additional landscape mitigation and enhancement measures are well established in the operational phase.

10.3.32 Table 10.1 below provides an overview matrix of the combination of receptor sensitivity and magnitude of change which results in varying levels of effect significance.

Table 10.1: Landscape and Visual Significance of Effect

Sensitivity	Magnitude of Change					
	No Change	Negligible	Low	Medium	High	
High	Neutral	Negligible/Minor	Minor/Moderate	Moderate/Major	Major	
Medium	Neutral	Negligible	Minor	Moderate	Major/Moderate	
Low	Neutral	Negligible	Negligible	Minor	Moderate	

**Nature of Effects**

- 10.3.33 Effects can be direct or indirect. Direct effects are generally limited to those parts of the site physically affected by the footprint of the proposed scheme. Potential indirect effects generally relate to the introduction of elements of the proposed scheme to the context of the existing visual baseline.
- 10.3.34 Effects may be short term/ temporary (those occurring during construction of the proposed scheme) or long term/ permanent (those lasting for the lifetime of the proposed scheme).
- 10.3.35 Effects attributable to the proposed scheme can be regarded as beneficial or adverse and, in some cases, may be considered to be neutral.
- 10.3.36 Some may consider the visual effects as beneficial or adverse depending upon their predisposition towards landscape, landscape change and their subjective opinion to the type of change proposed.
- 10.3.37 Assuming a precautionary approach in making an assessment of the 'worst case scenario', this assessment considers all potential effects which would arise from the proposed scheme to be negative/ adverse, unless specifically identified as being beneficial/ neutral in the assessment. Again, depending on the receptor's predisposition, not all people would consider the effects to be negative/ adverse, or that negative/ adverse effects would necessarily be considered unacceptable.



## Assessment of Cumulative Landscape and Visual Effect (CLVIA)

10.3.38 Within the assessment of visual effects, consideration is given to the potential cumulative effects that may arise from the introduction of the schemes in two or more locations in close proximity.

### Nature of Cumulative Effects

10.3.39 The approach to the cumulative assessment was informed by GLVIA3 guidance (Chapter 7: Assessing cumulative landscape and visual effects).

10.3.40 Cumulative visual effects which may affect views and visual amenity are considered. Cumulative visual effects can occur as follows:

- Combined effects occur where a static receptor is able to view two or more developments from a viewpoint within the receptors arc of vision (assumed to be about 120 degrees for the purpose of this assessment) at the same time
- Successive effects occur where a receptor is able to view two or more developments from a viewpoint, but needs to turn or re-position themselves or head to see them
- Sequential effects occur when a receptor is moving from one area to another, for instance when a person is travelling along a road or footpath and is able to see two or more developments at the same, or at different times as they pass along the route. Frequent sequential effects occur when a development appears intermittently with short time lapses between points of visibility, depending on the speed and distance. Occasional sequential effects occur where long periods of time lapse between views of developments, due to a lower speed of travel and/ or longer distances between the points of visibility. Sequential effects can potentially affect views from routes over a much wider area, as different developments become apparent in views when moving through the landscape.

### Significance of Residual Cumulative Effects

10.3.41 The significance of potential cumulative effects has been judged using a multifaceted approach based on that described above for the LVIA. This considered the sensitivity of visual receptors and the potential magnitude of change in the view due to the addition of the proposed scheme.

10.3.42 Effects are broadly described as being:

- **Major** – Where the proposed scheme has an obvious additional effect, when experienced in conjunction with other developments, on views
- **Moderate** – Where the proposed scheme has a discernible but not obvious additional effect, when experienced in conjunction with other developments, on views
- **Minor** – Where the proposed scheme has a relatively small additional effect, when experienced in conjunction with other developments, on views
- **Negligible** – Where the proposed scheme has an imperceptible additional effect, when experienced in conjunction with other developments, on views.

10.3.43 As shown in Table 10.1, there are gradual transitions between levels of effects, and each was assessed on a case-by-case basis. Within the context of this assessment effects that are graded as major or moderate are considered significant and therefore warrant greatest weight in the decision-making process.

### Photosheet Methodology

10.3.44 Viewpoints are locations from where views of the proposed scheme are theoretically available and are representative of specific conditions and/ or receptors. They are useful for assessing specific views from sensitive locations and a diverse number of views and receptor groups and are selected to be representative of visibility patterns in the study area. Viewpoints are, by their nature, static representations located in

publicly accessible areas such as roads, tracks and footpaths, which in reality tend to be experienced by moving receptors together with other views.

- 10.3.45 In line with best practice guidance, all photography utilised for the preparation of assessment images was taken on a tripod mounted digital camera with a full frame digital sensor and a 50mm fixed focal length camera lens. The camera, a Canon EOS 6D Digital SLR, was mounted on a panoramic tripod head to a height of 1.5m above ground level, unless the proposed view was obstructed.
- 10.3.46 The location of the viewpoints were recorded using a hand held GPS. Bracketed, overlapping exposures were taken to ensure a minimum of distortion in the final photosheet image. The viewpoint elevation was calculated using 5m Digital Terrain Model (DTM) information allied with the viewpoint location and camera height. Elevations are approximate given the relative accuracy of the 5m DTM.
- 10.3.47 The supporting Figures of the desk-based baseline and fieldwork are shown on Landscape **Figures 10.1 - 10.7, Volume 4 and Landscape Mitigation Plans in Appendix 10.1, Volume 3.**

### Assessment Assumptions and Limitations

- 10.3.48 The assessment of effects described in this chapter are based on currently available information and designs have been produced for each scheme. The chapter provides a preliminary assessment of likely significant effects, where these effects would occur and what would cause them.
- 10.3.49 All viewpoints considered in the assessment are located on publicly accessible land. The effects on views from residential properties is undertaken from publicly accessible land. Given that public access can be limited in Northern Ireland, it was not possible to obtain useful images for all schemes. Therefore, schemes B: Derryanvil Road, F: Rose Cottages, M: Annagh Hill and N2: Fairways Estate have been assessed using a combination of fieldwork and publicly available aerial imagery.
- 10.3.50 Viewpoint photography includes photographs taken during field work in November 2021.
- 10.3.51 A Zone of Theoretical Visibility (ZTV) drawing was not produced for this assessment, with potential visibility appraised through a combination of fieldwork, desktop studies and ultimately professional judgement. The purpose of a ZTV is to illustrate potential visibility of development above ground level. As the schemes are proposed to be at ground level or below this would potentially negate the effectiveness of the ZTV outcomes.
- 10.3.52 Where embankments are proposed it is assumed that the resulting landworks may require additional grassland mix beyond the proposed 2m landscape working area. This has been reflected on the mitigation drawings which accompany this report where relevant.

### Additional Note

- 10.3.53 Due to restrictions imposed by the 2021 Covid 19 lockdown greater reliance was placed on desktop research, and it was less feasible for the author to undertake site visits. However, the site photography was completed by Qualified/Chartered professionals following the guidance of the author. The assessment assumes that the screening provided by existing vegetation and proposed mitigation would reduce during winter months when vegetation is not in leaf.
- 10.3.54 Considering the diverse landscape characteristics of the locations of the proposed Portadown Flood Defence schemes pre-construction Arboricultural tree surveys (BS 5837 2012) (Ref. 10.15) will be undertaken at selected sites prior to the implementation of the site clearance works. This survey work would be instrumental in minimising the loss of existing tree cover, ensuring appropriate replacement where lost is unavoidable and be a fundamental component in the arboricultural, ecological and landscape design of the flood defence schemes. A tree survey would inform further design and the detailed assessment of visual effects described in this ES.
- 10.3.55 An assessment of night-time effects is not included as the majority of the project would be unlit or where lighting is already part of the baseline environment.

- 10.3.56 Construction assumptions are set out in Chapter 6: Description of Proposed Scheme, with the following additional assumptions relevant to the LVIA:
- Topsoil and subsoil stockpiles are no higher than 2m in height
  - The site office height would be 2.62m
  - Cranes and piling rigs would be used for the construction of flood defences and temporary construction lighting would be used to illuminate compounds and for construction works of longer duration at fixed points.
- 10.3.57 During the initial operation phase mitigation planting would be between 0.4m and 1m in height for transplants, 0.4m and 0.6m in height for hedgerow planting and between 3m and 4.5m in height for individual trees.
- 10.3.58 Following maturation mitigation tree planting is predicted to reach a height of at least 8m based on a planting size of 3m and conservative average growth rates of approximately 1m per 3 years.

## 10.4. Baseline Conditions

### Introduction

- 10.4.1 This section provides a brief description of the landscape and visual baseline for the surrounding area and each section of the scheme. There are no landscape designations within the study area/visual envelope, however there are Local Landscape Policy Areas (LLPAs) which are policy led designations designed to protect areas of important landscape amenity.
- 10.4.2 There are a few identified cycling routes within the proximity of the scheme sections, including National Cycle Network Routes (NCNRs). The study area also includes policy driven landscapes, namely Local Landscape Policy Areas (LLPAs) (see **Figure 10.3, Volume 4**), which outline the *"need to respect and protect the natural and man-made environment in and adjoining the Craigavon Urban Area and the Borough's other settlements, where development pressures are normally greatest."* (Ref 10.14).

### Landscape Designations

- 10.4.3 There are no landscape designations within the study area/visual envelope. There are however policy led designations (LLPAs) which are identified below.

### Local Landscape/Townscape Character and Features

- 10.4.4 As evidenced by the topography on **Figure 10.4, Volume 4** much of the area surrounding the scheme is low-lying, particularly along the various river courses, illustrating the potential need for flood alleviation measures.
- 10.4.5 The majority of schemes are within the urban influence of Portadown, with the remaining schemes within the more rural outskirts such as Derryanvil Road and Corcullentragh Road.
- 10.4.6 Notable transport routes within the study area include the A3 which runs broadly east to west for some 106km through several counties. The section which passes through the centre of Portadown crossing the River Bann is known as Northway. The A27 also crosses the River Bann to the south of Northway before turning south for some 37.5km to meet Newry.
- 10.4.7 The A4 route originates in Portadown west of the Portadown Train Station Park & Ride before meeting the M1 some 9km to the north-west.
- 10.4.8 The Newry-Portadown railway line broadly follows the path of the A3 as it crosses the River Bann before turning south at Portadown Railway Station to follow the course of the Newry Canal.
- 10.4.9 Given the nature of the proposals, although there may be some minor disruption to the localised transport routes during construction, such as temporary road closures and diversions, increased presence of heavy

goods vehicles and movement of large plant, there are not predicted to be any residual effects as a result of the scheme overall, therefore they are not assessed further in this chapter.

- 10.4.10 The River Bann is the main watercourse to flow through the scheme study area, passing through Portadown underneath the A3 (Northway) and A27 before meandering north towards Lough Neagh. The Ballybay River and Corcrair River course around Obins Street and north of Corcrair Mews respectively, whilst the Annagh River passes south of the Portadown Health and Care Centre.
- 10.4.11 Other watercourses include the Cusher River and Newry Canal, both of which act as tributaries to the River Bann south of Portadown town centre, east of the Fairways Estate.
- 10.4.12 Initial disruption to the localised watercourses is predicted during construction, particularly where vegetation removal is required, and sheet pilings are installed. These would be short-term however and generally limited to the riverbanks. For the River Bann, Corcrair River, Ballybay River and Annagh River there are not predicted to be any significant residual effects as a result of the scheme overall, therefore they are not assessed further in this chapter.

### Local Landscape Policy Areas (LLPAs)

- 10.4.13 These areas are described as consisting of "those features and areas within and adjoining settlements considered to be of greatest amenity value, landscape quality or local significance and therefore worthy of undesirable or damaging development." (Ref. 10.16) (See **Figure 10.3, Volume 4**).
- 10.4.14 Although these LLPAs are landscape policies set out to protect valued amenity areas rather than landscape designations, the impact of the proposals on them are considered within this assessment as locally important landscape features. LLPAs within the study area are as follows:
- River Bann P/LLPA/4 and P/LLPA/4(a): These LLPAs lie adjacent to each other on the northern outskirts of Portadown, west of Craigavon. P/LLPA/4(a) is an area where housing development has been deemed acceptable subject to key site requirements. The Craigavon Area Plan 2010 (Ref 10.14) states that *"The site is part of the River Bann floodplain and is important for the long distance views of and from the riverbank."*
  - People's Park P/LLPA/1: This LLPA covers People's Park between Garvaghy Road and Obins Street, north of Park Road. The People's Park comprises around 11ha of public parkland, created in the early 20<sup>th</sup> Century from the remains of the designed landscape setting of a former plantation estate. The Craigavon adopted plan (Ref 10.14) states that *"The LLPA is designated to protect the planned landscape and the important tree groups and is an important visual amenity."*

### Visual Receptors

#### Recreational Routes

- 10.4.15 There are no Public Rights of Way within the study area/visual envelope. There are however a number of identified walking and cycling routes within the proximity of the scheme sections, including National Cycle Network Routes (NCNRs). These are shown on **Figure 10.3, Volume 4**. Recreational routes are generally considered to be of high sensitivity given the often slow travelling speed of receptors, particularly walkers, in addition to the idea that they will experience a greater enjoyment of their surroundings. They are however still subject to the combination of susceptibility and value in line with the methodology of this assessment, and this is illustrated in Table 10.5 Schedule of Recreational Routes Sensitivity.
- 10.4.16 ABCBC have identified a number of walking routes within the county, three of which lie in the proximity of the scheme; namely:
- Walking Route 31 – People's Park Portadown: a network of footpaths within and around the recently refurbished public park which includes multiple sports pitches, pond area, event space and tranquil garden area
  - Walking Route 4 – Bann Boulevard Portadown: this relatively short walk originates at the River Bann Car Park, following the river as far as Whitecoat Bridge, some 1.3km south

- Walking Route 28 – Newry Canal Walk: a 32km long distance walking route running from Portadown to Newry which also doubles as a cycle route; the Newry Canal Towpath, discussed below.

10.4.17 In addition to these walking routes, a number of cycle routes exist within the proximity of the scheme. These are as follows:

- NCNR 9 – Newry Canal Towpath: this route follows the Newry Canal from Bridge Street Portadown to Newry
- NCNR 9 – Craigavon Cycle Trail: another section of the above route, this time following a circular route for 53.8km through the undulating countryside of County Armagh
- NCNR 94 – Loughshore Trail: a trail of some 16.6km in total, taking in the shores of Lough Neagh in addition to points of interest such as Antrim Castle and the Randalstown Viaduct.

### Individual Schemes

10.4.18 Table 10.2 below provides a listing of viewpoints used to represent visual receptors with the potential to be affected by the project, followed by an overview of the visual baseline environment for each scheme. The viewpoint locations are shown on **Figure 10.5, Volume 4**, with additional detail provided in photographic representations in **Figure 10.6a-v, Volume 4**. Although a number of schemes were scoped out previously due to lack of finalised designs, it was considered that in order to provide a robust assessment following the availability of more detailed proposals schemes F: Rose Cottages, M: Annagh Hill and N: Olde Golf Links have been included and assessed. More recent design iterations have provided further information on the make-up of proposals, for instance embankments, sheet piling and embedded walls.

### Viewpoints

10.4.19 The following viewpoints were identified during desktop assessment and field studies. The individual selected viewpoints are identified as one of the following types within Table 10.5 below:

- **Representative:** selected to represent the experience of different types of visual receptor
- **Specific:** selected because they are key and sometimes promoted viewpoint within the landscape
- **Illustrative:** chosen to demonstrate a particular effect or specific issue which might, for example, be the restricted visibility at some locations.

10.4.20 It should be noted that viewpoints may not include all of the above types, it is dependent on the nature of the proposed scheme and its location.

Table 10.2: Viewpoint Locations

No.	Name/Location	Grid Ref.	Approx. Distance/Direction to site	Reasons for inclusion/Type
01	Derryvore Lane south of Derryvore Manor	NW 12535 15019	320m/SE	Residents at nearby properties along Derryvore Lane - Representative
02	Island Road	NW 11941 13539	140m/NW	Residents at nearby farmhouse - Representative
03	Ashgrove Road	NW 11616 13650	10m/NE	Residents along Ashgrove Road and Ashgrove Manor - Representative

04	View towards Ulster Carpets at the River Bann	NW 12103 12743	55m/SW	Road users and users of the footpath along the northern edge of the route - Representative
05	Garvaghy Road at Ulster Carpets	NW 11887 12694	10m/NE	Residents along Garvaghy Road and visitors to People's Park - Representative
06	People's Park at Grass Multi-sports Pitch	NW 11696 12665	130m/SE	Visitors to People's Park - Representative
07	Bridge Street (North)	NW 12150 12379	45m/NW	Road users and users of the footpath along the northern edge of the route - Representative
08	Newry Canal/ River Bann Towpath north of Bridge Street	NW 12123 12414	50m/NW	Road users and users of the footpath along the northern edge of the route - Representative
09	Bridge Street (South)	NW 12179 12381	57m/SE	Road users and users of the footpath along the southern edge of the route - Representative
10	Newry Canal/ River Bann Towpath south of Bridge Street	NW 12152 12350	0m/SE	Road users and users of the footpath along the southern edge of the route - Representative
11	People's Park	NW 11594 12593	130m/SW	Visitors to People's Park - Representative
12	Corcrain Mews	NW 10851 12880	10m/SE	Residents at Corcrain Mews - Representative
13	Charles Park	NW 10746 12749	75m/SE	Residents at Charles Park - Representative
14	Drumcree Grove	NW 10565 12639	70m/SE	Residents at Drumcree Grove and recreational users of the amenity area - Representative
15	Selshion Parade	NW 10367 12592	45m/SE	Residents at Selshion Parade and recreational users of the amenity area - Representative
16	Corcullentragh Road	NW 09515 11823	200m/NE	Road users along Corcullentragh Road, residents at the nearby farmhouse - Representative
17	Ripley Crescent	NW 11226	30m/NE	Residents at Ripley Crescent and Ripley Meadows - Representative

No.	Name/Location	Grid Ref.	Approx. Distance/Direction to site	Reasons for inclusion/Type
		10962		
18	Tandragee Road south of Annagh United FC	NW 12033 10558	0m/E	Residents at The Fairways Estate - Representative
19	Bann Boulevard nr. Annagh River	NW 12341 11706	175m/NW	Recreational users of Bann Boulevard and Craigavon Cycle Route/ NCN Route 9 - Representative
20	Newry Canal Towpath at fishing steps 1	NW 12321 11947	75m/NNW	Recreational users of Bann Boulevard and Craigavon Cycle Route/ NCN Route 9 - Representative
21	Newry Canal Towpath at fishing steps 2	NW 12305 11984	20m/NNW	Recreational users of Bann Boulevard and Craigavon Cycle Route/ NCN Route 9 - Representative
22	Pleasure Gardens Play Area	NW 12180 12197	90m/NE	Users of the nearby play area, Bann Boulevard and Craigavon Cycle Route - Representative

### A: Ashgrove Road

- 10.4.21 The potential visual receptors are the residents on Ashgrove Road and Ashgrove Lodge, the recreational users of the NCNR 9 and users of Island Road. The scheme area is an open agricultural environment with a matrix of agricultural drainage channels draining to the River Bann east of the scheme and it is these channels that are adjacent to the residential properties.
- 10.4.22 The surrounding environment comprises an open rolling agricultural environment with high dense hedges and scattered tree cover on field boundaries, with fields that are small and irregular with a mix of arable and pastureland use. The field boundaries vary from gappy hedgerows, post and wire fencing, and high hedgerows of native species with a scattering of mature specimen trees. The occasional stand of mixed species woodlands provides an element of height punctuation to the irregular field pattern.
- 10.4.23 Views towards this scheme are represented by Viewpoints 02 and 03 (see **Figure 10.5b for viewpoint locations and 10.6b and 10.6c for photographs, Volume 4**).

### A1: Corcrair Mews

- 10.4.24 The recreational users of St John the Baptist College's football pitch and the residents of Corcrair Mews are the likely receptors influenced by the proposed flood alleviation works. South of the River Corcrair, Corcrair Mews is in the river flood plain, with scrubby open ground to the north-west and south and with sports recreational grounds to the north. The A4 Corcrair Road provides a robust boundary to the north and east of the site.
- 10.4.25 The area comprises a mixed-use environment with a school, health centre, residential and light industrial use resulting in an urban fringe environment that has an occasional visual connection to the surrounding agricultural landscape.
- 10.4.26 The scrubby open ground to the north-west of the site provides a physical connection to the Portadown agricultural fringe that extends north and west from the town.
- 10.4.27 Views towards this scheme are represented by Viewpoint 12 (see **Figure 10.5d for viewpoint locations and 10.6l for photographs, Volume 4**).

## B: Derryanvil Road

- 10.4.28 The potential receptors in this open agricultural flood plain environment are the residents of a single property and the agricultural workers at the adjacent farm buildings. West of the River Bann and north of a minor River Bann tributary this is an isolated holding with little direct visual access to or from any of the distant neighbouring properties.
- 10.4.29 This is a landscape of medium size pastoral fields with a generally rectilinear form east towards the River Bann, whilst in the west the field pattern is smaller and less uniform. Tree cover is limited to scattered mature specimens on field boundaries with one small woodland area and a copse at the head of the tributary.

## C: Woodside Green (Ulster Carpets)

- 10.4.30 In this instance the visual receptors would be pedestrians on the Garvaghy Road, residents of Woodside Green and employees commuting to and from the Ulster Carpets factory. Additional receptors are likely to be recreational users of the Hoy Meadow, north of the site and south of the railway sidings, these would include users of the fishing platforms and recreational walkers.
- 10.4.31 The Ulster Carpets factory is adjacent to agricultural land, the River Bann, a railway line, a trunk road and residential housing. The factory exterior wall is a significant component of the north side of the Garvaghy Road with terrace housing opposite. From the bridge crossing of the Corcrain River on Garvaghy Road there are views north and south of the canalised section of the Corcrain River. North of Garvaghy Road there is a row of mature pine trees along the western bank of the river, which are visible from within People's Park.
- 10.4.32 Views towards this scheme are represented by Viewpoints 04 and 05 (see **Figure 10.5c for viewpoint locations and Figure 10.6d and 10.6e for photographs, Volume 4**).

## D: People's Park

- 10.4.33 This is a valuable local open space with good pedestrian access and where a variety of recreational facilities are available. The primary receptors to The People's Park are the rear of the houses on Garvaghy Road, the rear of the houses on King Street, and the front of the two storey houses on Park Road which have direct visual ingress to the park from their first-floor windows. The Park contributes to a strong sense of openness on Park Street.
- 10.4.34 The Park is set within a residential urban environment with pockets of light industry, retail and commercial premises with visual and environmental connections to the River Bann and the River Corcrain. These frequently tree lined riverbanks provide a 'green' connection with People's Park as well as a visual link with properties overlooking the park from Garvaghy Road and Park Road and Parkside on Obins Street.
- 10.4.35 The townscape is of red brick Victorian terrace housing which is also the most frequent housing style adjacent to the scheme. Additional to this housing style there are red brick two storey detached, two storey semi-detached and some later two storey semi-detached, rendered (dry dash) terraces and bungalows. To the west of the People's Park is a larger more contemporary housing development made up of single and two-storey brick and rendered dwellings.
- 10.4.36 Views towards this scheme are represented by Viewpoints 06 and 11 (see **Figure 10.5c for viewpoint locations and Figure 10.6f and 10.6k for photographs, Volume 4**).

## E: Parkside

- 10.4.37 The visual receptors on Scheme E would be residents of Parkside, Rose Cottages, Park Road and the recreational users of the People's Park.
- 10.4.38 A combination of residential and light industry use are adjacent to the urban parkland landscape which provides open amenity sports pitches and other outdoor facilities. Park Road and Obins Street are the main arterial routes which also provide access and is the north-eastern boundary in this residential area.



- 10.4.39 Views towards this scheme are represented by Viewpoint 11 (see **Figure 10.5c for viewpoint location and Figure 10.6k for photograph, Volume 4**).

#### **F: Rose Cottages**

- 10.4.40 The visual receptors of Scheme F would be residents of the Rose Cottages estate along the northern embankment of the Corcrain River. The embankment provides informal walking routes, with the riverside providing dense riparian woodland cover. Dwellings within Rose Cottages generally consist of two-storey or 1.5-storey homes arranged in cul-de-sacs.
- 10.4.41 Between the river and Obins Street development is characterised by informal commercial buildings often enclosed by mature woodland.

#### **H: Castle Street**

- 10.4.42 Visual receptors at the Castle Street scheme are predominantly pedestrians either on the river towpath, recreational users of the fishing platforms or pedestrians on the bridges crossing the River Bann e.g. Shillington Bridge to the north or the Bann Bridge to the south. This is a light industrial environment with small pockets of open green space. One is a small area adjacent to the old pump house (Coffee shop) that connects under the Bann Bridge to the Bowling Green Park and a small green space north of the slipway which is the proposed location for a new flood defence bund.
- 10.4.43 Access to the fishing platforms is possible along the towpath east of Castle Street. The tree lined riverbanks opposite have good tree cover, and this contributes to the creation of a tranquil riverine environment for recreational users of the towpaths.

- 10.4.44 Views towards this scheme are represented by Viewpoint 07 (see **Figure 10.5c for viewpoint location and Figure 10.6g for viewpoint photography, Volume 4**).

#### **I: Foundry Street**

- 10.4.45 Receptors at Foundry Street scheme are pedestrians and recreational users on the southern riverbank towpath and fishing platforms, or pedestrians on the bridges crossing the River Bann for example Shillington Bridge to the north or the Bann Bridge to the south. Access to the fishing platforms on the north bank is from the Foundry Street car park. The tree lined riverbanks provide a wooded character, although the adjacent commercial buildings are also prominent in views from the southern bank. User access is limited to access to the fishing platforms and the southern bank is more suitable for the general recreational user.
- 10.4.46 Views towards this scheme are represented by Viewpoint 08 (see **Figure 10.5c for viewpoint location and Figure 10.6h for photograph, Volume 4**).

#### **J: Bowling Green**

- 10.4.47 The recreational users of the River Bann towpath, the Bann Boulevard playing area and the bowling green are the primary receptors for this scheme. Additionally views of the scheme are available from the public footpath on the Bann Bridge. There are no residential receptors. There are two northern access points to the Bowling Green Park, the first is from the bridge footpath which also provides views looking south up the River Bann. The second is from the towpath under the Bann Bridge emerging on the towpath north of the Bowling Green. The environment and the views become less enclosed as the route progresses south on this section of the River Bann and the riverbank environment becomes increasingly tree fringed with greater available space for recreational users, including those at Portadown Boat Club, in a more open riverine environment.
- 10.4.48 The River Bann urban environment at this location transitions from a light industrial/urban fringe to a more open agricultural countryside. There is a light industrial factory on the northern bank, whilst on the southern bank a large Tesco's supermarket and car park lies adjacent to open green space, with the play park adjacent to the supermarket and the Portadown Boat Club. Beyond these facilities the landscape becomes more open and pastoral with large fields predominantly for marginal rough grazing. The countryside beyond this location finds the River Bann meandering within the open flood plain with housing, a Golf Club to the north and open fields and mainline railway to the south.

10.4.49 Views towards this scheme are represented by Viewpoints 10, 20, 21 and 22 (see **Figure 10.5c for viewpoint locations and Figure 10.6j,10.8t,10.6u and 10.6v for photographs, Volume 4**).

#### **K: Health Centre**

10.4.50 Recreational users of the River Bann footpath, NCNR 9, local pedestrians and visitors to Portadown Health & Care Centre form the potential visual receptors to this scheme.

10.4.51 South of the Bowling Green section and east of the Health Centre the landscape is an open marginal agricultural one dissected by the River Annagh as the landscape drops towards the River Bann and car park. This car park provides access to the Newry Canal Towpath and the NCNR 9, which terminates at the Bann Bridge in Portadown.

10.4.52 Views towards this scheme are represented by Viewpoint 19 (see **Figure 10.5c for viewpoint location and Figure 10.6s for photograph, Volume 4**).

#### **L: Irwins Mill**

10.4.53 Employees at the adjacent commercial use properties and recreational users of the towpath network would be the primary receptors of the Irwins Mill scheme. Residential receptors at Wildwood and Springfield Roads which comprise single storey housing developments 210m due east of the scheme would experience oblique views of the scheme.

10.4.54 The surrounding area comprises a Bowling Green, mature trees on the river fringe, fishing platforms, towpath and the Portadown Boat Club and these components contribute to a diverse recreational environment. This environment leads to the increasingly open floodplain of the upper River Bann, with marginal agricultural land within a matrix of drainage ditches descending from the housing of Springfield and Wildwood to the River Bann.

10.4.55 Views towards this scheme are represented by Viewpoint 09 (see **Figure 10.5c for viewpoint location and Figure 10.6i for photograph, Volume 4**).

#### **M. Annagh Hill**

10.4.56 Recreational users of the River Bann footpath, NCNR 9, local pedestrians on Mourneview Street and Annagh Hill would form the potential visual receptors to this scheme.

10.4.57 East of the scheme the landscape is an open marginal agricultural one dissected by the River Annagh as the landscape drops towards the River Bann and the local car park to the north. This car park provides access to the Newry Canal Towpath and the NCNR 94. West of the scheme, the mix of residential and commercial properties incorporating areas of brownfield land results in an urban fringe character.

#### **N Olde Golf Links**

10.4.58 The primary visual receptors at the Olde Golf Links Estate would be the residents in properties on the perimeter of the residential area on the southern, western and northern fringe of the housing development.

10.4.59 West of Tandragee Road properties at The Olde Golf Links are largely detached, comprising a mix of two-storey, single-storey and 1.5 storey-dwellings. East of Tandragee Road, properties are terraced two-storey and back onto a football pitch with associated car parking. Further east land is generally pastoral bound by mixed woodland leading to the railway line.

10.4.60 Views towards this scheme are represented by Viewpoint 18 (see **Figure 10.5e for viewpoint location and Figure 10.6r for photograph, Volume 4**).

#### **N2. Fairways Estate**

10.4.61 The primary visual receptors at the Fairways would be the residents in properties on the perimeter of the residential area on the northern and eastern fringe of the housing development.

10.4.62 The section lies due south of Portadown, west of the River Bann and the mainline railway line. This agricultural fringe environment is in the floodplain of the upper River Bann, comprising marginal agricultural land within a matrix of drainage ditches descending from the housing and railway line to the River Bann.

#### **P: Derryvore Lane**

10.4.63 The employees at the light industrial buildings, road users and nearby residents of Derryvore Lane are the visual receptors who would experience change as a result of the proposals.

10.4.64 The surrounding area is in an open agricultural environment of pastoral rectilinear fields with hedged field boundaries. The tree cover in the area is predominantly on the field boundaries with small amounts of shelter planting nearer to the residential dwellings.

10.4.65 Views towards this scheme are represented by Viewpoint 01 (see **Figure 10.5a for viewpoint location and Figure 10.6a for photograph, Volume 4**).

#### **Q: Ripley Mews**

10.4.66 The visual receptors for this scheme would be the residents along Armagh Road with views to the rear of their properties, and residents of Ripley Meadows and Ripley Crescent. Residents of Kingsway Drive north-east of the scheme may also experience visual change as a result of the proposals from the rear of their properties.

10.4.67 The surrounding area comprises an open marginal pastoral landscape due east of the residential properties with some tree cover on the fringe of a drainage channel which bounds the land.

10.4.68 Views towards this scheme are represented by Viewpoint 17 (see **Figure 10.5e for viewpoint location and Figure 10.6q for photograph, Volume 4**).

#### **R: Corcullentragh Road**

10.4.69 This scheme protects a collection of agricultural buildings and one residential property located at the end of a private access road from Corcullentragh Road on the western banks of the Ballybay River. A visually isolated location with visual receptors limited to either employees at the agricultural buildings or more distant workers at Long Meadow Cider Orchards.

10.4.70 This scheme on the flood plain of the Ballybay River is within a larger field pattern that is of pastoral and arable use. These hedged field boundaries with mature trees scattered along the field boundary margins give onto a finer grained field pattern in the east. The eastern areas characterised by orchards are a strong component of the western suburban fringe of Portadown.

10.4.71 Views towards this scheme are represented by Viewpoint 16 (see **Figure 10.5d for viewpoint location and Figure 10.6p, Volume 4**).

#### **S: Corcrair Drive**

10.4.72 The visual receptors on the Corcrair Drive scheme would be residents of Selshion Parade, Drumcree Grove, Corcrair Drive, Corcrair Avenue and Charles Park.

10.4.73 The area comprises a suburban fringe landscape with open amenity grassland, sports pitches and amenity woodland that gives onto open countryside to the north. The A4 Corcrair Road is the main arterial route which also provides a north-eastern boundary to this residential area.

10.4.74 Views towards this scheme are represented by Viewpoints 13, 14 and 15 (see **Figure 10.5d for viewpoint location and Figure 10.6m,10.6n and 10.6o for photographs, Volume 4**).

## **10.5. Evaluation (Value of Resource or Sensitivity of Receptors)**

10.5.1 Receptor sensitivity is arrived at through a combination of professional judgements made on value and susceptibility. The methodology and approach to sensitivity is mapped out in Section 10.5 of this report.

10.5.2 The LLPAs are assigned a medium value, with a susceptibility of medium and overall sensitivity to change of medium.

10.5.3 The following tables provide an overview of the judgement of overall sensitivity to the scheme for the identified baseline receptors which will then be taken forward into the assessment.

## Visual

### Recreational Routes

Table 10.3: Schedule of Recreational Routes Sensitivity

Recreational Route	Value	Susceptibility	Sensitivity
Walking Route 31: People's Park Portadown	Medium	Medium	Medium
			High
Walking Route 28: Newry Canal Walk	High	Medium	High
			High
NCNR 9: Craigavon Cycle Trail	High	Medium	High
			High

### Individual Schemes

Table 10.4: Schedule of Individual Scheme Sensitivity

Scheme	Value	Susceptibility	Sensitivity
A: Ashgrove Road	Low	Low	Low
			Low
B: Derryanvil Road	Medium	Low	Low
D: People's Park	Medium	Low	Medium
			Medium
F: Rose Cottages	Low	Low	Low
			Medium
I: Foundry Street	Low	Low	Low
			Medium
K: Health Centre	Low	Low	Low
			Low

Scheme	Value	Susceptibility	Sensitivity
M: Annagh Hill	Low	Low	Low
N2: Fairways Estate	Low	Low	Low
N: Olde Golf Links	Low	Low	Low
P: Derryvore Lane	Low	Low	Low
Q: Ripley Mews	Low	Low	Low
R: Corcullentragh Road	Medium		Medium
S: Corcrair Drive	Low	Low	Low

## 10.6. Impact Assessment

### Potential Impacts

- 10.6.1 The proposed schemes have the potential to affect localised landscape character in addition to the visual amenity of receptors in close vicinity to the sites.
- 10.6.2 There are a number of ways in which the schemes might affect the existing landscape and visual characteristics found within the study area. These effects are likely to be temporary (and relate specifically to the construction stage of works) or permanent (incurred upon completion of the schemes). Effects are expected to reduce over time as the proposed landscape mitigation measures mature and the schemes become an integrated part of their surroundings.
- 10.6.3 Potential impacts identified within these proposals on landscape receptors are likely to be:
- The potential displacement of land cover within a localised area to allow implementation of the works
  - The potential removal of existing landscape features within a localised area such as remnant field boundary hedgerows, tree cover and vegetation to facilitate site access and/or elements of the schemes
  - The excavation, removal and regrading of soil to provide appropriate flood prevention levels
  - The introduction of new features within the landscape including sheet piling; embedded walls; and brick walls with glass panels (Scheme H: Castle Street)
  - Realignment of access roads and footpaths
  - Relocation of the footbridge at Scheme M: Annagh Hill.
- 10.6.4 Potential impacts identified within these proposals on visual receptors are likely to be:
- Introduction of embankments and landscape bunds to provide flood prevention measures
  - The introduction of compensatory tree planting following the loss of tree cover across the schemes
  - Raised bridge parapets at the Ulster Carpets scheme (Scheme C)
  - Increased plant and vehicle movements during construction.

### Local Landscape Policy Areas

- 10.6.5 Of the LLPAs within the context of the study area, People's Park P/LLPA/1 would undergo the greatest change as a result of the proposals. These would however be confined to the construction period as

footpath levels are raised, sheet piles are installed, and embankments implemented. The impacts however would be short-term, and over the longer term during operation there is not predicted to be any notable change to the character of the existing amenity area. As a result, the scheme would not contradict Plan Policy CON 2 Local Landscape Policy Areas within the Craigavon Area Plan 2010. Views within People's Park are illustrated by **Figures 10.6f and 10.6k, Volume 4**.

- 10.6.6 River Bann P/LLPA/4 and River Bann P/LLPA/4a which lie adjacent directly north-east of Ashgrove Road would experience change as the flood defences at Ashgrove Road are implemented. The construction of the defences would have some initial impact, for instance during installation of sheet piles to the rear of Ashgrove Lodge and north-east of Ashgrove Manor and removal of vegetation. This would however be short-term, and the compensatory planting outlined on drawing CO401635A-AMEY-A-XX-DR-L-3000-01 (**Appendix 10.1, Volume 3**) would provide enhanced biodiversity and amenity value over the long term. Views towards the River Bann LLPA are illustrated by **Figures 10.6b and 10.6c, Volume 4**.

## Assessment of Visual Impacts

### Recreational Routes

- 10.6.7 Of the recreational routes previously discussed, the majority follow a broadly similar if not identical partial route; along the towpath of the Upper Bann from south of Portadown to Bridge Street. For instance, the Craigavon Cycle Trail (NCNR9) and Newry Canal Towpath (NCNR 9) both come under the auspice of NCNR 9, and broadly follows the same route as the Bann Boulevard walking route (Walking Route 4) and Newry Canal Walk (Walking Route 28). Therefore, in order to avoid double counting of effects, these receptors will be assessed as one as they are all predicted to experience similar effects as a result of the proposed schemes. They will therefore be grouped under 'Upper Bann Recreational Routes'.

### Upper Bann Recreational Routes

- 10.6.8 For receptors utilising the various cycling and walking routes along the Upper Bann during the construction phase, there would be visual disruption to varying degrees whilst passing various schemes; including N2: Fairways Estate; N: Olde Golf Links; M: Annagh Hill; K: Health Centre; L: Irwins Mill; and J: Bowling Green. For the majority of these schemes, construction activity would be viewed at distance and intermittently as users pass along a tree-lined route. Upon reaching Schemes L: Irwins Mill, J: Bowling Green and H Castle Street however, activity would become more notable. This would represent a **high** magnitude of impact overall for these highly sensitive receptors.

### Walking Route 31: People's Park

- 10.6.9 For users of the various walking routes throughout the People's Park, notable visual change would be incurred as a result of construction works at schemes D: People's Park and E: Parkside. Both of these schemes would require physical change to existing footpaths within the park, and as a result would require closures to these sections. Although other routes and the sports/community resources within the park are likely to remain open, the visual disruption caused by the works would alter people's enjoyment of the open space and would likely deter visitors as a result. Overall, it is judged that this would result in a **high** magnitude of change.

### NCNR 94: Loughshore Trail

- 10.6.10 For users of the Loughshore Trail, there would be visual disruption during a short section of their journey from proximity with the following schemes: C: Ulster Carpets; H: Castle Street; I: Foundry Street; and J: Bowling Green. Change would appear particularly noticeable around Castle Street as the route utilises the riverside connection between Castle Street and Bridge Street which would likely be diverted during construction. Given the length of the overall route, this would be a minor setback for users of the cycle route but would appear locally significant. The resultant magnitude of impact is predicted to be locally **high**, but low overall.

## Individual Schemes

### A: Ashgrove Road

- 10.6.11 Visual receptors at this scheme are residents of nearby housing at Ashgrove Road, Ashgrove Manor in addition to residents of the farmhouse at Island Road. Viewpoints 02 and 03 represent views towards this scheme for receptors.
- 10.6.12 The scheme requires the installation of steel sheet pile and walls embedded within embankments along Ashgrove Road, Island Road and to the rear of Ashgrove Lodge. The proposed flood defence would have an approximate total length of 860m.
- 10.6.13 During the short-term construction period (approximately 6 months) construction activities at Ashgrove Road would be predominantly in the open field environment. There would however be construction activities on Ashgrove Road, Ashgrove Lodge and Island Road that would require these routes to have phased temporary closures. The changes to views would be noticeable to the residents of the Ashgrove Road, Lodge Road, Ballyoran Park, Woodgrove and Island Road and consequently the magnitude of impact is assessed as **medium**.

### A1: Corcrain Mews

- 10.6.14 Visual receptors at this scheme are residents at Corcrain Mews. Viewpoint 12 represents views towards this scheme for receptors.
- 10.6.15 The works at this site are to provide hard and soft flood defences along the Ballybay River to the rear and west of properties at Corcrain Mews and a wall on Obins Street. The total length of flood defence is proposed to be 450m.
- 10.6.16 The construction activities associated with the installation of the flood defences on the southern bank of the Ballybay River, north of Corcrain Mews would be the most evident. The proposed works on the northern bank are predominantly in the open field environment and would present less visual effect to the adjacent western boundary of the Corcrain Orange Lodge. Some views of construction activities would be discernible from Corcrain Mews and the Orange Lodge, but these would be temporary, and the magnitude of impact is assessed as **medium**.

### B: Derryanvil Road

- 10.6.17 Visual receptors at this scheme are residents at the property to the western edge of the site. A combination of raised access road, embankment and steel sheet piles would be installed to protect agricultural buildings and single dwelling. The total length of defence would be 247m.
- 10.6.18 The construction activities associated with the installation of the flood defences (estimated to last approximately 6 months), south-west of the River Bann, are unlikely to be discernible from the everyday activities of the large agricultural unit. Residents of the farmhouse will experience some minor disruption, particularly during sheet piling operations adjacent to the property boundary, but the majority of works are proposed around the extents of the agricultural buildings. Aside from the farmhouse, the site is well screened from the nearest residential properties 400m to the south on Island Road. Some minor changes might be discernible from Island Road, but these would be temporary, and the magnitude of impact is assessed as **negligible**.

### C: Ulster Carpets / Woodside Green

- 10.6.19 Visual receptors of this scheme are users of the riverside footpath, residents at Garvaghy Road and visitors to People's Park. Viewpoints 04 and 05 represent views towards this scheme for receptors.
- 10.6.20 The works at the Ulster Carpet factory consists of both hard and soft defences along the banks of the River Bann and Corcrain River. It is proposed that the eastern extents along the River Bann comprises a flood defence wall with sheet piles and embedded walls. Along the Corcrain River section, it is proposed that steel sheet piling would be used to a flood defence level of 16m Above Ordnance Datum (AOD). The total length of flood defence would be approximately 825m.

- 10.6.21 The installation of the flood defences on both the banks of the Corcraun and Bann rivers are being undertaken within an industrial environment. The works are extensive but offer very little opportunity for viewing from a publicly accessible vantage point southwest of the River Bann. The site is screened from the nearest residential properties to the south on Garvaghy Road. Some temporary changes, such as the loss of the pine trees, would be discernible from Garvaghy Road. Therefore the magnitude of impact is assessed as **medium**.

#### **D: People's Park**

- 10.6.22 Visual receptors of this scheme are visitors to People's Park, nearby residents at Garvaghy Road and King Street/Whitten Close. Viewpoints 06 and 11 represent views towards this scheme for receptors.
- 10.6.23 It is proposed to provide sheet steel piles along the rear of the properties at Whitten Close which would extend around the western extents of the properties north on the eastern bank of the Corcraun River (ch340m to ch220m). There is a footbridge over the Corcraun River at this location and it is proposed to raise the ground level in the vicinity of the path and provide a new section of path over the embankment in conjunction with the steel sheet pilings (ch360m to ch470m). The embankment would extend along the Corcraun River through the park at the edge of the playing field. A small area of the park would be locally raised just north of the community centre. Another embankment would be constructed along the north-eastern boundary of the park, to provide protection to properties on Garvaghy Road. The existing path would be ramped up to the flood embankment with a maximum gradient of 1:10. The total length of flood defence is approximately 560m.
- 10.6.24 The proposed construction activities within the People's Park (approximate duration of 9 months) would have an effect on the pedestrian traffic and the recreational use of the park. The works would be phased to ensure minimal inconvenience is experienced by the park users. The works would be partially visible from the rear of the properties on Garvaghy Road and from the rear of the bungalows at the west end of Kings Street. The works proposed at the north of the community centre would be screened by the existing park infrastructure and as a result the magnitude of impact is assessed as **medium**.

#### **E: Parkside**

- 10.6.25 Visual receptors of this scheme are visitors to People's Park and nearby residents at Parkside. Viewpoint 11 represents views towards this scheme for receptors.
- 10.6.26 It is proposed to provide a flood wall to the west of the properties on Parkside just south of the People's Park. This would consist of a masonry wall faced with a close board timber fence of approximately 2.40m high. The existing path from Corcraun River to the north-east of Parkside is to be raised to a height of 16.40 AOD from Corcraun River through is length to tie in at the southern end at the same height north of the synthetic pitch. The total length of these flood defences is approximately 100m.
- 10.6.27 The proposed construction activities in the western section of People's Park would have an effect on the nearby residents at Parkside, pedestrian traffic and the recreational use of the park. The works would be phased to ensure minimal inconvenience is experienced by the park users and nearby residents at Parkside. Some glimpsed views maybe available to Rose Cottages on the north bank of the Corcraun River. The magnitude of impact is assessed overall as **medium**.

#### **F: Rose Cottages**

- 10.6.28 Visual receptors of this scheme are residents at the southern extents of Rose Cottages. It is proposed to provide steel sheet piles with earth bunds and footway to the rear of houses located on Rose Cottages. The proposed flood protection would be 357m long and lined with IBEX fencing with gates.
- 10.6.29 The proposed construction activities in the western section of People's Park would have an effect on limited residents along the northern banks of the Corcraun River. The installation of IBEX fencing and steel sheet piles to the rear of Rose Cottages (approximate duration 6 months) would cause localised disruption and is likely to result in the removal of scrub vegetation. The magnitude of impact is assessed as **medium**.



## H: Castle Street

- 10.6.30 Visual receptors of this scheme are users of the footpath/cycleway along the River Bann. Viewpoint 07 represents views towards this scheme for receptors.
- 10.6.31 It is proposed to provide a flood defence wall with steel sheet piling, to 1.60m above ground level, to the northern side of the slip way around the western side of the open grass area bounding the asphalt parking. Flood gates are proposed at the head of the slipway leading down to precast wall panels on auger piling that continues the length southwards to the Pump House coffee shop where it changes to a dwarf wall with a glass panel flood defence, 1.60m above ground level. The total length of flood defence is 348m.
- 10.6.32 The construction activities proposed adjacent to the Pump House coffee shop between Bridge Street Bridge and Shillington Bridge (Northway) would require the temporary closure of the footpath connecting to the Bann Boulevard footpath (approximate duration of works 9 months). These works would be phased to ensure minimal inconvenience is experienced by the walkers, fishermen and other footpath users. There are no residential properties that have direct visual access to this stretch of the river therefore any views would be transitory glimpsed views between the existing built infrastructure of the area. The magnitude of the impact is assessed as **high**.

## I: Foundry Street - Eastern bank of the River Bann

- 10.6.33 Visual receptors of this scheme are users of the footpath/cycleway along the River Bann. Viewpoint 08 represents views towards this scheme for receptors.
- 10.6.34 It is proposed to provide new flood protection along the storage yard associated with the commercial properties and along the rear of the buildings at the edge of the Bann. A reinforced concrete wall would be constructed along high ground to the northern section of the scheme, changing to steel sheet piles south of the storage yard. The protection would vary in height along its length dependent on ground levels. Steps are proposed over the flood wall for access to the fishing platforms. The total length of flood defences is 295m.
- 10.6.35 With very limited public access the works proposed for the north-eastern bank of the River Bann would not represent significant inconvenience to the general user. There would be a temporary closure of the two fishing platforms and whilst the works would be visible from the south-western bank of the river the construction activities would be completed with minimal inconvenience (approximate duration of works 6 months). However, the loss of the riverside trees would produce a notable visual change and although the views of this location are transitory the visual impact would be locally significant over the short-term. The magnitude of the impact is assessed overall as **medium**.

## J: Bowling Green

- 10.6.36 Visual receptors of this scheme are users of the footpath/cycleway along the River Bann. Viewpoints 10, 20, 21 and 22 represent views towards this scheme for receptors.
- 10.6.37 The proposals would involve sheet piling with cladding to both sides, approximately 1.45m high, following the boundary from Regal Leisure, stepping out from the Bowling Green boundary to run parallel with it aligning with the fencing delineating the playground. In the park area, to the east of the car park, the land is to be graded up with the sheet piled cladded wall. At the crest of the hill a new connection (steps) cutting through is proposed for more direct access from the car park. From there the flood defence will follow the existing fence line to Tesco's car park and around the Boat Club, at approximately 1.8m above existing ground level. This proposal will require existing trees to be removed. The flood protection would be 532m long and around 1.45m high from the base of the original footpath.
- 10.6.38 The construction activities proposed adjacent to the Bowling Green and other recreational areas of the River Bann riverbank would affect footpath users and other recreational users of the site (approximate duration of works 9 months). A popular and valuable recreation site with a variety of leisure facilities, the implementation of this 532m of flood defences would have a noticeable impact on the use and access of this section of the River Bann. The proposed temporary closure of the 22 fishing platforms and footpaths would be phased to minimise any inconvenience that might be experienced by the facility users. There are no residential properties overlooking the site but works would be partially visible for pedestrian users of the

Bann Bridge (A27/Bridge Street) and the car park of the Meadows Shopping Centre. However, the loss of the trees by the Bowling Green, Tesco's car park boundary, Riverside by the Boat Club would produce a temporary visual change and although the views of this location are transitory the visual changes would be significant. The magnitude of the impact is assessed as **high**.

### **K: Health Centre**

- 10.6.39 Visual receptors of this scheme are users of the footpath/cycleway along the River Bann. Viewpoint 19 represents views towards this scheme for receptors.
- 10.6.40 It is proposed to provide a 147 of embedded wall along the eastern carriageway verge of Meadow Lane to protect the Portadown Health and Care Centre from flooding. The embankment would be set to a flood level of approximately 16.45m AOD. There would also be a ramp from the footpath over the flood defence wall opposite the entrance to the car park.
- 10.6.41 The River Bann car park is the start/end of the short 1.28km footpath Bann Boulevard that connects to the 32.1km Newry Canal Way. The flood defences proposed for the Portadown Health Centre would be visible from the footpath but would not result in any physical changes. There is potential for a short temporary road closure on Meadow Lane opposite the Health Centre. The magnitude of impact is assessed as **low**.

### **L: Irwins Mill**

- 10.6.42 Visual receptors of this scheme are users of the footpath/cycleway along the River Bann. Viewpoints 09 and 10 represent views towards this scheme for receptors.
- 10.6.43 The proposal would require the installation of a sheet steel piled flood defence wall and embedded embankment wall, these two flood defence structures are on the west, eastern and partly northern boundaries of Thompson Aero Seating factory on Goban Street. The proposed flood defence would be an approximate total length of 459m.
- 10.6.44 Levaghery Close is 284m south-east of the flood defences, these residential properties may have a first-floor view of the proposed works. The other views of the site are transitory views from the footpath on the southwest riverbank. Site boundary vegetation loss would be unavoidable but on the southern boundary the flood defence embankment and ditch provide the opportunity for compensation planting. The magnitude of the impact is assessed as **low**.

### **M: Annagh Hill**

- 10.6.45 Visual receptors of this scheme are residents at Mourneview Street and Annagh Hill. The proposal would require the installation of a sheet steel piled flood defence wall and embedded wall, these two flood defence structures are to the south of Mourneview Street and the northern bank of the River Annagh and southern minor tributary continuing to the south turning east for a short length along Annagh Hill. The proposed flood defence would be an approximate total length of 317m.
- 10.6.46 Properties on Mourneview Street are 35m north-west of the flood defences, these residential properties may have a first-floor view of the proposed works. The other views of the site are transitory views from the footpath on the northwest riverbank. River side vegetation loss would be unavoidable but on the southern boundary the flood defence, embankment and ditch provide the opportunity for compensation planting. The magnitude of the impact is assessed as **low**.

### **N: Olde Golf Links**

- 10.6.47 Visual receptors of this scheme are nearby residents at the Olde Golf Links development. Viewpoint 18 represents views towards this scheme for receptors.
- 10.6.48 The Olde Golf Links scheme requires the installation of 888m of sheet steel pilings along the eastern, southern and western boundaries. These defences would provide protection for the majority of properties within the residential development.

- 10.6.49 The introduction of sheet piling to boundaries of Olde Golf Links will be in contrast to the existing landscape character and view. The construction activities are similar to day-to-day agricultural operations and therefore would not present significant visual impact within this agricultural environment. The magnitude of the impact is assessed as **medium**.

### **N2: Fairways Estate**

- 10.6.50 Visual receptors of this scheme are residents of the nearby Fairways development. The Fairways estate scheme requires the installation of 286m of sheet steel pilings. These defences would protect properties north, east, and south of Fairways residential development. The Fairways estate is adjacent to open countryside in a landscape criss-crossed by a matrix of drainage channels.
- 10.6.51 These flood defence earth embankments would be graded into the surrounding agricultural land and sown with an appropriate grass mix. The construction activities are similar to day-to-day agricultural operations and therefore would not present significant visual impact within this agricultural environment. The magnitude of the impact is assessed as **low**.

### **P: Derryvore Lane**

- 10.6.52 Visual receptors of this scheme are residents of the nearby properties at Derryvore Lane. Viewpoint 01 represents views towards this scheme for receptors.
- 10.6.53 Flood defences at Derryvore Lane comprise steel sheet piles to flood defence level 15.8m AOD. The defences broadly follow the existing fence line of the adjacent field to the industrial units for 490m, encompassing the western and northern boundaries extending around the parking area at Philip Graham Vehicle Repairs returning on the eastern boundary heading south along Derryvore Lane.
- 10.6.54 The receiving landscape will undergo change with the loss of hedgerow to make way for flood defences that incorporate steel sheet piles. The construction activities are however similar to day-to-day agricultural operations and therefore would not present significant visual impact within this agricultural environment. The magnitude of impact is assessed as **low**.

### **Q: Ripley Mews.**

- 10.6.55 Visual receptors of this scheme are residents of Ripley Crescent and Ripley Meadows. Viewpoint 17 represents views towards this scheme for receptors.
- 10.6.56 Ripley Mews is located between the back gardens of semi-detached properties on Armagh Road and detached properties on Ripley Mews with adjoining open fields. The flood defence measures would comprise steel sheet piles to the east of properties along Armagh Road, and a dwarf wall at Ripley Crescent. The flood defences measure a length of 245m.
- 10.6.57 The proposed construction activities would resemble day to day agricultural operations and the proposed location of these flood defences, at the rear of residential properties of Ripley Meadows, Ripley Mews and Armagh Road, would be seen as the same. The magnitude of the impact is assessed as **low**.

### **R: Corcullentragh Road**

- 10.6.58 Visual receptors of this scheme are residents of the nearby farmhouse. Viewpoint 16 represents views towards this scheme for receptors.
- 10.6.59 At this site there is a collection of agricultural buildings located at the end of a private access road from Corcullentragh Road on the western banks of the Ballybay River. The proposed flood defence measures comprise steel sheet piles to the east, south and west of the property. The flood defence measure a length of 213m.
- 10.6.60 The proposed steel sheet piles would be located in relatively close proximity to the farmhouse, there would be potential for visual or audible disturbance (approximate duration of works 3 months). The magnitude of impact is assessed as **medium**.

## S: Corcrair Drive

- 10.6.61 Visual receptors of this scheme would be a number of residents at Charles Park, Drumcree Grove and Selshion Parade. Viewpoints 13, 14 and 15 represent views towards this scheme for receptors.
- 10.6.62 Corcrair Drive comprises three locations at the north-western settlement limit. The first to the north of a row of terraced properties on Selshion Parade. The second at the north side of a row of properties on Drumcree Grove and the third north of properties along Charles Park. Flood prevention measures would include reinforced walls clad with brickwork to compliment the surrounding urban character. The total for the three sites in Corcrair Drive flood defence measure a length of 350m.
- 10.6.63 Where the site flood defences are earth bunding these would be graded into the surrounding open recreational ground and sown with a species rich grass mix. Where a flood defence wall has been specified it may be appropriate to undertake some tree planting to correspond with the existing tree planting. The magnitude of the impact is assessed as **medium**.

## Cumulative Visual Impacts

- 10.6.64 With regards to cumulative visual impacts, these are discussed where two or more schemes are likely to be viewed by various receptors in conjunction. The likelihood of adverse effects occurring during operation, i.e. following implementation of the proposed mitigation measures, is considered minimal. It is more likely that cumulative effects as a result of two or more schemes being viewed together would occur during construction, although this would of course only take place if schemes were being built at the same time. Current information assumes that construction works could take place over a 36 month period, with no indication at this time as to the order in which they will commence. As a result it is not possible to predict where cumulative adverse effects may occur until this information becomes available. Schemes where this may potentially occur include the following:
- Schemes I: Foundry Street, H: Castle Street, J: Bowling Green and L: Irwins Mill
  - Schemes D: People's Park and E: Parkside
  - Schemes A1: Corcrair Mews and S: Corcrair Drive
  - Schemes N: Olde Golf Links and N2: Fairways Estate
- 10.6.65 Although cumulative assessment is not possible at this stage, in order to avoid potential cumulative visual effects across the schemes listed above it would be prudent to ensure construction of these schemes be staggered.

## 10.7. Mitigation

- 10.7.1 The purpose of landscape mitigation is to avoid, minimise, restore or offset potential landscape and visual impacts of the project. The principal means of mitigation is embedded in the design for each scheme and any associated works to achieve the best fit with topography and sensitive landscape features. Given the limited footprint of the majority of schemes, much of the mitigation proposed is compensatory, particularly with the replacement of disturbed grassland and occasionally the loss of vegetation as a result of construction. Where opportunities have arisen to enhance baseline conditions, such as additional tree planting within People's Park, the rear of Rose Cottages and within Bowling Green, this has been incorporated into the planting proposals.

### Mitigation of Construction

- 10.7.2 During construction, landscape and visual impacts are likely to be more intrusive than the completed scheme due to vegetation clearance and the presence of construction equipment, traffic management and temporary works, albeit within a localised area. Construction of each scheme would inevitably result in the modification of localised landscape features such as trees and hedges, but these would be compensated for within the mitigation designs where possible.

10.7.3 Construction effects would be temporary in nature, but the following mitigation would help to reduce adverse effects of the construction phase on identified receptors:

- Clear signage during temporary route diversions to aid road users and also ensure prompt delivery of site materials
- Tidy site management would reduce the uncharacteristic clutter associated with building works
- Storage compound areas would be reinstated to former use upon completion of works
- Fencing used around site offices, welfare units and parking within the compound where used would be carefully chosen in order to integrate with the surrounding area as far as possible
- Existing trees to be retained and protected would be protected in accordance with BS 5837: 2012. Prior to commencement of works, existing trees proposed to be retained should be protected by the erection of a protective barrier that meets the minimum default specification consisting of a vertical and horizontal scaffold framework well braced to resist impacts. No works to be carried out or storage of materials shall be permitted within root protection areas
- Construction works lighting to involve the use of suitably located units, in accordance with current best practice standards to minimise lighting intrusion to surrounding sensitive receptors, including residents.

### Mitigation of Operation

10.7.4 Landscape mitigation for the project has sought to restore lost features where practicable and to restore or offset impacts on landscape character. Landscape mitigation may also function as visual screening when it has become established and reaches a reasonable height.

10.7.5 Landscape mitigation is applied to the project with specific measures at each scheme section. Individual landscape mitigation strategies are shown on Drawings CO401635A-AMEY-A1&S-XX-DR-R-3000-01 to CO401635A-AMEY-R-XX-DR-R-3000-01 within **Appendix 10.1, Volume 3**. An overview showing the relative mitigation drawings locations is shown on **Figure 10.7, Volume 4**.

10.7.6 The landscape planting design includes a range of measures including:

- Woodland planting
- Woodland edge
- Linear belts of trees
- Hedgerows
- Individual trees
- Wetland meadow grassland
- Species rich grassland mix.

10.7.7 Proposed mitigation for each site within the scheme is described below.

### A: Ashgrove Road

10.7.8 Mitigation proposals consist of reinstatement of lost grassland, proposed native woodland edge and woodland in addition to individual trees. These defences adjacent to open fields where the replacement planting is proposed is an opportunity to enhance the vegetative cover and improve the biodiversity of the area. Increasing the tree and shrub cover, particularly where additional bund construction is proposed, would improve the visual and physical integration of the flood defence works.

### **A1: Corcrain Mews**

- 10.7.9 After the installations of the steel sheet piled flood defences on the Ballybay riverbank, the space for implementation of compensation planting would be limited, however there would be potential for a wetland meadow. To the south of Corcrain Mews there is potential for tree planting on the proposed embankment that would provide additional screening for Corcrain Gardens when completed. From ch370m to ch420m, west of the Corcrain Orange Lodge the regrading would provide the opportunity for additional tree planting and landscape enhancement.

### **B: Derryanvil Road**

- 10.7.10 The visual integration of the proposed sheet steel piles within the agri-industrial site would have a site appropriate and functional appearance. The proposed replacement tree and wetland meadow planting implemented at appropriate locations would further integrate the works and the site into the surrounding landscape.

### **C: Ulster Carpets / Woodside Green**

- 10.7.11 Compensation tree planting will be required after the installation of the flood defences both northeast of the site adjacent to Ulster Carpet factory and on the margins of the River Bann, although retention where possible would be preferred. In particular the existing pine trees which provide character to the western bank of the canalised section will be retained if possible. A small area to the southern end of the flood defences at the railway line would provide an opportunity for additional tree planting and wetland meadow.

### **D: People's Park**

- 10.7.12 Mitigation measures for this scheme consist mainly of replacement of displaced grassland, including wetland meadow mixture to either bank of the Corcrain River as it enters the park, compensatory tree planting where required and additional tree planting to increase amenity value. Additional tree planting would also provide beneficial visual and biodiverse aspects in keeping with the park's LLPA status.
- 10.7.13 The implementation of the flood defences, path reinstatement and ground level change north of the community centre would require some of the proposed route to be excavated by hand to ensure minimal disturbance to the mature trees on the site.

### **E: Parkside**

- 10.7.14 The vertical realignment of the People's Park footpath will require careful excavation to avoid permanent damage to the mature tree stock of the area. At the west of the site the existing mature trees perform a screening function associated with Rose Cottages north of the River Corcrain and the adjacent Gerald Hamill & Sons scrap yard to the south. The retention of these areas of woodland is important to retain its screening properties. The proposed works will require careful excavation to ensure minimal impact on these mature trees, hand digging would be required under the 'Drip line' of the tree canopy to avoid root damage. Where tree removal is unavoidable replanting with 'Select Standard' or Extra Heavy standard specimens would be recommended.

### **F: Rose Cottages**

- 10.7.15 To the south of Rose Cottages housing is the River Corcrain and on the southern bank of the river is Gerald Hamill & Sons scrap yard. The mature trees on the southern bank adjacent to the scrap yard and tree fringe to People's Park site provide some visual screening and will be retained where possible. Additional tree planting on the northern bank between ch000.00 and ch160.00 and ch260.00 to ch320.00 of the flood defences would enhance and develop this existing scrubby woodland screening.

### **H: Castle Street**

- 10.7.16 Mitigation proposals include the replacement of lost grassland as a result of the proposals and compensatory tree planting. Additional tree planting is also proposed to increase visual amenity adjacent to the riverside for recreational users and provide enhanced biodiversity value.

**I: Foundry Street - Eastern bank of the River Bann**

- 10.7.17 Foundry Street opposite Castle Street site on the eastern bank is between the Shillington Bridge (Northway) and the Bann Bridge (Bridge Street) with public access to fishing platforms on the eastern bank of the river. The compensation planting, replacing trees lost during the installation of the flood defences is an opportunity to plant trees that will benefit the ecology of the river. Exact tree loss is unknown at the time of writing. The same riverine species on both sides of the river would provide visual unity and contribute to the riverside character, enhance the recreational use of the riverbank, the other fishing platforms further upstream and the Portadown Boat Club and the landing steps.

**J: Bowling Green**

- 10.7.18 There is tree planting proposed along the riverbank and for the boundary of the Rowing Club. The additional river side planting is proposed to enhance the riverbank environment. The tree planting would supplement embankment stability and in unison with the other riverside flood defence projects (west & eastern banks) provide an enhanced riverside environment in conjunction with the flood defence walls and the revised footpath routes. Further tree planting to aid integration in the park and compensate for tree loss is proposed either side for the flood defence.

**K: Health Centre**

- 10.7.19 Portadown Health and Care Centre on Meadow Lane is at the confluence of the Rivers Bann and Annagh. Some tree planting would be lost to the flood defence works and so the provision of individual trees to restore this very wet parcel of land would be both functional and visually appropriate.

**L: Irwins Mill**

- 10.7.20 The light industrial site (Thompson Aero) on the north-eastern bank of the River Bann is a significant visual component of the Bowling Green (section J) opposite, Bann Bridge South and the Rowing Club on the southwestern bank. Mitigation proposals will retain existing trees where possible and replace like where lost. Grassland will be reinstated with a grassland mix.

**M: Annagh Hill**

- 10.7.21 The open agricultural land to the east of the flood defences and Annagh Hill provide an open aspect to this mixed light industrial and residential urban environment on the north-eastern bank of the River Bann. Individual tree planting will provide screening or filtering of views towards the defences from nearby properties and provide additional tree cover at the northern section near the footbridge.

**N: Olde Golf Links**

- 10.7.22 Individual tree planting such as birch, beech and oak would provide additional tree cover around the extents of the development, whilst wetland meadow mix will be provided to the south and east. Replacement planting will be provided where tree loss occurs.

**N2: Fairways Estate**

- 10.7.23 From ch120m to ch180m on the eastern boundary native tree planting will be undertaken as compensation planting and to provide an element of visual screening for residents along the eastern boundary of the scheme. Additional tree planting to the verge at The Fairways will aid integration of the flood defence. A wetland meadow mix and species rich grassland mix will compensate for loss of grassland and shrubs during construction.

**P: Derryvore Lane**

- 10.7.24 Compensation tree planting including scattered trees to the proposed embankment at the south of the scheme are proposed to visually replicate the existing boundary line and provide filtering of views. Retention of existing vegetation to the northern site boundary will be implemented where possible.

**Q: Ripley Mews.**

- 10.7.25 Predominately residential in character but adjacent to open fields the proposed flood defences would reinforce a boundary between the two land uses. Ripley Mews defences would be steel sheet piling with earth embankments and will require reinstatement of grassland. Some individual trees are also proposed along the defences east of Armagh Road to complement the existing character. Ripley Crescent will be protected with a dwarf wall with some tree planting to reflect the existing field boundary.

**R: Corcullentragh Road**

- 10.7.26 The construction of the steel sheet piling with minor earth grading and grass seeding form the flood defences. The flood defence is set back from existing juvenile trees that should be retained where possible and those that have to be removed to facilitate development should have compensatory planting. To reduce the visual intrusion the steel sheet piling should have brick cladding facing the farmhouse. Additionally, embankments will be seeded, providing grassland where land would be disturbed.

**S: Corcrair Drive**

- 10.7.27 The flood defences for this housing area comprises reinforced walls clad with brickwork to compliment the surrounding urban character with 'Select Standard' or Extra Heavy standard specimens trees. Where there is space planting trees to the front of the flood defence will aid integration. Additionally, where land would be disturbed, it shall be reinstated with species rich grass seed.

**10.8. Residual Effects****Construction**

- 10.8.1 With mitigation applied the residual construction effects are summarised in Tables 10.5 and 10.6. Significant effects, although temporary, are in bold.

**Operation**

- 10.8.2 The residual operational effects as a result of the scheme is assessed as those present during the operational phase; that is the likely effects following completion of works and successful maturation of the proposed mitigation measures. The residual effects for the proposals are presented in Table 10.5 and 10.6.

**Assessment of Visual Effects****Upper Bann Recreational Routes**

- 10.8.3 This collection of recreational routes which broadly follows the towpath along the River Bann would experience enhancements during operation as a result of the schemes including improved walkways and access and additional planting. The majority of these enhancements would take place at schemes J: Bowling Green, L: Irwins Mill, H: Castle Street and I: Foundry Street. Further south of the towpath there would be minimal visual change for recreational users. The impacts would subsequently reduce from high to **low** with some beneficial impacts including more suitable riverine planting, improved footpath surfacing and access.

*Significance of Effect (Operation)*

- 10.8.4 The combination of high sensitivity and low impact for recreational users results in a **minor adverse** and not significant effect.

**Walking Route 31: People's Park**

- 10.8.5 For recreational users within the People's Park following construction and maturation of the mitigation proposals, the impacts are predicted to reduce to **low** as the flood prevention measures assimilate within their surroundings.



*Significance of Effect (Operation)*

- 10.8.6 The combination of high sensitivity and low impact for recreational users results in a **minor adverse** and not significant effect.

**NCNR 94: Loughshore Trail**

- 10.8.7 For users of this long distance cycle trail changes to the route as a result of the schemes would not notably alter their enjoyment of the route overall and would provide some beneficial aspects such as improved access and surfaces. As a result, the magnitude of impact is predicted to reduce to **low** from high locally.

*Significance of Effect (Operation)*

- 10.8.8 The combination of high sensitivity and low impact for recreational users results in a **minor adverse** and not significant effect.

**Individual Schemes****A: Ashgrove Road****Operational Phase***Magnitude of impact*

- 10.8.9 During operation sown species rich grass would be established. The residents of Ashgrove Lodge and Ashgrove Road would benefit from the establishment of the plant material associated with the flood defences. The users of the local road network would experience very little change and there would be no noticeable change in the baseline conditions. The magnitude of impact is consequently assessed as **negligible** for residents of Ashgrove Road.

*Significance of Effect (Operation)*

- 10.8.10 The combination of low sensitivity and negligible magnitude results in a **negligible** and not significant effect.

**A1: Corcrair Mews***Magnitude of impact*

- 10.8.11 During operation the sown species rich grass would be established. The residents of Corcrair Mews would experience the benefits as the mature plant material establishes. The users of the local playing fields would experience very little change and there would be no noticeable change in the baseline conditions. The magnitude of effect is therefore assessed as **negligible** for residents of Corcrair Mews and users of the Corcrair Orange Lodge.

*Significance of Effect (Operation)*

- 10.8.12 The combination of low sensitivity and negligible magnitude results in a **negligible** and not significant effect.

**B: Derryanvil Road***Magnitude of impact*

- 10.8.13 During operation the sown species rich grass would be established. The residents of Derryanvil Road would experience the benefits as the mature plant material establishes. The residents and local road users would experience very little change and there would little noticeable change in the baseline conditions. The magnitude of impact is therefore assessed as **negligible** for the road network users and residents.

*Significance of Effect (Operation)*

- 10.8.14 The combination of low sensitivity and negligible magnitude results in a **negligible** and not significant effect.

**C: Ulster Carpets / Woodside Green***Magnitude of impact*

- 10.8.15 During operation the sown species rich grass would be established. The residents of Castle Avenue and Woodside Green and employees of Ulster Carpets would experience the benefits of the mature planting. The magnitude of impact is assessed as **negligible** for these residents and other users.

*Significance of Effect (Operation)*

- 10.8.16 The combination of low sensitivity and negligible magnitude results in a **negligible** and not significant effect.

**D: People's Park***Magnitude of impact*

- 10.8.17 During operation the sown species rich grass would be established. The residents of Park Road, Kings Street and Parkside would experience the benefits of both the mature planting, revised walkways and re-grading. The magnitude of impact is assessed as **negligible** for these residents and park users.

*Significance of Effect (Operation)*

- 10.8.18 The combination of medium sensitivity and negligible magnitude results in a **negligible** and not significant effect.

**E: Parkside***Magnitude of impact*

- 10.8.19 During operation the sown species rich grass would be established. The residents of Parkside would experience the benefits of the mature planting. The magnitude of impact is assessed as **negligible** for these residents and other park users.

*Significance of Effect (Operation)*

- 10.8.20 The combination of medium sensitivity and negligible magnitude results in a **negligible** and not significant effect.

**F: Rose Cottages***Magnitude of impact*

- 10.8.21 During operation the species rich grass sown on embankments would have established. The Park users would have become accustomed to the revised footpath levels and see the initial visual impact recede as the plant material establishes on the flood defences. The users of the sports facilities would experience no change to the facilities although there might be small noticeable change to the baseline conditions. The magnitude of impact is assessed as **low**.

*Significance of Effect (Operation)*

- 10.8.22 The combination of low sensitivity and low magnitude results in a **negligible** and not significant effect.

**H: Castle Street***Magnitude of impact*

- 10.8.23 During operation the revised riverside walkway route would be fully incorporated with the riverbank environment. There will be a stronger visual connection for riverside users, however there will be less visual and physical connection with the riverside walks. This will blend in to the existing landscape and view over time. The restored riverbank planting would have gained maturity; therefore the magnitude of impact is assessed as **low** for these recreational users and river users.

*Significance of Effect (Operation)*

- 10.8.24 The combination of medium sensitivity and negligible magnitude results in a **minor** and not significant effect.

**I: Foundry Street - Eastern bank of the River Bann***Magnitude of impact*

- 10.8.25 During operation the restored riverside would be fully incorporated with the riverbank environment and the western and eastern banks would make a significant visual contribution to the whole of the riverside environment. The restored riverbank planting would have reached maturity; therefore the magnitude of impact is assessed as **negligible** for these recreational users and river users.

*Significance of Effect (Operation)*

- 10.8.26 The combination of low sensitivity and negligible magnitude results in a **negligible** and not significant effect.

**J: Bowling Green***Magnitude of impact*

- 10.8.27 During operation the revised riverside walkway route would be fully incorporated with the riverbank environment and the fishing platforms. The Bowling Club, Pleasure Garden and fishing platform users would experience greater connectivity and improved riverside environment and access. There will be restricted connectivity from the Bowling Green to the Pleasure Garden. The flood fence will create a change in environment that over time will blend to an extent with the existing view. The restored riverbank planting would have matured with both banks contributing to the riverside environment; consequently the magnitude of impact is assessed as **low** for these recreational users and river users.

*Significance of Effect (Operation)*

- 10.8.28 The combination of medium sensitivity and negligible magnitude results in a **minor** and not significant effect.

**K: Health Centre***Magnitude of impact*

- 10.8.29 During operation the revised riverside footpath and the Newry Way would be fully incorporated with the riverbank environment. The restoration of the riverbank adjacent to the car park and the river Annagh confluence with the River Bann would experience greater visual connectivity and improved access. The restored riverbank planting would reach maturity, with the resultant magnitude of impact assessed as **negligible** for these recreational users and river users.

*Significance of Effect (Operation)*

- 10.8.30 The combination of low sensitivity and negligible magnitude results in a **negligible** and not significant effect.

**L: Irwins Mill***Magnitude of impact*

- 10.8.31 During operation the revised riverside planting would be fully incorporated with the riverbank environment adjacent to Irwins Mill. The restored riverbank planting would reach maturity with both banks contributing to the riverside environment. The magnitude of impact is assessed as **negligible** for the recreational users on the opposite bank and the river users.

*Significance of Effect (Operation)*

- 10.8.32 The combination of low sensitivity and negligible magnitude results in a **negligible** and not significant effect.

**M: Annagh Hill***Magnitude of impact*

- 10.8.33 During operation the revised riverside planting would be fully incorporated with the riverbank environment adjacent to Annagh Hill. The restored riverbank planting would reach maturity with both banks contributing to the riverside environment. The magnitude of impact is assessed as **negligible** for nearby residents and workers at the nearby industrial estates.

*Significance of Effect (Operation)*

- 10.8.34 The combination of low sensitivity and negligible magnitude results in a **negligible** and not significant effect.

**N: Olde Golf Links***Magnitude of impact*

- 10.8.35 The introduction of sheet piling to boundaries of Olde Golf Links will change the view that will blend into the existing view over time. The flood defence planting would reach maturity providing integration with the agricultural environment. The magnitude of impact is therefore assessed as **low**.

*Significance of Effect (Operation)*

- 10.8.36 The combination of low sensitivity and negligible magnitude results in a **negligible** and not significant effect.

**N2: Fairways Estate***Magnitude of impact*

- 10.8.37 During operation the flood defences would be fully incorporated with the open agricultural environment to the east. The restored flood defence planting would reach maturity providing integration with the agricultural environment. Consequently, the magnitude of impact is assessed as **negligible** for this open agrarian landscape.

*Significance of Effect (Operation)*

- 10.8.38 The combination of low sensitivity and negligible magnitude results in a **negligible** and not significant effect.

**P: Derryvore Lane***Magnitude of impact*

- 10.8.39 The introduction of sheet piling to boundaries at Derryvore Lane will change the agricultural view, however this will blend into the existing view over time. During operation the site would be fully incorporated within

the wider agricultural landscape as planting reaches maturity. The magnitude of impact is therefore assessed as **negligible** for workers at the industrial estate, occasional traffic along Derryvore Lane and nearby residents.

*Significance of Effect (Operation)*

- 10.8.40 The combination of low sensitivity and negligible magnitude results in a **negligible** and not significant effect.

**Q: Ripley Mews**

*Magnitude of impact*

- 10.8.41 During operation the species rich grassland would be established, and the flood defence embankments and bund planting would reach maturity. The magnitude of impact is therefore assessed as **negligible** for this peri-urban location.

*Significance of Effect (Operation)*

- 10.8.42 The combination of low sensitivity and negligible magnitude results in a **negligible** and not significant effect.

**R: Corcullentragh Road**

*Magnitude of impact*

- 10.8.43 During operation the species rich grassland would be established, and replacement tree planting will have matured settling the flood defence built form into the receiving environment. The magnitude of impact is therefore assessed as **low** for this rural location.

*Significance of Effect (Operation)*

- 10.8.44 The combination of medium sensitivity and negligible magnitude results in a **minor** and not significant effect.

**S: Corcraín Drive**

*Magnitude of impact*

- 10.8.45 During operation the proposed species rich grassland would be established, and the compensation planting installed with the flood defence embankments and bund planting would reach maturity. The magnitude of impact is assessed as **negligible** for this rural location.

*Significance of Effect (Operation)*

- 10.8.46 The combination of low sensitivity and negligible magnitude results in a **negligible** and not significant effect.

Table 10.5 Schedule of Effects on Recreational Users

Receptor	Relevant Viewpoints	Magnitude (Construction)	Significance (Construction)	Magnitude (Operation)	Significance (Operation)
Upper Bann Recreational Routes	19, 20, 21, 22, 10, 09, 07, 08	High	Major	Low	Minor
Walking Route 31: People's Park	06, 11	High	Major	Low	Minor
NCNR 94: Loughshore Trail	07, 08	High	Major	Low	Minor

Table 10.6 Schedule of Effects on Individual Schemes

Receptor	Relevant Viewpoints	Magnitude (Construction)	Significance (Construction)	Magnitude (Operation)	Significance (Operation)
A: Ashgrove Road	02, 03	Medium	Minor	Negligible	Negligible
B: Derryanvil Road	-	Low	Negligible	Negligible	Negligible
D: People's Park	06, 11	Medium	Moderate	Negligible	Negligible
F: Rose Cottages	-	Medium	Minor	Low	Negligible
I: Foundry Street	08	Medium	Minor	Negligible	Minor
K: Health Centre	19	Low	Negligible	Negligible	Negligible

Receptor	Relevant Viewpoints	Magnitude (Construction)	Significance (Construction)	Magnitude (Operation)	Significance (Operation)
L: Irwins Mills	09, 10	Low	Negligible	Negligible	Negligible
M: Annagh Hill	-	Low	Negligible	Negligible	Negligible
					Negligible
N: Olde Golf Links	18	Medium	Minor	Low	Negligible
Q: Ripley Mews	17	Low	Negligible	Negligible	Negligible
S: Corcraun Drive	13, 14, 15	Medium	Minor	Negligible	Negligible

## 10.9. Monitoring

### Construction

10.9.1 During construction works it is advised that regular checks are undertaken by the Environmental Clerk of Works (ECoW) to ensure any mitigation proposals are being adhered to in accordance with the approved designs, including retention and replacement of individual trees, grass seeding, hedgerows and woodland mixes. Landscape bunds or embankments should also be checked for appropriate height and gradient.

### Operation

10.9.2 During operation it is advised inspections are retained on a less frequent basis to ensure the proposed new planting has successfully integrated, and where there has been any notable loss of vegetation ensure it is replaced as necessary.

## 10.10. Summary

10.10.1 The assessment has found that the proposed flood alleviation scheme would incur significant, although temporary, effects on a number of visual receptors during the construction phase, namely:

- Users of Upper Bann Recreational Routes
- Walking Route 31: People's Park
- Users of the NCNR 94: Loughshore Trail
- Scheme D: People's Park (Users of the park and nearby residents)

- Scheme E: Parkside (Users of the People's Park and nearby residents)
- Scheme H: Castle Street (Users of the River Bann footpath/cycleway)
- Scheme J: Bowling Green (Users of the River Bann footpath/cycleway)
- Scheme R: Corcullentragh Road (residents).

10.10.2 The significant (moderate) construction effects associated with the individual schemes are generally as a result of heightened sensitivity due to their surroundings and public use.

10.10.3 For recreational users who would experience major significant effects during construction this is generally as a result of being highly sensitive to changes around them as they traverse the various routes. During construction the presence of large plant for sheet pile installation, an increase in large goods vehicles, temporary fencing, compound huts and temporary diversions would combine to create significant (major) effects.

10.10.4 During operation, all effects are predicted to be not significant as the schemes and associated visual changes integrate with their surroundings.

### **Conclusions**

10.10.5 The schemes would provide effective flood prevention measures for a number of receptors across the study area, and although there would be significant visual effects during the initial construction phase, there are not predicted to be any significant residual effects during operation.

10.10.6 Furthermore, the various schemes have sought to successfully comply with the policies outlined in the SPPS, Armagh Area Plan 2004 and Craigavon Area Plan 2010 by ensuring minimal intervention on the character of landscape within the policy areas and enhancing those areas where possible.



## 11. Terrestrial Biodiversity

### 11.1. Introduction

11.1.1 This chapter reports the assessment of the likely significant effects to arise from the construction and operation of the scheme in Portadown, in terms of ecology and biodiversity, in the context of the site and surrounding areas.

11.1.2 The chapter also identifies, where appropriate, the mitigation measures proposed to prevent, minimise or control likely significant adverse effects on the ecology of the site and surrounding area arising from the scheme, and the subsequent anticipated residual effects following the adoption of the mitigation measures. The objectives of this chapter are to:

- Describe the ecological baseline.
- Describe the assessment methodology and significance criteria used in completing the impact assessment.
- Describe the potential effects, including direct, indirect and cumulative.
- Describe the mitigation measures proposed to address any likely significant effect.
- Assess the residual effects remaining following the implementation of mitigation.

11.1.3 The identified potential ecological effects may be related to the potential effects identified by other disciplines. Therefore, please also refer to the following chapters:

- Chapter 8: Air Quality
- Chapter 9: Cultural Heritage
- Chapter 10: Landscape and Visual Effects
- Chapter 14: Noise

11.1.4 This assessment has been informed by data presented in the following appendices in **Volume 3**:

- **Appendix 11.1** – Portadown Wintering Waterbird Survey Report
- **Appendix 11.2** – Portadown Badger Survey Report
- **Appendix 11.3** – Portadown Otter Survey Report
- **Appendix 11.4** – Portadown Smooth Newt Survey Report
- **Appendix 11.5** – Portadown Bat Roost Potential Assessment Report
- **Appendix 11.6** – Portadown Bat Activity Survey Report

### 11.2. Statutory and Policy Context

11.2.1 Chapter 2 identifies and describes the legislation, policy and guidance relevant to the assessment of the potential environmental impacts associated with the scheme. This section provides an overview of the specific legislation, policy and guidance of relevance to the ecological assessment.

11.2.2 This assessment is carried out in accordance with the principles in the following legislation and policy:

- The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017
- The Drainage (Environmental Impact Assessment) Regulations (Northern Ireland) 2017

- The Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2017
- The Conservation (Natural Habitats, etc) Regulations (Northern Ireland) 1995 (transposes EU Birds Directive 2009/147/EC and EU Habitats Directive 2009/147/EC, 92/43/EC)
- Wildlife and Natural Environment Act (Northern Ireland) 2011
- The Wildlife (Northern Ireland) Order 1985
- Invasive Alien Species (Enforcement and Permitting) Order (Northern Ireland) 2019

11.2.3 The following ecological guidance documents were consulted during the preparation of this Ecological Impact Assessment (EcIA):

- Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.1 (CIEEM 2018) (Ref 11.1), and
- BS42020:2013 Biodiversity – Codes of Practice for Planning and Development (Ref 11.2).

## 11.3. Methodology

### Scope of the Assessment

11.3.1 The generic EIA methodology has been applied across the scheme and is detailed in Chapter 2. The EcIA follows specifically the CIEEM Guidelines of Ecological Impact Assessment in the UK and Ireland, hereafter referred to as 'the CIEEM Guidelines'.

11.3.2 The EcIA has involved the following key stages:

- Identifying the zone of influence (ZoI) arising from the whole lifespan of the scheme,
- A background data search to obtain archival records of sites and species, and to gain information to focus the field surveys,
- Identifying ecological features (e.g., habitats, species, ecosystems and their functions/processes, previously known as ecological receptors) through field surveys,
- Determination of the ecological value/importance of the ecological features,
- Identification of the potential impacts and assessment of effects,
- Identification of the significant effects of the impact in the absence of any mitigation,
- Incorporation of ecological mitigation measures to avoid or reduce effects and compensation measures,
- Assessment of the significance of any residual ecological effects remaining,
- Identification of any cumulative impacts.

### Consultation

11.3.3 The scope of this assessment has been informed by consultation and engagement with statutory consultees throughout the assessment process. A summary of this can be found in Chapter 4 Consultation.

### Extent of Study Area

11.3.4 The scheme proposes the provision of flood walls and embankments at 20 locations (A, A2, B, C, D, E, F, H, I, J, K, L, M, N, O, P, Q, R, S) in and around the town of Portadown to prevent flooding of land and property. Since the PEA was issued, site G has been removed from the scope of works and a new site (N2 The Fairways) has since been added. Portadown sits within Armagh City, Banbridge and Craigavon Borough

Council. A detailed scheme description and information on the 20 individual site locations is given in Chapter 6 Description of Proposed Scheme.

11.3.5 The study area includes the land within the footprint of the scheme and Zone of Influence (ZoI). Due to the variable sensitivity of terrestrial ecology and ornithology receptors, the study area differed depending on the receptor considered. The species specific ZoIs are shown in Table 11.1.

Table 11.1 Species and habitat specific ZoIs

Ecological Feature		ZoI	Study Area	Survey Area
Designated Sites	Statutory designated	5km	5km	N/A- 15km buffer considered for international sites
	Non-statutory designated	2km	2km	
				Within footprint of flood defences plus a 50m construction working buffer
Smooth Newt		2km	2km	Within the footprint of the flood defences plus a 500m buffer area
				Within the footprint of the flood defences
Bats		4km	4km	Within footprint of flood defences plus a 50m construction working buffer
Terrestrial Mammals (badger & otter)		2km	2km	

11.3.6 The survey area for which baseline survey data was collected was taken to be the footprint of the proposed flood defence at each location with a ZoI of 50m from each site to allow for a construction working corridor.

### Desk-based Assessment

11.3.7 A desk-based assessment was undertaken to identify sites of national and international nature conservation importance within 2km and 15km of the scheme.

11.3.8 Baseline data for desk-based assessment was collected from the following sources:

- Google Maps (Ref 11.3)
- Northern Ireland Environment Agency (NIEA) Natural Environment Map Viewer (Ref 11.4)
- Department of Agriculture, Environment and Rural Affairs (DAERA) Protected Areas Search (Ref 11.5)
- Armagh City, Banbridge and Craigavon Borough Council. Local Development Plan (LDP) Preparatory Paper 8: Environmental Assets (Ref 11.6)
- Armagh City, Banbridge and Craigavon Local Biodiversity Plan (LBAP) (Ref 11.7)
- National Biodiversity Network (NBN) Atlas (Ref 11.8)

## Field Surveys

- 11.3.9 A habitat survey was carried out during August and September 2020 to ascertain the habitat types present in the study area and to determine the habitat potential for protected fauna.
- 11.3.10 Where landowner access was not agreed or sites could not be accessed, professional judgement was used to identify habitat types based on aerial mapping and observing sites from roads or public footpaths where available.
- 11.3.11 Additional follow up protected species surveys, including overwintering birds, smooth newt, bat roost and activity, otter and badger were also undertaken at appropriate times of the survey year in 2020/2021 to inform this EcIA (**Appendices 11.1 to 11.6, Volume 3**).

## 11.4. Baseline Conditions

- 11.4.1 The results of the desk-based assessment and the field surveys undertaken during 2020 and 2021 are summarised below. Full survey results and survey methodologies are available in the survey appendices **11.1 to 11.6, Volume 3**.

### Designated Sites

- 11.4.2 Table 11.2 details the designated terrestrial sites that have been considered within the study area. There are eight statutory designated sites, three of these are Areas of Special Scientific Interest (ASSI), one Ramsar site and one Special Protection Area (SPA), one National Nature Reserve (NNR) and one Nature Reserve (NR).
- 11.4.3 Designated sites within a ZoI of up to 2km are considered, unless mobile/migratory species are present, in which case a ZoI of up to 10km is considered. Non-statutory sites within a ZoI of up to 300m were considered, however none were present.

Table 11.2 Designated Sites within 2km of the scheme

Designated Site Name	Distance and Direction from Scheme	Reason for Designation
Derryvore ASSI	Nearest Site P; 130m northwest Furthest from Site N; 4.3km north	Designated for its fen habitat, Derryvore is of special scientific interest for its wetland flora and fauna. It is a diverse herb-rich wetland, with a number of unusual fen communities and several notable species.
Brackagh Bog ASSI	Nearest Site O; 0m east Furthest from Site P; 4.5km south	Designated for its fen and wet woodland habitat, the area is of special scientific interest for its wetland flora and fauna.
Selshion ASSI	Nearest Site R; 630m south Furthest from Site N; 3.3km northwest	The site is designated for its fen habitat and invertebrate assemblages. Selshion consists of a series of flooded peat cuttings, with a complex mosaic of open water, swamp, and acid fen communities with occasional drier areas of heath.
Lough Neagh & Lough Beg Ramsar site	Nearest Site P; 2.1km north Lough Neagh is hydrologically connected to the locations alongside the Bann and its tributaries	The site is important for rare and locally important invertebrates, waterfowl, breeding birds, breeding wetland species, winter waterfowl and a population of Pollan (a UK Priority Species).
Lough Neagh & Lough Beg SPA	Nearest Site P; 4.5km northeast	This site qualifies under Article 4.1 of the Birds Directive by regularly supporting: internationally important numbers of wintering birds, nationally important number of breeding birds and over 20,000 waterfowl in winter.

Designated Site Name	Distance and Direction from Scheme	Reason for Designation
Lough Neagh Islands	Nearest Site P; 2.1km northeast	This includes approximately 80 islands which provide nesting sites for a number of breeding (mostly wetland) bird species.
Oxford Island NNR	Nearest Site P; 4.5km northeast	This national nature reserve is located on a peninsula on the southeast shore of Lough Neagh. It contains a variety of habitats, including: wet meadows, reedbeds, woodlands and shoreline scrub. This site is important for large numbers of wintering waterfowl.
Brackagh Bog NR	Nearest Site O; 0m east Furthest from Site P; 4.5km south	The nature reserve occupies almost the same footprint as the ASSI, although slightly smaller. The site was formerly occupied by a raised bog that was subject to extensive peat cutting over 300 years. It is designated for its fen habitat and wet woodland.

## Habitats

### Desk Study

11.4.4 The following priority terrestrial habitats for conservation action were identified in the Portadown area in the LBAP:

- Woodland
- Mixed woodland:
- Slantry Wood - a Local Nature Reserve (LNR) located approximately 1km northeast at the nearest point (Site P).
- Wet woodland:
- Brackagh Bog NNR - cutover bog, wet woodland
- Peatland
- Lowland raised bog:
- Brackagh Bog ASSI - cutover bog
- Grassland and arable:
- Floodplain grazing marsh:
- Upper Bann floodplains - lower floodplain of Lough Neagh and the River Bann
- Open mosaic habitats on previously developed land.

11.4.5 The Ballybay river, Corcrair River and Annagh River are all tributaries of the River Bann and flow into the Bann in Portadown. The Bann then flows into Lough Neagh, north of Portadown. The rivers provide habitat corridors for a range of species that potentially may be found within the scheme extents.

### Habitat Field Survey

11.4.6 A habitat survey was conducted in August & September 2020. A detailed habitat description for each habitat at the 20 individual sites is listed in Table 6-5 of the Portadown EIA Scoping Report (Ref 11.9), **Appendix 2.1, Volume 3**. In addition, a full species lists for each habitat for each site can also be found in Portadown EIA Scoping Report. Below is an overview of the habitats found across the scheme.

### **Amenity Grassland**

- 11.4.7 This habitat was present within Sites D (People's Park), E (Parkside), H (Castle Street), J (Bowling Green), K (Health Centre), N (Olde Golf Links), Q (Ripley Meadows), R (Corcullentragh Road) and S (Corcrair Drive). A description all the locations of each site across the scheme are found in Chapter 6 Scheme Description.
- 11.4.8 This grassland comprised of playing pitches, path and roadside verges and regularly managed grassland. The grass is kept short and is of low species diversity.

### **Arable**

- 11.4.9 This habitat was present within site A1 (Ashgrove Road) and is a maize field with *Impatiens glandulifera* (Himalayan Balsam) growing along the road boundary.

### **Bare Ground**

- 11.4.10 This habitat was present within Sites A2 (Corcrair Meadows), B (Derryanvil Road), D, E, H, J, I (Foundry Street), L (Irwins Mill), N and S. Bare ground was present as footpaths, roads, farmyard and paved areas.

### **Buildings**

- 11.4.11 Buildings were present at Sites A1, A2, B, H, J, L, N, O (313 Tandragee Road), Q, R and S, and were mainly residential and commercial properties.

### **Ditch**

- 11.4.12 Drainage ditches were present at Site O along the bog and field boundaries. There was some water present on the day of survey.

### **Ephemeral/Short Perennial**

- 11.4.13 This habitat was present at Sites B and C (Woodside Green). At Site B, this was a small area next to the farm shed with areas of spoil and at Site C was situated between the factory buildings and boundary fence. Species included *Matricaria discoidea* (Pineapple weed), *Brassica oleracea* (Wild Cabbage), *Tussilago farfara* (Colt's-foot) and *Trifolium repens* (White Clover).

### **Fen**

- 11.4.14 This habitat was present at Site O only and is adjacent to Brackagh Bog ASSI. The vegetation at the boundary is typical of a fen habitat with species such as *Phragmites spp.* (Common Reed), *Typha latifolia* (Bulrush) and *Filipendula ulmaria* (Meadowsweet).

### **Hedgerow**

- 11.4.15 This habitat was present at Sites A1, B, O and P (Derryvore Lane). Hedgerows were present along field boundaries and species present included *Crataegus monogyna* (Hawthorn), *Rosa canina* (Dog-rose) and *Fraxinus excelsior* (Ash).

### **Improved Grassland**

- 11.4.16 This habitat was present at Sites A1, B, O, P and R. These fields were predominantly used for grazing and were comprised of perennial rye grass, *Alopecurus pratensis* (Meadow Foxtail), and *Cirsium spp.* (Thistles).

### **Marginal Vegetation**

- 11.4.17 This habitat was present as sites C, H and J and was confined to thin strips along the riverbank. Typical species included *Phalaris arundinacea* (Reed Canary-grass), *Syngonium podophyllum* (Arrowhead) and *Lemnoideae spp.* (Duckweed).

### Neutral (wet) Grassland

- 11.4.18 This habitat was present at Site K in a field that lies within a floodplain. Species present included perennial rye-grass, thistles and *Juncus effusus* (Soft-rush). Cattle were present grazing in the field on the day of survey and there is potential that this habitat (floodplain grazing marsh) is of importance in the local BAP.

### Neutral Grassland

- 11.4.19 This habitat was present at Sites A2, C, L, M (Annagh Hill), N, Q and R. This habitat is a mixture of wet grass and soft rush species. At Site C, *Heracleum trachyloma* (Giant Hogweed) and *Reynoutria japonica* (Japanese Knotweed) was present along the riverbank. Some of the fields were grazed.

### Plantation Woodland

- 11.4.20 This habitat was present at Sites A1, K and S. Species present include *Sambucus nigra* (Elder), *Alnus glutinosa* (Alder), hawthorn, dog-rose, *Betula pendula* (Silver Birch) and *Quercus robur* (Pedunculate Oak).

### Running Water

- 11.4.21 This habitat was present at Sites A1, A2, B, C, D, F (Rose Cottage), H, I, J, K, L, M, N, P, R and S. Running water was present in the form of streams, Ballybay River, ditches, Corcrair River and River Bann.

### Scattered Trees

- 11.4.22 This habitat was present at Sites A2, C, D, E, F, H, I, J, L, Q, R and S. Species include alder, ash, hawthorn, *Acer campestre* (Field Maple), ash and oak.

### Scrub

- 11.4.23 This habitat was present at Sites A2, C, E and R, the main species present was *Rubus fruticosus* agg. (Bramble).

### Standing Water

- 11.4.24 This habitat was present at Site D only in the form of a pond.

### Tall Ruderal

- 11.4.25 This habitat was present at Sites A2, B, F, H, I, J and N. Species include bramble, soft rush, *Dactylis glomerata* (Cock's-foot), *Poa annua* (Annual Meadow-grass), *Urtica dioica* (Common Nettle), *Chamaenerion angustifolium* (Rosebay Willowherb) and *Jacobaea vulgaris* (Common Ragwort).

### Unimproved Grassland

- 11.4.26 This habitat indicated in the PEA as being present at Site A1 only as a field used for grazing horses.

### Invasive and Non-native Species

- 11.4.27 Giant hogweed, Himalayan balsam and Japanese knotweed were present at some sites, namely at Site C along the riverbank and A1 in the arable field. The locations of these are shown on the phase 1 habitat map within the scoping report (**Appendix 2.1, Volume 3**).
- 11.4.28 The background data search identified giant hogweed and Himalayan balsam potentially within Site I, with records dated from 2012 and 2013.

### Protected and Noteworthy Species

- 11.4.29 10 protected species were recorded within 1km of each site boundary.
- 11.4.30 These included barn owl (*Tyto alba*), Eurasian badger (*Meles meles*), soprano pipistrelle (*Pipistrellus pygmaeus*), lesser noctule bat (*Nyctalus leisleri*) and common pipistrelle (*Pipistrellus pipistrellus*).

## Bats

- 11.4.31 All Northern Ireland bats are listed in Annex IV of the EU Habitats Directive which requires that they are accorded strict protection. Under the Conservation (Natural Habitats etc.) Regulations (NI) 1995 (as amended in 2009) which enacts this directive, it is an offence to damage or destroy a bat's breeding or resting place.
- 11.4.32 Three species of bat (soprano pipistrelle (*Pipistrellus pygmaeus*), lesser noctule bat (*Nyctalus leisleri*) and common pipistrelle (*Pipistrellus pipistrellus*) were recorded within the ZoI.
- 11.4.33 Each site was subject to a bat preliminary roost assessment (PRA) survey, full detailed results and locations of buildings and trees surveyed can be found in Portadown Flood Alleviation Preliminary Bat Roost Assessment Report in **Appendix 11.5, Volume 3**. Twenty seven buildings were assessed to have bat roosting potential - 11 had low potential (Buildings B1, B2, B10, B12, B13, B15, B16, B19, B20, B26 and B27) and 16 moderate potential (B3, B4, B5, B6, B7, B8, B9, B11, B14, B17, B18, B21, B22, B23, B24, B25), none had high roosting potential.
- 11.4.34 Further surveys were scoped in on eight of the moderate buildings.
- B4 and B5 are located within Site H and had features such as crevices in the outer stone wall and holes, ridge tiles lifted and moved tiles.
  - B6 is located within Site I and the building had an old brick facing with holes at the corners along the river edge.
  - B8 is located in Site A2 and is a road bridge with at least one hole and other gaps.
  - B11 is in Site R and is the main farmhouse with access for bats found on the rear west side.
  - B17 is in Site L and is an old factory building with multiple access holes in the wall, through open doors and broken windows in the disused part of the building.
  - B22 is in Site C and is an old shed and brick building with access under the roof.
  - B25 is in Site E with holes and access along the edge of the roof of the social club.
- 11.4.35 Note at the time of writing additional building surveys (comprising emergence re-entry surveys) have not been undertaken and therefore a precautionary approach has been taken in this assessment assuming bats are present. It has been agreed that these surveys will be undertaken as part of the pre-construction mitigation phase of the scheme, to minimise the time scale between surveys and construction.
- 11.4.36 Fourteen trees were assessed to have moderate or high bat roosting potential. Further surveys were scoped in on nine of these trees.
- T4 is in Site R and is a large beech with two knotholes.
  - T5 is in Site P and is a large willow spp. with thick ivy.
  - T6 and T7 are in Site L. T6 is a sycamore with thick ivy and T7 is a line of nine trees with low-moderate potential due to thick ivy.
  - T9 is in Site C and is a dead stump beside the railway bridge.
  - T11 and T12 are in Site O and are both ash trees with thick ivy.
  - T13 and T14 are in Site Q. T13 is an ash tree with thick ivy and T14 is a group of five trees with thick ivy.
- 11.4.37 Note at the time of writing additional tree surveys (comprising climbing or emergence re-entry surveys) have not been undertaken and therefore a precautionary approach has been taken in this assessment assuming bats are present.



- 11.4.38 Bat activity surveys have also been carried out and transects were walked at all sites except Site S, K, L, E, D and C. This because they were either scoped out as being of low suitability for foraging bats or in the case of sites L and C access permission was not granted. Static detectors were deployed at Sites M, R and P. Full detailed results can be found in Portadown Flood Alleviation Bat Activity Survey 2021 in **Appendix 11.6, Volume 3.**
- 11.4.39 The following bat species were recorded Leisler's bat (*Nyctalus leisleri*), common pipistrelle, soprano pipistrelle, brown long-eared (*Plecotus auritus*), *Myotis* species and Nathusius' pipistrelle (*Pipistrellus nathusii*) on the static detectors and during the walked transects.
- 11.4.40 Bats were encountered at all sites, however Sites M, H, I, J, R and P had activity levels of most interest, with frequent High or Very High activity levels.

### Smooth Newts

- 11.4.41 Smooth newts (*Triturus vulgaris*) are the only species of newt to be found in Northern Ireland. They are protected under Article 10 of the Wildlife (Northern Ireland) Order 1985 (as amended).
- 11.4.42 No smooth newts were recorded within the ZoI in the background data search.
- 11.4.43 Habitat Suitability Index (HSI) assessments were carried out on waterbodies found in Site D, L, M, O and Q in 2021. Torchlight newt surveys were then conducted on these waterbodies.
- 11.4.44 No newts were recorded across all five sites during the torch surveys; however, one smooth newt was found in a drainage gully at Site L during ground investigation works prior to the surveys. Detailed survey results are found in the Smooth Newt Survey Report Portadown Flood Alleviation Scheme, **Appendix 11.4, Volume 3.**

### Otter

- 11.4.45 Otters (*Lutra lutra*) are a European Protected Species and a Northern Ireland priority species. Otters are listed on Annex IV of the EC Habitats Directive (92/43/EEC) and are protected under the Conservation Regulations 1995 (as amended).
- 11.4.46 No otters were recorded at any sites in the background data search but were recorded within a 2km buffer.
- 11.4.47 Eleven sites were deemed suitable for use by otters and were further surveyed in 2021, these were Sites A2, C, F, H, I, J, L, N, P, R and a new site N2 Fairways, which was added after the habitat survey was completed.
- 11.4.48 No otter holts or natal dens were found at any of the ten sites. Evidence of otter using the River Bann was found at only five sites: Bowling Green (otter slide), Castle Street (spraint), Olde Golf Links (couch and slide), Irwins Mill (slide) and Tandragee Road (slide). For detailed descriptions of the otter field signs identified see the Portadown Otter Survey Report, **Appendix 11.3, Volume 3.**

### Badger

- 11.4.49 Badgers are a nationally protected species and are listed on Schedules 5, 6 and 7 of the Wildlife (Northern Ireland) Order 1985 as amended by the Northern Ireland Wildlife Act 2011.
- 11.4.50 Badgers were not recorded at any sites in the background data search but were recorded within a 2km buffer.
- 11.4.51 Five sites were deemed to be suitable for badgers (Site A1, N, P, R and Fairways). Some parts of site could not be accessed during the PEA survey so were assessed by boat on a freshwater habitat survey in November 2021.
- 11.4.52 No main setts have been identified.
- 11.4.53 A sett was located at one of the sites, 20m from the line of flood defences. A total of 11 holes were found, seven of these were large and showed signs of use and having been cleared out. Four were quite small and

most likely only permitted immature badger entry. Two latrine pits were found close to the sett. Due to the size of the sett and amount of activity it is most likely an annex sett or potentially a large subsidiary sett.

- 11.4.54 A single subsidiary burrow and badger footprints were located at a second site, approximately 5m from the works during a freshwater habitat assessment.
- 11.4.55 Detailed photos and mapped locations of the two setts are found in the Portadown Badger Survey Report, **Appendix 11.2, Volume 3.**

### Wintering Birds

- 11.4.56 Wintering bird surveys were undertaken at Sites C, L, H, I, J and K.
- 11.4.57 Only a relatively low number of individuals were observed. Species recorded included mallard (*Anas platyrhynchos*), black-headed gull (*Chroicocephalus ridibundus*), herring gull (*Larus argentatus*), kingfisher (*Alcedo atthis*), grey heron (*Ardea cinerea*), teal (*Anas crecca*), little grebe (*Tachybaptus ruficollis*) and moorhen (*Gallinula chloropus*). Due to the low number of individuals and the low diversity of waterbird species recorded it is concluded that habitat in the vicinity of the works is of negligible interest to wintering birds and that habitat is not functionally linked to any of the surrounding European designated sites.
- 11.4.58 Detailed winter bird survey results are found in the Portadown Wintering Waterbird Survey Report, **Appendix 11.1, Volume 3.**

### Breeding birds

- 11.4.59 No specific surveys for breeding birds have been undertaken as effects were scoped out as being not significant. Although the Portadown EIA Scoping Report concluded that hedgerow and similar types of vegetation will likely offer suitable nesting habitat for a range of common bird species, it is assumed that site clearance will take place outside of the bird nesting season in accordance with best practice and in line with legislation. Areas of arable farmland and grazed grassland may also support ground nesting species such as skylark, whilst exposed areas of earth cliff or bank along the River Bann may provide nest sites for kingfisher. However, defences in agricultural areas are generally around either field boundaries or around farm buildings so impacts on ground nesting birds are unlikely. The proposed locations along the River Bann are mostly in vegetated areas along the bank.

## 11.5. Evaluation (Value of Resource or Sensitivity of Receptors)

- 11.5.1 Table 11.3 provides a summary of the value of the identified ecological receptors.

### Existing Ecological Features

Table 11.3 Ecological Features scoped in and out for the detailed impact assessment

Ecological Feature	Scoped in for detailed assessment	Scoped out for detailed assessment	Reasoning
Brackagh Bog ASSI and NR	✓		Brackagh Bog is located on site at Site O
Derryvore ASSI	✓		Derryvore ASSI is 130m northwest from Site P
Selshion ASSI		✓	Over 600m from the closest flood alleviation works location and given this distance, it is considered unlikely that any air impacts from construction traffic will result in significant effects on the fen habitats. No impact on the site from operational maintenance.
Lough Neagh & Lough Beg Ramsar site and SPA	✓		Lough Neagh & Lough Beg Ramsar and SPA is located c. 4.5km northeast of the scheme. It is

			hydrologically connected to some locations of the scheme and therefore the site has been scoped into a detailed assessment. A pollution event, of a sufficient magnitude during construction, has the potential to affect the receiving aquatic and marine environments (either alone or in combination with other pressures on water quality) to an extent that could undermine the conservation objectives of the Lough Neagh and Lough Beg Ramsar and SPA.
Lough Neagh Islands NNR		✓	Over 2km from the nearest section of the scheme. No significant effect is expected on the habitat.
Oxford Island NNR		✓	Over 2km from the nearest section of the scheme. No significant effect is expected on the habitat.
Amenity grassland		✓	Habitat of low ecological value.
Arable		✓	Habitat of low ecological value.
Bare ground		✓	Habitat of low ecological value.
Buildings		✓	Habitat of low ecological value.
Ditches		✓	Habitat of low ecological value.
Ephemeral/short perennial		✓	Habitat of low ecological value.
Fen	✓		Tandragee Road proposed flood defence is located adjacent to a large area of fen habitat which is part of the Brackagh Bog ASSI and NR.
Hedgerows		✓	Habitat of low ecological value. Only species-poor hedgerows present during the habitat survey.
Improved grassland		✓	Habitat of low ecological value.
			Habitat of low ecological value.
Neutral (wet) grassland and/or unimproved neutral grassland	✓		Through a review of the PEA and Phase 1 habitat maps and the scheme site locations, it currently appears there may be a direct impact to areas of unimproved neutral grassland or wet grassland at Ashgrove Road, Corcrain Mews, Woodside Green, Health Centre, Irwin's Mill, Annagh Hill Industrial Estate, Corcullentragh Road, Olde Golf links & Ripley Mews. Habitat of low ecological value at a site level.

Plantation broadleaved woodland		✓	Habitat of low ecological value.
Running water		✓	Habitat of low ecological value.
			Habitat of low ecological value.
Scattered trees		✓	Habitat of low ecological value.
Standing water		✓	Habitat of low ecological value.
Tall ruderal		✓	Habitat of low ecological value.
Invasive non-native plant species	✓		Himalayan balsam was present at Site A1 along a boundary in an arable maize field, and Sites D, H, J and L. Japanese knotweed and giant hogweed were found along riverbanks at Site C and at Site I and around factory buildings at Site L
Bat	✓		Bats were encountered at all sites, however Sites M, H, I, J, R and P had activity levels of most interest, with frequent High or Very High activity levels
Badger	✓		Outlier/subsidiary badger setts were identified at one site atop a scrubby bank approximately 20m from the works and a single holed subsidiary sett and badger footprints were located at a second site, approximately 5m from the works.
Smooth newt		✓	No newts were recorded across all five sites during the torch surveys.
Otter		✓	No otter holts or natal dens were found at any of the ten sites. Evidence of otter using the River Bann was found at only five sites however there is no direct significant impact to the River Bann
Wintering birds		✓	Due to the low number of individuals and the low diversity of waterbird species recorded it is concluded that habitat in the vicinity of the works is of negligible interest to wintering birds and that habitat is not functionally linked to any of the surrounding European designated sites.
Breeding birds		✓	Due to the discrete nature of the works and associated habitat loss no significant impacts on breeding birds are envisaged. The timing of vegetation removal and Construction Environmental Management Plan (CEMP) will contain measures to ensure compliance with the legislation concerning nesting bird species.

- 11.5.2 Ecological receptors are valued with regard to the guidance provided in *Guidelines for Ecological Impact Assessment in the UK and Ireland* (CIEEM, 2018).
- 11.5.3 The assessment of likely effects as a result of the scheme has taken into account both the construction and operational stages. The scale attributed to each effect has been assessed based on the magnitude of change (or impact) due to the scheme and the value or importance of the affected ecological feature to a given source of impact or change from the baseline conditions.
- 11.5.4 Following the determination of the scale of an effect, the overall significance of the effect has been determined qualitatively by considering:
- The number of ecological features affected and their 'value' (e.g., whether it is local or regional effect).
  - The reversibility and duration of the effect.
  - The type and sensitivity of the ecological feature affected.
  - The type of effect or impact and whether it is beneficial or adverse.

**Value of Receptors**

- 11.5.5 The EcIA guidelines suggest that the value or importance of ecological features should be defined in terms of geographical scale. Therefore, the value (or potential value) of ecological features within the zone of influence for the project has been considered at the scales with associated values outlined in Table 11.3.
- 11.5.6 In determining the overall value of ecological features/receptors, consideration is also given to several other aspects of ecological value, including designations, biodiversity value, potential value, secondary or supporting value, economic value, legal protection and multi-functional features. These values are applied to the receptors within a defined geographical context and summarised in Table 11.4.

Table 11.4. Ecological features evaluation criteria

Ecological Value/ Importance	Qualifying Criteria	Relevant Significance
Very High /International	An internationally designated site or candidate/proposed site (Special Protection Area (SPA), potential SPA, Special Area of Conservation (SAC), candidate SAC and/or Ramsar site). A sustainable area of a habitat listed in Annex I of the Habitats Directive or smaller areas of such habitat which are essential to maintain the viability of the larger whole. Sustainable population of an internationally important species or site supporting such a species (or supplying a critical element of their habitat requirement) i.e.: IUCN Red List species that is listed as critically endangered, endangered or vulnerable; or Species listed in Annex IV of the Habitats Directive; or Sites that support 1% or more of a biogeographic population of a species; or The species is at a critical phase of its life cycle.	Europe
High / National	A nationally designated site (Area of Special Scientific Interest (ASSI), National Nature Reserve) or a discrete area which meets the selection criteria for national designation (e.g. ASSI selection criteria). An area formally selected by Defra as a Nature Improvement Area. A sustainable area of a priority habitat identified in the UK BAP or of smaller areas of such habitat, which are essential to maintain the viability of the whole.	UK/Northern Ireland

Ecological Value/ Importance	Qualifying Criteria	Relevant Significance
	<ul style="list-style-type: none"> <li>· Sustainable population of a nationally important species or site supporting such a species (or supplying a critical element of their habitat requirement) i.e.:</li> <li>· Species listed on Schedules 5 and 8 of the Wildlife Order;</li> <li>· UK Red Data Book species.</li> <li>· Other species listed as occurring in 15 or fewer 10 km squares in the UK; or</li> <li>· Sites supporting 1% or more of a national population.</li> </ul>	
Regional	<ul style="list-style-type: none"> <li>· Non-statutory designated sites that represent a scale, or habitat/species assemblage, of importance across a number of counties within a recognised regional context. Non-designated sites that the designating authority has determined meet the published ecological selection criteria for designation, particularly large or represent habitat or species assemblages of importance at a regional level.</li> <li>· Viable and extensive areas of legally protected habitat/habitat identified in regional biodiversity action plan (BAP) or County BAP, or smaller areas of such habitats that are essential to maintaining the viability of the resource at a regional scale.</li> <li>· Any regularly occurring population of an internationally/nationally important species or a species in a relevant policy which is important for the maintenance of the regional meta-population.</li> <li>· Semi-natural ancient woodland greater than 0.5ha.</li> </ul>	County Armagh
Local	<ul style="list-style-type: none"> <li>· County sites and other sites which the designating authority has determined meet the published ecological selection criteria for designation, e.g. local nature conservation sites.</li> <li>· Viable areas of legally protected habitat/habitat identified in Council BAP, or smaller areas of such habitats that are essential to maintaining the viability of the resource at a county scale.</li> <li>· Any regularly occurring population of an internationally/ nationally important species or a species in a relevant County BAP which is important for the maintenance of the county meta-population.</li> <li>· Semi-natural ancient woodland greater than 1ha.</li> <li>· Networks of species-rich hedgerows.</li> </ul>	Portadown
Site	<ul style="list-style-type: none"> <li>· Habitats of limited ecological value, e.g. amenity grassland, but which contribute to the overall function of the application site's ecological functions.</li> <li>· Very small, but viable, populations of internationally/nationally important species or habitats, or a species or habitat in a relevant UK/Council BAP which is not important for the maintenance of the local meta-population.</li> </ul>	Application red line boundary

11.5.7 Once the ecological features have been identified and their value defined, a judgement is made as to whether the scheme is likely to result in impacts upon each of the identified features/receptors, and if appropriate, the nature of those impacts.

11.5.8 Several key factors have been considered when describing and assessing ecological impacts, including:

- Positive (beneficial) or negative (adverse) impacts in accordance with nature conservation objectives and policy.
- Extent of impact (area or distance).
- Duration of impact (short term 0-2 years, medium term 2-10 years, long term 10+ years and includes permanent effects (normally greater than 25 years) or related to species' life-cycles).

- Magnitude of impact, considering the size of an impact as a change from the baseline conditions and has been considered of a scale of large, medium, small or negligible.
- Timing and frequency of impact (where the effect occurs for short periods of time and may re-occur occasionally at regular or irregular intervals).
- Reversibility in whether the effect is permanent (where recovery from the effect is not possible within a reasonable timescale and represents long-lasting change of an ecological feature) or temporary (where spontaneous recovery is possible and the effect occurs for a limited period of time and is not permanent).
- Direct, indirect, residual and cumulative impacts are also considered.

- 11.5.9 Direct impacts are changes directly attributable to a defined action of the scheme, such as physical loss of a habitat or the immediate mortality of an individual of a particular species.
- 11.5.10 Indirect impacts are attributable to an action which affects ecological resources through effects on an intermediary ecosystem, process or receptor e.g., loss of food resources for a species downstream of a site due to fish-kill by polluted run-off entering a river.
- 11.5.11 After assessing the potential impacts of the scheme, attempts are made to avoid and mitigate significant adverse ecological effects. Once measures to avoid and mitigate significant adverse ecological impact have been finalised, an assessment of the residual impacts is undertaken to determine the scale and significance of the residual impact on ecological features.
- 11.5.12 Cumulative impacts are the collective effects of changes that may be insignificant individually but in combination, often over time, have the potential to be significant.
- 11.5.13 Where any of the above parameters are unknown, this has been stated.

### **Determination of Significant Effects**

- 11.5.14 Following the classification of an effect, a clear statement is made as to whether the effect is "significant" or "not significant". Under the CIEEM 2018 guidelines, the significance of effect on the ecological features has been determined based on the analysis of the factors that characterise the impact.
- 11.5.15 A significant effect is determined as "an effect that either supports or undermines biodiversity conservation objectives for the ecological feature or for biodiversity in general". The assessment considers whether an effect has the potential to affect the integrity of a habitat or the conservation status of a species. Integrity of a habitat or site is defined as "the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified". The conservation status of a species is "the sum of the influences acting on it which may affect its long-term distribution and abundance within the geographical area of interest". Conservation status is considered to be favourable under the following circumstances:
- Population dynamics indicate that the species is maintaining itself on a long-term basis as a viable component of its habitats.
  - The natural range of the species is not being reduced, nor is it likely to be reduced for the foreseeable future, and
  - There is (and probably will continue to be) a sufficiently large habitat to maintain its population on a long-term basis.
- 11.5.16 To allow a consistent approach across all disciplines, the standard levels of significance defined in the 2018 CIEEM guidelines are set out in Table 11.5 alongside the equivalent definitions of effect used elsewhere in this Environmental Statement.

Table 11.5. Effects significance conversion

Significance following CIEEM guidelines	Magnitude of impact conversion
Significant at the international level	Major
Significance at the national level	Major
Significance at the regional level	Moderate
Significance at the county or district level	Moderate
Significance at the local level	
Not significant	Negligible

### Limitation and Assumptions

- 11.5.17 The following limitations and assumptions have been identified:
- 11.5.18 The assessment has been based on the construction information and phasing information provided by the engineers. The general arrangement drawings used for this assessment are provided in **Appendix 6.1, Volume 3**.
- 11.5.19 The exact location of site compounds and laydown areas has not been finalised, so a precautionary approach has been taken. It is anticipated that site compounds will use areas of existing hard standing where possible, with potential locations identified at DfI car park at Shillington's factory, People's Park car park, Foundry Street car park, Annagh Hill and Tandragee Road.
- 11.5.20 The assessment relies on available data, and best endeavours have been made to ensure that the data is accurate and up to date.
- 11.5.21 Not all the sites could be surveyed during the Phase 1 habitat survey due to land access restrictions. This is not a significant limitation to the preliminary survey as sites could be mapped based on observations from publicly available locations or from aerial mapping and photographs from other site visits. However, species specific surveys for the ES did require additional land access.
- 11.5.22 The Phase 1 habitat data in the scoping report does not present a detailed ecological valuation of areas of unimproved neutral and wet grassland, so a precautionary approach has been taken.
- 11.5.23 Emergence and re-entry surveys of trees and structures have not yet been carried out as the construction details are not yet sufficiently detailed to highlight what trees and buildings with roost potentially will be directly affected. Therefore, a precautionary approach has been applied.
- 11.5.24 Wintering bird surveys were missed between October and January due to the surveys being commissioned in February. This is not thought to have constrained the conclusions drawn.
- 11.5.25 The density of aquatic plants on the surface of ditches at Sites L and Q made it difficult to effectively torch survey for smooth newts.
- 11.5.26 Many sites included in the scheme are widely accessible to the public and this prevented static bat detector deployment in some areas.



Table 11.6. Summary of Ecological Feature Value / Importance

Ecological Feature	General UK Value Inferred by Legislation and Action Plans	Intrinsic Value of the Feature in the Context of the Development Area	Justification of Intrinsic Value of Feature
Bat	International, bats are listed as a European Protected Species in the Habitats and Species Regulations, 2010.	Local (Low)	<ul style="list-style-type: none"> <li>The intrinsic value is considered to be local based on the background data search, a review of the habitats on and surrounding site, and the results of the bat activity surveys, which recorded low numbers of activity by common species.</li> <li>Eight buildings and 14 trees were assessed to have moderate roosting potential for bats.</li> <li>Six species of bat were recorded using the site during activity transect surveys.</li> </ul>
Badger	Local, key legislation relating to badgers is the Protection of Badgers Act, 1992. The badger act does not apply in Northern Ireland however in Northern Ireland, badgers and their setts are protected under the Wildlife Order (Northern Ireland) 1985 as amended by the Wildlife and Natural Environment Act (Northern Ireland) 2011.	Local (Low)	<ul style="list-style-type: none"> <li>No main setts were identified.</li> <li>An outlier/subsidiary sett and were located at two sites, with fresh activity at both sites. Surrounding habitats are suitable for foraging and sett building.</li> </ul>
Invasive non-native plant species	The Invasive Alien Species (Enforcement and Permitting) Order (Northern Ireland) 2019, is the corresponding domestic legislation to the EU Invasive Alien Species Regulation 1143/2014.	Local (Low)	<ul style="list-style-type: none"> <li>Giant hogweed, Himalayan balsam and Japanese knotweed were present at some sites, namely at Site C along the riverbank and A1 in the arable field.</li> </ul>
Brackagh Bog ASSI and NR	National importance as it is a nationally designated site.	National (High)	<ul style="list-style-type: none"> <li>Designated for its fen and wet woodland habitat, the area is of special scientific interest for its wetland flora and fauna.</li> </ul>
Derryvore ASSI	National importance as it is a nationally designated site.	National (High)	<ul style="list-style-type: none"> <li>Designated for its fen habitat, Derryvore is of special scientific interest for its wetland flora and fauna. It is a diverse herb-rich wetland, with a number of unusual fen communities and several notable species.</li> </ul>
Lough Neagh & Lough Beg Ramsar site and SPA	International importance as it is a European designated site.	International (Very High)	<ul style="list-style-type: none"> <li>Lough Neagh &amp; Lough Beg Ramsar and SPA is located c. 4.5km northeast of the scheme. It is hydrologically connected to some locations of the scheme and therefore the site has been scoped into a detailed assessment.</li> </ul>

Ecological Feature	General UK Value Inferred by Legislation and Action Plans	Intrinsic Value of the Feature in the Context of the Development Area	Justification of Intrinsic Value of Feature
Unimproved neutral or wet grassland habitat	Wildlife and Natural Environment Act (Northern Ireland) 2011	Local (High)	Possible direct impact to areas of unimproved neutral grassland or wet grassland potentially at Ashgrove Road, Corcrair Mews, Woodside Green, Health Centre, Irwin's Mill, Annagh Hill Industrial Estate, Corcullentragh Road, Olde Golf Links & Ripley Mews. Potential to cause indirect disturbance and impact to this valuable habitat, however the footprint of the defences is small at each individual location.
Fen	National importance as it is a nationally designated site.	National (High)	Tandragee Road proposed flood defence is located adjacent to a large area of fen habitat which is part of the Brackagh Bog ASSI and NR

## 11.6. Impact Assessment

### Construction

11.6.1 The construction phase will see raised flood embankments, reinforced concrete walls, sheet pile walling, embedded walls, embedded cantilever walls, raised footpaths and walkways and secant piling. For a detailed scheme description see Chapter 6.

11.6.2 Potential impacts on ecological features associated with construction include:

- Permanent loss of habitat (vegetation clearance) and associated species due to ground and excavation works, provision of services and utilities and the construction of new hard standing and structures.
- Temporary loss of habitat and associated species through siting and subsequent removal of site compounds and storage areas for construction materials.
- Temporary disturbance of species within the site due to construction non-chemical pollution - noise, vibration, light and site personnel.
- Environmental incidents and accidents - spillages, noise, fire and emissions.
- Modification of habitats and introduction of undesirable species, such as injurious weed or invasive non-native species, as a result of traffic movements, reinstatement works and landscaping.

11.6.3 Where such impacts occur, mitigation measures will be adopted to help eliminate or offset adverse impacts and resulting ecological effects.

### Statutory Designated Sites - Impacts and Effects

11.6.4 There are four statutory designated sites that have been identified as sensitive receptors:

- Lough Neagh and Lough Beg SPA and Ramsar.
- Brackagh Bog ASSI and NR, and
- Derryvore ASSI

- 11.6.5 Lough Neagh and Lough Beg SPA and Ramsar site is located approximately 2km northeast but there is a potential pollution pathway via the River Bann. Further information on the impacts on the SPA/Ramsar site is provided in the Habitats Regulations Assessment for the scheme.
- 11.6.6 Brackagh Bog is located at Site O, an area of fen habitat is located adjacent to the proposed flood defence works and Derryvore ASSI is 130m northwest from Site P.
- 11.6.7 There will be no direct habitat loss on these statutory sites due to the nature of the works, however indirect impacts could potentially include:
- Non-chemical pollution - noise, dust, vibration, lighting, and
  - Changing the hydrological regime (ground and surface water) in the vicinity of the ASSI sites only. Lough Neagh and Lough Beg SPA being a sufficient distance for alteration to the underlying hydrological regime to be considered unlikely.
- 11.6.8 During the construction phase there is a risk of non-chemical pollution occurring within these designated sites, resulting from noise generated by plant and equipment, dust or vibration from the proposed construction activities, and light pollution from temporary works lighting. In the absence of mitigation, such effects may result from construction of flood defences.
- 11.6.9 In addition, the groundwater hydrological regime for Brackagh Bog and Derryvore ASSI could be changed by the ongoing construction works. The magnitude of impact prior to mitigation for all indirect impacts identified is assessed as being moderate due to the likelihood of indirect impacts which results from the flood alleviation sites being in close proximity. Therefore, the effect (pre-mitigation) is assessed as being **moderate adverse** (significant effect).

#### Habitats- Impacts and Effects

- 11.6.10 The Scoping report indicates that flood defence works will be within or adjacent to areas of unimproved neutral grassland or wet grassland (potentially floodplain grazing marsh) and fen (see above) all habitats of conservation importance under the Wildlife and Natural Environment Act (Northern Ireland) 2011. There is the potential for construction works to damage botanically diverse habitat types.
- 11.6.11 The flood defence works may result in a direct permanent effect leading to the loss of such habitat. Access routes may lead to an indirect temporary impact with damage from machinery or compaction of water logged soils affecting species diversity. Therefore, the effect (pre-mitigation) is assessed as being **moderate adverse** (significant effect).

#### Bats - Impacts and Effects

- 11.6.12 The following species were recorded during the surveys, Leisler's bat (*Nyctalus leisler*), common pipistrelle, soprano pipistrelle, brown long-eared (*Plecotus auritus*), *Myotis* species and Nathusius' pipistrelle (*Pipistrellus nathusii*).
- 11.6.13 Bats were encountered at all sites, however Sites M, H, I, J, R and P had activity levels of most interest, with more frequent High or Very High activity levels.
- 11.6.14 There are a range of habitats across all sites but bare ground, grassland and running water is present across most. Bare ground and amenity grassland does not provide suitable foraging habitat for bats but running water and improved and neutral grasslands provide foraging opportunities for bats.
- 11.6.15 Due to the relatively discrete nature of the proposed works, there is unlikely to be significant loss of habitats for bats, however there is the potential for disruption to foraging and commuting routes through temporary lighting, noise and vibration. The magnitude of change, prior to mitigation is low. Therefore, there is likely to be an indirect, temporary impact on foraging and commuting bats across the sites that is **minor adverse** (not significant).
- 11.6.16 Eight buildings and 14 trees were assessed to have bat roosting potential, however further surveys have yet to be carried out on these.

- 11.6.17 Pre-construction checks and climbing and/or emergence and re-entry surveys will be required on the buildings and trees highlighted with roosting potential for bats, to ensure no roosts will be disturbed or removed during construction works.
- 11.6.18 Should the pre-construction checks and surveys confirm that buildings or trees are used as active roost sites, there will be an impact from constructions works on these structures. Should roosting bats be confirmed, a protected species licence and appropriate mitigation will be required. The trees and buildings are of site importance only and the magnitude of impact prior to mitigation is high. Therefore, if roosting bats are confirmed, there is likely to be a direct, long-term, permanent effect on the loss of roost features within the study area that is **major adverse** (significant).

### **Badgers- Impacts and Effects**

- 11.6.19 Evidence of badger activity was recorded during the preliminary ecological assessment walkover and outlier/subsidiary badger setts were identified at one site, atop a scrubby bank and a single subsidiary burrow and badger footprints were located at a second site, approximately 5m from the works.
- 11.6.20 The badger sett is located within 20m from the line of flood defences, though separated by a slope of thick scrub. The sett will potentially be disturbed by the works potentially leading to tunnel collapse and incidental mortality of individual badgers. There is likely to be a direct, long-term, permanent effect on badgers that is **minor to moderate adverse** (significant effect).
- 11.6.21 The single hole subsidiary badger sett located 5m from the second site will likely be disturbed if not destroyed by the works potentially leading to incidental mortality of individual badgers. Therefore, there is likely to be a direct, long-term, permanent effect on badgers that is **minor to moderate adverse** (significant effect).
- 11.6.22 There is the potential for disruption to badgers through temporary lighting, noise and vibration during construction. The magnitude of change, prior to mitigation is low. Therefore, there is likely to be an indirect, temporary, short-term effect on badgers that is **minor adverse** (not significant).

### **Invasive Non-Native Species- Impacts and Effects**

- 11.6.23 Himalayan balsam was present at Site A1 along a boundary in an arable maize field, and Sites D, H, J and L. Japanese knotweed and giant hogweed were found along riverbanks at Site C, in tall ruderal habitats at Site I and around factory buildings at Site L.
- 11.6.24 The construction phase of the scheme has the potential to cause adverse direct effects on invasive non-native species through unwittingly causing the unwanted spread to locations where these invasive species are not currently present.
- 11.6.25 There is potential for direct impacts from construction as noted above. The magnitude prior to mitigation is moderate. Therefore, there is likely to be a direct, long-term, permanent effect on invasive non-native species that is **moderate adverse** (significant).

### **Operation**

- 11.6.26 Potential impacts on ecological features during the operational phase are likely to be minimal and restricted to works during minor routine maintenance, such as:
- Disturbance of species and habitats due to increased people, vehicles and typical uses and activities e.g., noise, vibration and artificial lighting.
  - Implementation of landscape design and habitat management.

### **Statutory Designated Sites – Impacts and Effects**

- 11.6.27 Operational impacts expected for Brackagh Bog ASSI and NR and Derryvore ASSI involve pollution run-off or accidental spillage from routine maintenance works. The magnitude of change prior to mitigation is

moderate. Therefore, in the absence of any mitigation there is likely to be a direct, long-term, permanent effect on the statutory sites of **moderate adverse** (significant effect) from the above operational impact.

### Habitats- Impacts and Effects

11.6.28 Operational effects on unimproved grassland and wet meadows are likely to be similar as for ASSI, above, limited to pollution run-off or accidental spillage from routine maintenance works.

### Bats – Impacts and Effects

11.6.29 There are no operational impacts expected for roosting bats.

11.6.30 There are no operational impacts expected for foraging and commuting bats.

### Badgers – Impacts and Effects

11.6.31 There are no operational impacts expected for badgers.

### Invasive Non-Native Species – Impacts and Effects

11.6.32 There is the potential for unwittingly causing the spread of invasive non-native species during routine maintenance works. The magnitude of impact prior to mitigation is moderate. Therefore, there is likely to be a direct, long-term, permanent effect on invasive non-native species that is **moderate adverse** (significant effect).

## 11.7. Mitigation

### Construction

- 11.7.1 Given the mobile nature of badger and otter, pre-construction surveys will be undertaken to ensure no new badger setts or otter holts have been constructed in the intervening period between the end of the surveys for this ES and the beginning of construction.
- 11.7.2 The trees and buildings with moderate bat roost potential will be surveyed prior to construction to develop any necessary mitigation to avoid adverse impacts on the local bat population.
- 11.7.3 To reduce the potential for significant adverse effects during the construction phase, the following primary mitigation measures will be implemented.
- 11.7.4 The design of the proposed works and siting of elements such as compounds and laydown areas will aim to avoid areas of sensitive habitat such as unimproved neutral or wet grassland and flood defence works in these habitats will be kept to the minimum working area required. Access routes will be developed to avoid areas of wet grassland where possible. Following construction access routes, compounds or laydown areas will be reinstated to the habitat type before construction.
- 11.7.5 A Construction Environmental Management Plan (CEMP) will be developed and implemented to manage environmental issues associated with the construction of flood defences. This will include the following measures relevant to ecology and biodiversity:
- Vegetation removal likely to support breeding birds (including ground nesting species) will be removed prior to the bird breeding season (March to August inclusive). If this is not possible a pre-construction check for nesting birds will be undertaken to ensure no breeding birds present. If birds are present, then a standoff distance of 20m will be erected using demarcation tape and works will cease until the young have fledged, potentially a 6–8 week delay.
  - A preconstruction survey will also be undertaken of all proposed works adjacent to the River Bann where there are exposed earth cliffs and banks to ensure no active kingfisher nest burrows are present. If active nest burrows are found, then standoff distance and cessation of works until birds have fledged will be undertaken as described above.

- Reasonable measures will be specified to minimise the mobilisation and dispersal of dust during dry weather including dampening down of roadways and avoidance of any activities especially liable to generate dust when strong winds are forecast (see Air Quality Chapter 8 for further details).
- Liquids that might contaminate surrounding land in the event of a spillage will be stored and so far as possible handled, in bundled and lined enclosures designed for the containment of spills.
- Contractors and site staff will receive a talk on the various ecological sensitivities of the site and surrounding area as part of their site induction.
- Adherence to the relevant Environment Agency Pollution Prevention Guidelines during construction will substantially reduce the risk of polluting surface waters during the works.
- With the exception of vehicle movements, night-time lighting during construction phases will be avoided in all ecologically sensitive areas i.e. along hedgerows and rivers. These dark corridors will reduce the impact on bats and badgers allowing free movement for foraging.
- Comprehensive details of methods for avoiding and minimising the impacts on habitats and protected species.

11.7.6 A site Environmental Clerk of Works (ECoW) will be employed during the construction phase to manage and implement embedded and specific mitigation measures.

### **Statutory Designated Sites**

11.7.7 It is not envisaged that the proposed flood defence works will cause any alteration to the existing groundwater and surface water regime of Brackagh Bog ASSI or Derryvore ASSI.

11.7.8 Assent will be obtained from Department of Agriculture, Environment and Rural Affairs (DAERA) for working adjacent to the Brackagh Bog ASSI and in close proximity to the Derryvore ASSI and any requested mitigation measures adhered to. In addition, the production of a CEMP will outline the mitigation measures relevant to protecting statutory sites from construction impacts, such as:

- Site staff will be briefed on the location and importance of the ASSI sites and boundaries demarked to prevent accidental incursion into these areas by personnel or plant.
- Reasonable measures will be specified to minimise dispersal of dust during dry weather.
- Prevention of spillages that have the potential to contaminate land.
- Toolbox talks on the various ecological sensitivities of the site and surrounding area.
- Adherence to the relevant Environment Agency Pollution Prevention Guidelines during construction will substantially reduce the risk of polluting surface waters during the works.

### **Unimproved neutral grassland and wet meadow habitats**

11.7.9 To reduce the potential for significant adverse effects during the construction phase, the following mitigation measures will be implemented:

- The indicative site compound locations have been chosen to avoid areas of wet grassland and unimproved neutral grassland and will be located on areas of existing hard standing where possible.
- If wet grassland or unimproved neutral grassland will be directly affected (habitat potentially present at Ashgrove Road, Corcraun Mews, Woodside Green, Health Centre, Irwin's Mill, Annagh Hill Industrial Estate, Corcullentragh Road, Olde Golf Links & Ripley Mews), access routes will be developed to avoid these areas. Habitats will be reinstated post construction.

## Bats

- 11.7.10 To reduce the potential for significant adverse effects during the construction phase, the following mitigation measures will be implemented:
- 11.7.11 A Protected Species Plan (PSP) will be developed and implemented to manage impacts on bats from the construction phase. This will include the following measures:
- Pre-construction surveys will be undertaken on those trees and buildings identified as having the potential to support roosting bats. Should surveys confirm roosts, a European Protected Species Mitigation Licence (EPSML) will be required from DAERA. Part of the licence requirements will be to design and implement suitable mitigation such as the installation of alternate roost provision such as bat boxes and any trees or hedges that are removed as part of construction works would be replaced on a like for like basis to ensure continued availability of foraging habitat.
  - A Bat Lighting Mitigation Plan will detail how to avoid lighting sensitive habitats during construction and working hours. Night working should not be permitted at those sites that indicated a high level of bat foraging activity (Sites M, H, I, J, R and P) and night lighting will be installed on poles as low as possible to minimise light spread, luminaries shall be mounted horizontally and dark corridors with light spill of less than 1.0 lux must be preserved on all mature trees on site.

## Badgers

- 11.7.12 The effect of the scheme on badger as a result on construction will be negative, and therefore the following mitigation will be implemented:
- 11.7.13 A Protected Species Plan (PSP) will be developed and implemented to manage impacts on badgers from the construction phase. This will include the following measures:
- Resurveying of badger setts, including camera trapping to ascertain the level of activity and confirm that both setts are still active. If setts are still active, a review of the proposed works and micro siting exercise will be undertaken to ascertain if potential impacts can be avoided. If not then a licence for the closure of both setts will likely be required from the DAERA, as the construction works will be within 30m of the setts.
  - An artificial sett may need to be constructed as part of the licence requirements in close proximity to the outlier/subsidiary sett at site R and will need to be constructed before badgers are excluded and the current sett closed.
  - Badger fencing to prevent badgers entering sensitive work areas and any excavations left open overnight will have a plank or similar to allow badgers and other mammals an exit route if they accidentally fall in.

## Invasive Non-Native Species

- 11.7.14 To reduce the potential for significant adverse effects during the construction phase, the following mitigation measures will be implemented:
- A treatment programme to eradicate known stands of non-native invasive plant species before construction works commence should be undertaken using licenced contractors and herbicides approved as safe to use near watercourses.
  - The CEMP will provide details on preventing the spread of invasive non-native species across habitats with appropriate biosecurity measures e.g., washing boots and all equipment used in the vicinity of invasive species, and wastewater from wash facilities should be dealt with appropriately so as not to cause harm to the environment.
  - Areas with invasive non-native species in should be clearly fenced off with demarcation fencing and signposted to warn site personnel to prevent egress into these areas.

- Soil contaminated with roots and rhizomes of non-native invasive plant species should be disposed of appropriately in licenced hazardous landfill.
- Tracked vehicles should not be used within fenced demarcated areas.
- Site personnel should be given a toolbox talk before works commence to raise awareness of how to identify species and what to do and not do should they encounter them.

## Operation

### Statutory Designated Sites

- 11.7.15 A pollution prevention plan should be produced to ensure that, during routine maintenance works, there are no spillages or polluted surface water run-off into the statutory sites or watercourses that may affect sites further downstream.

### Unimproved neutral grassland and wet meadow habitats

- 11.7.16 Flood defences in areas where these habitats are present, are located on field boundaries or at the rear of properties to minimise any habitat loss. Wet grassland mixes will be sown post construction in suitable areas to allow reinstatement of this habitat.

### Bats

- 11.7.17 No mitigation is required for bats during the operational phase.

### Badgers - Impacts and Effects

- 11.7.18 No mitigation is required for badgers during the operational phase.

### Invasive Non-Native Species - Impacts and Effects

- 11.7.19 An invasive species management plan should be produced to inform site personnel on biosecurity protocols (as detailed above in the construction phase) when carrying out routine maintenance works to prevent the unlawful spread of species to additional areas.

## 11.8. Residual Effects

### Construction

#### Statutory Designated Sites

- 11.8.1 With the above mitigation measures applied there will be negligible change or effect which results in **negligible (not significant)** ecological effects to the statutory sites and so **no significant direct or indirect residual effects** are envisaged.

#### Unimproved and wet meadow habitat

- 11.8.2 With the implementation of the mitigation measures outlined there will be **direct, permanent residual effect minor adverse (not significant effect)**.

### Bats

- 11.8.3 With applied mitigation there will be a direct, short-term, temporary residual effect on foraging and commuting habitat within the proposed scheme that is **negligible adverse (not significant effect)**.
- 11.8.4 With the application of mitigation for bat roosts (provision of new roost resource such as bat boxes) to replace any lost roosts, there is likely to be a direct, long-term, permanent residual effect, that is **no change (not significant effect)**.



### Badgers

- 11.8.5 With applied mitigation from closure of the badger setts and construction of an artificial sett there will be a direct, long-term, permanent residual effect on badgers within the scheme that is **negligible adverse (not significant effect)**.

### Invasive Non-Native Species

- 11.8.6 With applied mitigation there will be a direct permanent residual effect on invasive non-native species within the proposed scheme that is **minor beneficial (not significant effect)**.

### Operation

#### Statutory Designated Sites

- 11.8.7 With mitigation applied there will be negligible change or effect which results in **negligible (not significant)** ecological effects to the statutory sites and so **no significant direct or indirect residual effect**.

#### Unimproved and wet meadow habitat

- 11.8.8 With the implementation of mitigation there will be **direct, permanent residual effect minor beneficial (not significant effect)**. No significant residual effects are envisaged.

### Bats

- 11.8.9 There will be **no residual effects** during the operational phase.

### Badgers

- 11.8.10 There will be **no residual effects** during the operational phase.

### Invasive Non-Native Species

- 11.8.11 With mitigation applied there will be negligible change or effect which results in **negligible (not significant)** ecological effects to the statutory sites and so **no significant direct or indirect residual effect**.

## 11.9. Monitoring

### Construction

#### Statutory Designated Sites

- 11.9.1 No monitoring will be required at statutory designated sites.

#### Unimproved and wet meadow habitat

- 11.9.2 Monitoring of the successful establishment of landscaping and replanting is likely to be required.

### Bats

- 11.9.3 Monitoring may be required for bats dependent on the results of pre-construction checks and surveys and whether an EPSML is applied for and the mitigation requirements of that licence application.

### Badgers

- 11.9.4 Monitoring of artificial setts will be required following the closure of badger setts under licence and the artificial setts created as mitigation.

### **Invasive Non-Native Species**

11.9.5 Monitoring may be required to ensure eradication and control of non-native invasive plant species within the footprint of the proposed scheme has been successful.

### **11.10. Summary**

11.10.1 With the implementation of the mitigation measures outlined no significant residual effects are envisaged. Table 11.8 below provides a summary:

Table 11.8 Residual effects significance after implementation of mitigation measures across the scheme

Description of Impact	Ecological Feature	Significance of Potential Effects					Summary of Mitigation Measures	Significance of Residual Effects				
		Major/ Moderate/ Minor/ Negligible	Beneficial/ adverse	P / T	D / I	ST / MT / LT		Major/ Moderate / Minor/ Negligible	Beneficial / adverse	P / T	D / I	ST / MT / LT
<b>Construction</b>												
Pollution - dust, noise and vibration	Statutory designated sites	Moderate	Adverse	P	D	LT	Obtaining assent from DAERA Production of a CEMP adherence to pollution prevention control measures	Negligible	N/A	N/A	N/A	N/A
Habitat Loss	Unimproved neutral and wet grassland	Moderate	Adverse	P	D	LT	Access routes developed to avoid areas of wet grassland. Reinstatement of habitat post construction	Minor	Adverse	T	D	ST
Pollution - noise and lighting	Commuting and foraging bats	Minor	Adverse	T	I	ST	Production of Bat Mitigation Lighting Plan	Negligible	Adverse	T	D	ST
Loss of roosting habitat	Roosting bats	Major	Adverse	P	D	LT	Pre construction survey to confirm presence of roosting bats If Present European Protected Species Mitigation Licence Provision of bat boxes	No change	N/A	P	D	LT
Disturbance to badger setts	Badgers	Minor / Moderate	Adverse	P	D	LT	Pre construction survey to confirm setts still active.	Negligible	Adverse	P	D	LT

Description of Impact	Ecological Feature	Significance of Potential Effects					Summary of Mitigation Measures	Significance of Residual Effects					
		Major/ Moderate/ Minor/ Negligible	Beneficial/ adverse	P / T	D / I	ST / MT / LT		Major/ Moderate / Minor/ Negligible	Beneficial /adverse	P / T	D / I	ST / MT / LT	
							Closure of sett under licence and creation of artificial setts						
Pollution - noise, vibration and lighting	Badgers	Minor	Adverse	T	I	ST	Production of Protected Species Plan	Negligible	Adverse	T	D		ST
Spread of invasive species	Invasive non-native species	Moderate	Adverse	D	P	LT	CEMP, treatment, toolbox talks	Minor	Beneficial	T	I		ST
<b>Operation</b>													
Pollution run-off	Statutory designated sites	Moderate	Adverse	P	D	LT	Production of pollution prevention plan	Negligible	N/A	N/A	N/A		N/A
Spread of invasive species	Invasive non-native species	Moderate	Adverse	D	P	LT	Production of invasive species management plan	Negligible	N/A	N/A	N/A		N/A
Notes: Significance of effects Scale - Major / Moderate / Minor / Negligible Nature = Beneficial or Adverse P Permanent T Temporary D Direct I Indirect ST short term MT medium term LT long term													

## 12. Fisheries and Aquatic Ecology

### 12.1. Introduction

#### Overview

- 12.1.1 Paul Johnston Associates Ltd (PJA Ltd) has been engaged by RSK and Amey to prepare a fisheries and aquatic ecology impact assessment chapter as part of an Environmental Statement (ES) for the proposed Portadown Flood Alleviation Scheme (FAS). The proposed Portadown FAS will construct new flood defences at a number of locations in the Portadown urban and sub-urban areas along the River Bann and associated inflowing tributaries including within the Ballybay/ Corcrain, Annagh and Cusher river sub-catchments. This Chapter of the ES examines the potential effects of the scheme on fish stocks and the aquatic environment, with emphasis on stocks of salmon and trout but also including coarse fish species.
- 12.1.2 This Environmental Statement (ES) uses desk study and field-based walkover assessments of fisheries habitat quality, fish survey data, and stream ecological quality, to outline the key fisheries and aquatic ecology sensitivities for watercourses in areas immediately upstream, adjacent to, and downstream of the scheme. Specifically, PJA Ltd was requested by RSK to conduct the following studies/ surveys to underpin the assessment of impacts on aquatic ecology:
- fisheries data – to inform on fisheries baseline status;
  - fisheries habitat assessment – to determine fisheries potential of the affected rivers and to provide data to assess impacts and potential enhancement measures;
  - Aquatic Invasive Species (AIS) surveys – to identify if AIS (macrophytes) are likely to be impacted by the works and to determine mitigation measures to avoid spread beyond the scheme extents; and
  - benthic macroinvertebrate surveys – ecologically-based water quality assessment.
- 12.1.3 Based on the description of key fisheries and aquatic ecology sensitivities, this chapter then assesses the significance of potential impacts associated with the scheme during the construction and operational phases. A series of recommended mitigations are proposed followed by assessment of the residual effects both for the construction and operational phases.
- 12.1.4 Impacts on fisheries, fisheries interests, and aquatic ecology may be caused by:
- loss of fish and aquatic flora and fauna through pollution during the construction phase;
  - loss of fish and aquatic flora and fauna or damage to aquatic habitats through run-off of suspended solids due to construction works;
  - reduced productivity due to obstruction of fish passage, loss of habitat or compaction of species within watercourses during both the construction and operational phases;
  - behavioural avoidance, disturbance of migration patterns of fish, and mortality of developing eggs due to noise and vibration during the construction phase;
  - unintentional spread of AIS during in-channel works during the construction phase; and
  - disruption of recreational angler access to fishing stands and bankside during both construction and operational phases.
- 12.1.5 Current fisheries, aquatic ecological, and relevant conservation information on local rivers is assimilated and supplemented through field survey data in the areas immediately upstream and adjacent to the proposed hard defences, and covering the principal watercourses downstream.

## 12.2. Statutory and Policy Context

### Fisheries Administration

12.2.1 With regard to fisheries administration and legislation, watercourses potentially interacting with the Portadown FAS lie within the jurisdiction of Inland Fisheries Division (IFD) of the Department for Agriculture Environment and Rural Affairs (DAERA). Under the provisions of the Fisheries Act (NI) 1966, DAERA IFD has responsibility for the conservation, protection, development and improvement of salmon and inland fisheries of Northern Ireland.

### Legislation

12.2.2 National and local legislation relevant to fisheries, the water environment, and aquatic biodiversity in the area of the proposed scheme includes the following:

- The Conservation (Natural Habitats, etc) Regulations (Northern Ireland) 1995;
- The Water (Water Framework Directive) Regulations (Northern Ireland) 2017;
- The Water (Amendment) (Northern Ireland) (EU Exit) Regulations 2019; which ensures that the Water Framework Directive (WFD) continues to operate in Northern Ireland after January 1st 2021; and
- Eel Fishing Regulations (Northern Ireland) 2010 (to transpose requirements of European Eel Regulation (EC) 1100/2007).

12.2.3 Domestic legislation relevant to fisheries, the water environment and aquatic biodiversity in the area of the proposed scheme includes the following:

- Fisheries (Northern Ireland) Act 1966;
- North/South Co-Operation (Implementation Bodies) (Northern Ireland) Order 1999;
- Drainage (Northern Ireland) Order 1973;
- Environment (Northern Ireland) Order 2002;
- Nature Conservation and Amenity Lands (Amendment) (Northern Ireland) Order 1989;
- Water (Northern Ireland) Order 1999;
- Water Environment (Water Framework Directive) (Northern Ireland) Regulations 2003;
- Wildlife (Northern Ireland) Order 1985;
- Wildlife and Natural Environment Act (Northern Ireland) 2011; and
- UK Biodiversity Action Plan (2007).

### Policy

12.2.4 Policy with regard to Atlantic salmon and European eel in this region is set out in the following:

- Upper Bann Local Management Area Action Plan 2009-2015;
- Atlantic Salmon Management Strategy for Northern Ireland and the Cross-Border Foyle and Carlingford catchments to meet the objectives of NASCO resolutions and agreements, 2008–2012 (DCAL); and
- Neagh Bann River Basin District Eel Management Plan (DCAL).

- 12.2.5 Proposals for protecting and enhancing the water environment are contained within the Draft 3rd cycle River Basin Management Plan: For the North Western, Neagh Bann, and North Eastern River Basin Districts (2021-2027).

## 12.3. Methodology

### Study area and associated watercourses

- 12.3.1 The study area is situated in both the central and wider Portadown area with twenty one hard defence options potentially intersecting or running adjacent to watercourses and drains within the following main catchments/ sub-catchments (see **Figure 12.1, Volume 4**):

- Main Upper River Bann catchment;
- Annagh River sub-catchment;
- Cusher River River sub-catchment; and
- Ballybay/ Corcrain River sub-catchment.

### Overview, Assumptions and Limitations

- 12.3.2 The methodology uses a desk study and field survey approach with the impact assessment based on guidance produced by the Chartered Institute for Ecology and Environmental Management (CIEEM) and Design Manual for Roads and Bridges (DMRB) as follows:

- Guidelines for ecological impact assessment in the UK and Ireland. Terrestrial, freshwater, coastal and marine (Ref. 12.1); and
- Design Manual for Roads and Bridges (DMRB, 2019). Road Drainage and the Water Environment, (Ref 12.2).

- 12.3.3 The planning of surveys, and subsequent assessment of baseline conditions, is made based on the mapping information of hard defences for the scheme provided by Amey as a shape file (entitled "Portadown Design Updates 2022").

### Desk studies

- 12.3.4 ArcGis 10.8.1 was used to identify the co-ordinates of the proposed defences and potential interactions/ intersections with designated river waterbodies. Designated river waterbody intersections/ interactions were identified using two shape files:

- NIEA river segment layer; and
- Rivers Agency river network.

- 12.3.5 Baseline environmental data was collated for salmonid and cyprinid fisheries, aquatic ecological status under the Water Framework Directive (WFD), and relevant conservation designations. Baseline environmental information was collated from the following sources after direct consultation or from publicly accessible web-based resources:

- Department of Agriculture, Environment & Rural Affairs (DAERA) – Inland Fisheries Group: IFD also was consulted regarding potential sensitivity of sites;
- DAERA NIEA protected areas (<https://apps.d.aera-ni.gov.uk/nedmapviewer/>);
- DAERA river basin map viewer and WFD status – (<https://apps.d.aera-ni.gov.uk/RiverBasinViewer/>);
- DAERA Inland Fisheries Divisions (IFD). Consultation to obtain fisheries data for the watercourses within the scheme footprint and to determine potential sensitivity to the proposed works; and

- The NBN Atlas for Northern Ireland was searched to obtain baseline distributional data for aquatic invasive plants to inform on the AIS of Schedule 9-listed aquatic plants (<https://northernireland-species.nbnatlas.org/species/>; see also field surveys).

### Water Framework Directive Ecological Status

- 12.3.6 The EU Water Framework Directive (2000), implemented in Northern Ireland through the Water Environment (WFD) Regulations (NI) 2003, requires member states to ensure that all waterbodies attain good ecological status, or where good status is already achieved, prevent any deterioration in status. To achieve these objectives, River Basin Management Plans (RBMPs) have been implemented through a series of Local Management Areas (LMAs) during the 2010 to 2015 planning cycle, now extended into the 2016 to 2021 cycle, and with provision under the WFD for a third cycle from 2022 to 2027. The most recent WFD classifications for designated river waterbodies were determined from DAERA NI online databases and through a data request to DAERA NIEA Water Management Unit. WFD-based assessments incorporate ecological (e.g. benthic macroinvertebrate community indicators, macrophyte indicators, diatoms and in some cases fish), physico-chemical (e.g. dissolved oxygen saturation, pH) and hydromorphological elements, and are reported at the broader waterbody scale. The status/ condition of each of the indicator elements is classified as High, Good, Moderate, Poor or Bad. A final overall ecological status classification for each waterbody is assigned based on the indicator element with the lowest classification, known as the "one out, all out" philosophy.
- 12.3.7 WFD classification facilitates water management at a broad spatial scale but may provide only "coarse-level" resolution of the ecological quality or sensitivity at a specific reach/ site (Ref. 12.3). Therefore, additional field collected baseline information will be used to more accurately assess ecological quality/ sensitivity of river reaches at each of the scheme locations.

### Conservation Designations & Significant Aquatic Species

- 12.3.8 Watercourses adjacent, within, and downstream of each of the scheme locations were assessed against the following spatial conservation designations to identify any potential interactions of relevance to fisheries and aquatic ecology:
- Areas of Special Scientific Interest (ASSIs): designated under the Nature Conservation and Amenity Lands (Amendment) (Northern Ireland) Order 1985 and protected by The Environment (Northern Ireland) Order 2002;
  - Designated salmonid rivers: outlined in the EC Freshwater Fish Directive 2006/44/EC (FWFD), and implemented in Northern Ireland by the Surface Waters (Fish Life Classification) Regulations (Northern Ireland) 1997. The FWFD sets associated water quality objectives and standards that, for salmonids, reflect their high sensitivity to water quality impairment. Article 6 of the WFD now repeals the FWFD, but rivers formerly designated as salmonid under the FWFD, are now included on the WFD register of protected areas as areas designated for the protection of economically significant aquatic species (including salmonids);
  - Special Areas of Conservation (SACs): designated under the EC Habitats Directive (1992) 92/43/EEC;
  - The presence of the following species designated under Annex II of the EU Habitats Directive:
    - Atlantic salmon (*Salmo salar*)
    - Brook lamprey (*Lampetra planeri*)
    - River lamprey (*Lampetra fluviatilis*)
    - Sea lamprey (*Petromyzon marinus*); and
    - The European Eel (*Anguilla anguilla*), although not an Annex II listed species, was recently added to the IUCN red list as Critically Endangered (Ref. 12.4).



## Fisheries Data

- 12.3.9 Baseline juvenile salmonid data, based on standard 5-minute semi-quantitative electrofishing surveys (see Ref. 12.5), was obtained from DAERA IFD. The abundance of salmon and brown trout (*Salmo trutta*) fry are classified from "Excellent" to "Absent" according to an index calibrated against known fish densities developed by Crozier and Kennedy (Ref. 12.5) and Kennedy (pers. comm., unpublished data) (Table 12.1).
- 12.3.10 DAERA fish data was available only for the period 2010 and only for the Upper Bann, as all other rivers within the scheme area are not sampled, which is a likely reflection of their general habitat and water quality.

Table 12.1 Semi-quantitative abundance categories for age 0 salmon and trout, as developed by Crozier and Kennedy (Ref. 12.5) and Kennedy (unpublished data).

Salmon		
Fry (0+) nos.	Density (No/100m <sup>2</sup> )	Abundance/ quality category
0	0	
1 – 4	0.1 – 41.0	Poor
5 – 14	41.1 – 69.0	Fair
15 – 24	69.1 – 114.6	Good
25+	114.6+	Excellent
Trout		
Fry (0+) nos.	Density (No/100m <sup>2</sup> )	Abundance/ quality category
0	0	
0 – 1	0.1 – 7.0	Poor
2 – 3	7.1 - 16.5	Fair
4 – 8	17 - 31	Moderate
9 – 17	32 - 59.9	Good
18+	60+	Excellent

## Angling interests

- 12.3.11 To assess angling and fish conservation interests for waterbodies in the area of the scheme, consultations were conducted with DAERA Inland Fisheries and the Local Senior Fisheries Officer. In addition, information on the coarse fishery managed by DAERA in the Upper Bann was collated from the following location <https://www.nidirect.gov.uk/articles/angling-upper-bann-river>.

## Field studies – preliminary site screening

- 12.3.12 GIS-based information of the locations of each flood defence was used to plan initial walkover surveys that would determine potential fisheries and aquatic ecological sensitivity, and if sites could be screened out of further baseline sensitivity and impact assessment. Using ArcGis 10.8.1, the design locations shape file (provided by Amey) of each proposed flood defence location was visualised together with the NIEA river segment shape file of watercourses designated under the Water Framework Directive (<https://www.daera-ni.gov.uk/publications/rivers-digital-datasets> ). Candidate watercourses were selected for survey if they intersected or occurred adjacent to a proposed flood defence location. Several watercourses were not identified as "designated waterbodies", possibly due to their small size or nature, but were present on pdf maps provided of the scheme area by Amey; these non-designated watercourses were identified as

additional candidate survey sites for preliminary screening. Sites were initially screened for fisheries sensitivity by assessing salmonid habitat quality using the Life Cycle Unit Method (described below under full baseline assessment).

- 12.3.13 Note that watercourses without potential to support sensitive fisheries (e.g. channel dry or habitat graded as unclassified, see below), and assessed as having very low expected ecological-based water quality, were screened out from full baseline assessment unless in-channel works are proposed (information provided by Amey); in the latter case, these very low sensitivity sites were assessed for AIS only because in-channel works during the construction phase may pose a risk of unintentionally spreading nuisance aquatic plants.

### **Field studies – full baseline field assessment**

- 12.3.14 For sites retained (screened-in) for full baseline assessment, the survey design was based on "Before-After-Control Impact Design" (BACID) where there is a need to compare response variables at an impact site over time (before and after the scheme), with the values of a control site (or multiple control sites) over the same time period (e.g. Ref. 12.6). A series of survey reaches was selected to describe full baseline fisheries habitat, ecologically-based water quality using benthic macroinvertebrates and the presence and extent of AIS (or surveys of AIS only, see above). A number of upstream (control) reaches also were selected on each key watercourse (e.g. Annagh, Ballybay and River Bann) to aid in the determination of potential future impacts of the scheme.

### **Fisheries habitat quality assessment**

- 12.3.15 Baseline fish habitat surveys were undertaken in the area of key watercourse interactions and largely during the initial walkover site screening (see above). Where proposed flood works occurred parallel to or intersected a watercourse (e.g. River Bann at Foundry St I, Irwins Mill L, Bowling Green J, and Woodside Green C; Annagh River at Annagh Hill Industrial Estate M) the full channel length was surveyed including up to 100m upstream and 100m downstream of the works extent, depending upon the nature of the watercourse and habitat homogeneity.
- 12.3.16 The Life Cycle Unit method (Ref. 12.7) currently used by DAERA Inland Fisheries Division was adopted for this aspect of the study (see DANI advisory leaflet No. 1). The method facilitates classification and mapping of survey reaches as Spawning, Nursery or Holding water, with assigned quality scores for each habitat type. Each stretch of a particular habitat type is graded 1 to 3, based on a series of criteria as set out in Annex 1 of the DANI advisory leaflet. Habitats of no fisheries interest or value are graded as "unclassified" and generally describe a substrate of fine silt, or extensive bridge invert, or engineered channel with solid bed and possibly constrained banks. On smaller, insignificant watercourses, a descriptive survey of habitat was conducted, documenting the general quality of spawning, nursery and holding water. This overall approach has been used by the authors for over 20 years. ArcGIS 10.8.1 was used to digitise and map habitat survey information and identify sensitive fisheries habitat for incorporation and assessment of baseline sensitivity.

### **Reach-scale physical habitat quality**

- 12.3.17 This aspect of the assessment was based on the DCAL/AFBI methodology developed to determine the potential fish habitat impacts arising from point source inputs or instream river works (DCAL/ AFBI, 2010 – Internal Report). Each of the sites selected for full baseline assessment was surveyed as recommended by DCAL/AFBI over a 40m long reach with 25 sampling points across five cross-sectional transects in each reach (5 sampling points per transect), and each transect separated by approximately 8m of stream length. At each sampling point, physical and morphological characteristics of the channel were recorded across the transect lines, bank-to-bank, to include substratum type, depth, flow velocity, and deposited fine sediment cover. Substrate was assessed visually using a bathyscope, hand-held viewer and summarised as per Bain et al. 1985 (Ref. 12.8; Table 12.2). Percentage deposited fine sediment (<2mm grain) on the riverbed was assessed according to Clapcott et al. (Ref. 12.9).

Table 12.2: Substrate classification and scoring based on the Wentworth system (from Bain *et al.* 1985)

Substrate type	Size Class (mm)	Score
Sand/silt	<2	1
Pebble	17-64	3
	65-256	4
Boulder	>256	5
	-	6

12.3.18 The classification system of Bain *et al.* (Ref. 12.8) was used to summarise the composition of substrate in a reach based on two indices:

- Coarseness index (CI) – calculated as the mean dominant substrate score; and
- Heterogeneity (SD) – calculated as the standard deviation of the mean CI.

12.3.19 These indices show how coarse or smooth the substrate of a reach is and if it is comprised of a mixture or is dominated by a particular substrate class (Table 12.3).

Table 12.3: Substrate description inferred from sample data (from Bain *et al.* 1985, Ref. 12.8)

Mean substrate score (CI)	Heterogeneity (SD)	Inferred substrate description
3.2	1.96	Heterogeneous, smooth and rough
5.0	0.00	Homogeneous, coarse
1.25	0.44	Nearly homogeneous, smooth
3.25	0.85	Heterogeneous, intermediate coarseness
5.05	0.69	Heterogeneous, coarse

12.3.20 It should be noted that owing to the generally very poor salmonid and physical habitat quality of many sites, it was not possible to enter the channel to conduct full transect measurements or carry out kick-sampling of benthic macroinvertebrates as per standardised sampling in shallow riffle/ runs (see 12.4 Baseline Conditions – full baseline assessment).

### Ecologically-based water quality - benthic macroinvertebrate and physico-chemical indicators

12.3.21 Kick sampling was undertaken to collect benthic invertebrates in each survey reach using a standard three-minute kick sample (hand-held 1mm mesh net), followed by a one-minute search as per UKTAG (Ref. 12.10) for assessing the condition of the quality element “benthic invertebrates” for WFD reporting. Although the standard WFD compliant method for classifying a site requires sampling in two seasons (usually spring and autumn), single season sampling can be undertaken to identify status for investigative studies. On-site measurements taken during the reach-scale physical habitat surveys (channel width, depth, substrate composition) were used for later modelling of site ecological quality class. Electrical conductivity (Hanna HI86303 conductivity meter) and flow velocity also were recorded (Geopacks flow meter) as they are used to model ecological quality.

12.3.22 Where possible, invertebrate samples should be collected from riffle/ run habitat in shallow flowing reaches of rivers (Ref. 12.19). However, many of the sites within the FAS area were too deep to wade and lacked

the standardised shallow riffle/ run habitat for ecological assessment; in such sites, samples were therefore taken in marginal vegetation and from the bed (if possible) using a sweep net followed by a one-minute search (Ref. 12.19).

12.3.23 In the laboratory, macroinvertebrate samples were sorted, identified and counted, with the ecological baseline summarized as the following observed metrics; total number of taxa, total site score, and average score per taxon (ASPT), using the abundance weighted sensitivity scores developed by Whalley and Hawkes as recommended for the WFD (Ref. 12.10). In order to classify a sites ecological status, expected (predicted) metric values were determined from site-specific physical and chemical data using the RIVPACS IV model implemented by the online River Invertebrate Classification Tool Version 2 (RICT2) a web application (<https://www.fba.org.uk/FBA/Public/Discover-and-Learn/Projects/RICT%20Application.aspx/>). This tool is maintained by the UK's environment agencies; Scottish Environment Protection Agency (SEPA), Environment Agency (EA), Natural Resources Wales (NRW) and Northern Ireland Environment Agency (NIEA).

### Aquatic Invasive Species (AIS) surveys

12.3.24 AIS surveys focusing on submerged and emergent aquatic macrophytes were conducted at sites where in channel works are proposed. Surveys followed the methodology outlined by Wilby (Ref. 12.11) based on in-channel sampling using a three-pronged grapnel and attached rope over a selected 150m section of watercourse at each site. Within each 150m section, ten equidistant sub-sample points were surveyed by throwing a grapnel across the full channel width followed by retrieval to assess the potential presence of aquatic plants with a focus on species listed on Schedule 9 of the Wildlife (Northern Ireland) Order 1985 such as;

- Nuttalls pondweed (*Elodea nuttallii*; previously recorded in the Lower Bann);
- Canadian pondweed (*E. canadensis*);
- Floating pennywort (*Hydrocotyle ranunculoides*);
- Water fern (*Azolla filiculoides*);
- Oxygen weed (*Lagarosiphon major*);
- Fringed water-lily (*Nymphoides peltata*); and
- Parrot/'s feather – (*Myriophyllum aquaticum*).

12.3.25 At each sub-sample location, species relative abundance was expressed using the DAFOR scale (Table 12.4). Data from all 10 sub-sampling points was pooled to provide an inventory of taxa recovered for each watercourse and scheme location. The location of any schedule 9-listed plants was mapped using ArcGIS 10.8.1 and the information incorporated to enable assessment of impacts and mitigations to prevent spread during the construction phase.

Table 12.4: Abundance codes used during the surveys for invasive, aquatic plant species.

Abundance	Abbreviation
Dominant	D
Abundant	A
Frequent	F
Occasional	
Rare	R

## Impact Assessment

12.3.26 The assessment of impacts and effects was derived from methodologies outlined by:

- the Design Manual for Roads and Bridges specifically with regard to Road Drainage and the Water Environment, LA 113 (DMRB, Ref. 12.2); and
- Guidelines for Ecological Impact Assessment in the UK and Ireland (Ref. 12.1).

12.3.27 The significance of the potential effects of the proposed scheme has been classified by professional consideration of the sensitivity of the receptor and the magnitude of the potential impact.

### Sensitivity Criteria

12.3.28 Using the information assembled through the baseline assessment, the Fisheries Significance/Sensitivity of each watercourse was graded according to the generic methodology for environmental sensitivity outlined in Table 12.5, which is adapted from DMRB guidance for assessing the importance/ sensitivity of water environment features (Table 3.7; DMRB, Ref. 12.2) and biodiversity resources (Table 3.9; DMRB, Ref. 12.12). Table 12.5 details the framework applied in determining the sensitivity and this evaluation was used as the basis for the assessment of effects and the specification of any necessary mitigation requirements with regard to fisheries and the aquatic environment.

Table 12.5: Estimating the Sensitivity/Importance of Receptors (adapted from Table 3.9 DMRB, Ref. 12.12)

Sensitivity	Criteria	Typical Examples
Very High	Attribute has a high quality and rarity on a regional or national scale	WFD Class 'High'. Site protected/designated under EC or UK habitat legislation (SAC, ASSI, salmonid water)/Species protected by EC legislation. Watercourse containing salmon and supporting a nationally important fishery or river ecosystem.
High	Attribute has a high quality and rarity on a local scale	WFD Class 'Good'. Species protected under EC or UK habitat legislation. Watercourse containing salmon or trout and supporting a locally important fishery or river ecosystem.
Medium	Attribute has medium quality and rarity on a local scale	WFD Class 'Moderate'. Watercourse containing trout and upstream of locally important fishery or river ecosystem.
Low	Attribute has low quality and rarity on a local scale	WFD Class 'Poor'. Watercourse without salmon or trout but upstream of locally important fishery or river ecosystem.
Negligible	Attribute has very low quality and rarity on a local scale	WFD Class 'Bad'/unspecified.

### Magnitude of impact

12.3.29 The magnitude of impact was assessed according to the criteria set out in Table 12.6 and includes a consideration of the timescale of the impact (short, medium or long term).

Table 12.6: Estimating the Magnitude of Impact on Receptors (adapted from Table 3.71, DMRB, Ref. 12.2, and Table 3.1, DMRB, Ref. 12.12).

Magnitude	Criteria	Type and Scale of Impact
Major	Results in loss of attribute and/or quality and integrity of the attribute	Loss or extensive change to a fishery. Loss or extensive change to a designated Nature Conservation Site. Major alteration to fish population levels in catchment as a whole, through fish mortality, habitat destruction or barrier to migration. Duration: long-term (>5 years).
Moderate	Results in effect on integrity of attribute, or loss of part of attribute	Partial loss in productivity of a fishery. Appreciable alteration to fish population levels in specific sub-catchment or zone. Duration: medium-term (1-5 years).
Minor	Results in some measurable change in attribute's quality or vulnerability	Minor loss in productivity of a fishery. Minor alteration to fish population levels in specific sub-catchment or zone. Duration: short-term (up to 1 year).
Negligible / No impact	Results in effect on attribute, but of insufficient magnitude to affect the use or integrity	Unlikely to affect the integrity of the water environment. No measurable alteration to fish population levels.

### Significance criteria

12.3.30 The correlation of magnitude against the sensitivity of the receptor determines a qualitative expression for the significance of the effect on the basis of a standard matrix shown in Table 12.7. The greater the sensitivity or value of a receptor or resource, and the greater the magnitude of the impact, the more significant the effect.

Table 12.7: Estimating the Significance of Potential Effects (adapted from Table 3.13, DMRB, Ref. 12.12, and Table 3.8.1, DMRB, Ref. 12.13).

Sensitivity	Magnitude of Impact			
	Major	Moderate	Minor	Negligible
Very High	Very Large	Large/Very Large	Moderate/Large	Neutral
High	Large/Very Large	Moderate/Large	Slight/Moderate	Neutral
Medium	Large	Moderate	Slight	Neutral
Low	Slight/Moderate	Slight	Neutral	Neutral

12.3.31 The five significance categories with typical effects are shown in Table 12.8. Effects evaluated as being Moderate, Large or Very Large are considered to be significant for the purpose of the EIA in line with the EIA Regulations and will require mitigation. Those effects assessed as Slight or Neutral are not considered to be significant in terms of the EIA.

Table 12.8: Descriptors of the Significance of Effect Categories (adapted from Table 3.7, DMRB, Ref. 12.13).

Significance category	Descriptors of effects
Very large	Only adverse effects are normally assigned this level of significance. They represent key factors in the decision-making process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most

Significance category	Descriptors of effects
	- damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category.
Large	- These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process.
Moderate	- These beneficial or adverse effects may be important, but are not likely to be key decision-making factors. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse effect on a particular resource or receptor.
Slight	- These beneficial or adverse effects may be raised as local factors. They are unlikely to be critical in the decision-making process, but are important in enhancing the subsequent design of the project.
Neutral	- No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

## 12.4. Baseline Conditions

### Desk assessment

#### Local River Catchments

12.4.1 The scheme is located in the Portadown area in the Upper River Bann catchment with the following four main sub-catchments (**Figure 12.1. Volume 4**);

- the Upper Bann;
- the Ballybay/ Corcrain river;
- the Annagh River; and
- the Cushier River.

12.4.2 The Ballybay/ Corcrain river flows in a northerly direction, from just west of Gosford Castle Forest Park, before meeting the main River Bann in Portadown downstream of Shillington's Bridge. The river is generally sluggishly flowing as it traverses a low gradient landscape largely of pastoral grazing before passing through the urbanised and residential suburbs of Portadown. The Annagh River is similarly low gradient and has its source several kilometres south of Portadown before flowing north over low gradient pastoral land and meeting the main River Bann just south of central Portadown. The Cushier River is the larger of the three Bann tributaries within the scheme area and is sourced from several tributaries that drain the more moderately sloping ground south and west of Gosford Castle Forest Park; the river then passes over a more gently sloping landscape as it flows north, parallel to the main Bann, before meeting over 1km south of Portadown. All three rivers have been subject to historical straightening and steepening of their channels and banks to facilitate drainage.

12.4.3 The main Upper River Bann has its source in Slieve Muck in the Mourne Mountains, first forming Spelga Dam before passing through numerous small towns and villages for ca. 54km where it passes through Portadown and continues for a further 10km to meet Lough Neagh. The Upper Bann in the area of Portadown is a wide and deep channel that was formerly maintained as an important navigational route for shipping and although managed for navigation since 1954, is still navigable from Lough Neagh to the confluence with the Newry Canal over 1km upstream of Portadown.

## Water Framework Directive Ecological Status

- 12.4.4 The Upper Bann is located in the Neagh Bann International River Basin District (IRBD), an international RBD which incorporates the River Bann system including Lough Neagh and its tributaries, all rivers draining into Carlingford Lough, and the Co. Louth rivers draining to the east coast.
- 12.4.5 To achieve the ecological objectives of the Water Framework Directive, River Basin Management Plans (RBMPs) have been implemented through Local Management Areas (LMAs) during the 2010 to 2015 planning cycle, now extended into the 2016 to 2021 second cycle, and with provision under WFD for a third cycle from 2022 to 2027, with public consultation completed in October 2021 (<https://www.daera-ni.gov.uk/consultations/consultation-draft-3rd-cycle-river-basin-management-plan-2021-2027> ).
- 12.4.6 The study area and associated drainage watercourses are located within the Upper Bann LMA and includes the following river waterbodies;
- Annagh River (GBNI1NB030308091);
  - Cusher River (Tandragee; GBNI1NB030308218);
  - Ballybay River (UKGBNI1NB030308110);
  - Lough Neagh Peripherals – R.Bann from Cusher confluence to L. Neagh (GBNI1NB030308243); and
  - Upper Bann (Gilford; GBNI1NB030308256).
- 12.4.7 The latest available ecological assessment for these waterbodies (2018) is summarised in Table 12.9 which indicates the overall classification and status with regard to each of the principal parameters monitored (if available).

Table 12.9: Classification of individual quality elements contributing to overall WFD status of relevant water bodies in the Upper Bann LMA, 2018 (Source: NIEA, 2021)

Parameter	Annagh River (8091)	Ballybay River (8110)	Cusher River (8218)	L. Neagh Periph. (8243)	U. Bann Gilford (8256)
Benthic Invertebrates	Bad	-	High	-	High
Macrophytes	High	-	Good	-	Good
Phytobenthos	Good	-	Moderate	-	Moderate
Fish	-	-	-	-	Moderate
Dissolved oxygen	Bad	-	High	-	High
pH	High	-	High	-	High
Soluble Reactive Phosphorus	Poor	-	Moderate	-	Poor
Ammonia	Moderate	-	High	-	High
Hydrological regime	High	-	High	High	High
Morphological conditions	-	-	-	-	-
<b>Overall Status</b>	<b>Bad</b>	<b>Moderate</b>	<b>Moderate</b>	<b>Poor Ecological Potential</b>	<b>Moderate</b>

- 12.4.8 Ecological and water quality monitoring to inform waterbody status is conducted by the NIEA Water Management Unit to comply with statutory monitoring for WFD compliance.



- 12.4.9 The monitoring station that informs the Annagh River waterbody WFD status is located ca. 2.8km upstream of the confluence with the River Bann and upstream of all potentially interacting flood defences (station ID F10296; **Figure 12.1, Volume 4**). The monitoring station that informs the Ballybay River waterbody WFD status is located at Obins Street in Portadown within the study area (Station ID F10292; **Figure 12.1, Volume 4**), approximately 1.3km upstream of the confluence with the River Bann. The monitoring station that informs the Cusher River (Tandragee) waterbody WFD status is located at Knock bridge on the lower Cusher upstream of any flood defence location (Station ID F10295; **Figure 12.1, Volume 4**), approximately 2.83km upstream of the confluence with the River Bann. For the River Bann section within the study area, there is no monitoring station used to inform the WFD status assessment for the waterbody known as "Lough Neagh peripherals"; rather, the section is assessed using indicator elements for Lough Neagh's Lake classification and is considered a heavily modified waterbody on account of navigational and flood risk management. However, the section just upstream and including to above Gilford (Upper Bann Gilford) is assessed based on the monitoring station at Lawrencetown, over 13km upstream of Portadown (Station ID F10273; **Figure 12.1, Volume 4**).
- 12.4.10 The latest WFD classifications (2018) show that watercourses within the study area were, at best, Moderate ecological status (Ballybay River, Cusher River), with the Annagh River classified at Bad status and the section of the Bann in Portadown classified as having Poor Ecological Potential (Table 12.9). Although the Upper Bann further upstream of Portadown was classified at Moderate (Gilford), its relevance to the FAS is low because the waterbody is not within the scope of the study area, and its informing monitoring station is distant upstream.
- 12.4.11 The Annagh River status of Bad was driven by the benthic invertebrate and dissolved oxygen indicator elements, with the "one out all out" philosophy of WFD classification meaning that the lowest indicator element (s) is used to determine final ecological classification. The Lough Neagh peripherals waterbody, which includes the section of river in the Bann alongside the scheme, was based on the status of Lough Neagh and so may not reflect local conditions. While the Cusher River waterbody was assessed at Moderate, there is very low potential for the scheme to interact with this waterbody.

### Conservation Designations & Significant Aquatic Species

- 12.4.12 There are no site designations either under European or local legislation relating to river habitats intersecting or potentially interacting with the scheme. However, Brackagh Bog ASSI occurs adjacent to part of the scheme towards the eastern extent of Site O Tandragee Road while Derryvore ASSI occurs adjacent to Site P Derryvore Lane (**Figure 12.1, Volume 4**); both are bog, fen and wet woodland habitat and are designated for their invertebrate assemblages that include moths and dragonflies, and aquatic and wetland plants.
- 12.4.13 Waterbodies draining the study area are located upstream of Lough Neagh (**Figure 12.1, Volume 4**), which has the following conservation designations relevant to fisheries and aquatic species.

#### Lough Neagh Ramsar, SPA and ASSI

- 12.4.14 The northern extent of the scheme is, at nearest, 10.5km upstream of Lough Neagh, which is designated as a Special Protection Area based on the bird species present and the availability and type of associated habitat however, the following aspects are relevant to fisheries and aquatic ecology;
- Lough Neagh and Lough Beg Ramsar site –The Loughs qualifying criteria include its size as the largest freshwater lake in the British Isles, its range of aquatic and wetland habitats, and the presence of rare species including Pollan *Coregonus autumnalis*, a salmonid fish which is not found elsewhere in Europe, two aquatic snails, the freshwater opossum shrimp *Mysis relicta*, and 12 species of dragonfly. The northern extent of the scheme is within 1.6km of the Ramsar boundary (**Figure 12.1, Volume 4**).
  - Lough Neagh ASSI – The Lough was designated under Article 24 of the Nature Conservation and Amenity Lands (Northern Ireland) Order 1985. Pollan is a qualifying feature of the designation (EHS NI, 2008), with the Lough Neagh population the largest in Ireland. Pollan is listed as a UK Priority Species for Conservation and is classified as endangered in the Irish Red Data Book (Ref. 12.14). Additional qualifying features include populations of non-migratory river lamprey, and "dollaghan", a

strain of brown trout that grows and matures in the Lough before migrating upstream to various inflowing tributaries (including the Blackwater and tributaries) that are used as spawning and nursery habitats. The northern extent of the scheme is within 10.5km of the designated site (**Figure 12.1, Volume 4**).

### Salmonid Waters

- 12.4.15 Only one river with potential interactions with the scheme, the main channel River Bann, is designated as a "salmonid" water under the Surface Waters (Fish Life Classification) Regulations (Northern Ireland) 1997, which implements the EC Freshwater Fish Directive. The Fish Directive was repealed by the WFD at the end of 2013, and the ecological status defined in the WFD sets the same protection to waterbodies designated for fish under the original directive. Areas designated under the Fish Directive have become areas designated for the protection of economically significant aquatic species under WFD and placed on the Register of Protected Areas. The protected area extends from the river confluence with Lough Neagh downstream of the scheme area, up through Portadown and beyond to the headwaters in a south-easterly direction (**Figure 12.1, Volume 4**). Although the main channel Cusher River also is a designated a salmonid water, the section does not interact directly with the scheme.

### Atlantic salmon

- 12.4.16 The relevant conservation designations for Atlantic salmon give the species national and international significance. Atlantic salmon is listed in Annexes IIa and Va of the EC Habitat and Species Directive (Directive 92/43/EEC), Appendix III of the Bern Convention, and has a IUCN status of threatened in the Irish Red List No 5 (Ref. 12.14). Following the UK exit from the EU, the European Union (Withdrawal) Act 2018 brought all existing EU law into UK law to ensure that it would continue to have legal effect after the UK's withdrawal from the EU, including the EC Habitat and Species Directive so that its requirements were still met. Atlantic salmon was added to the UK Biodiversity Action Plan (BAP) list in 2007 as a priority species for conservation action. The North Atlantic Salmon Conservation Organisation (NASCO) has endorsed a precautionary approach to the conservation, management and exploitation of the salmon resource and the environments in which it lives; Northern Ireland, through the UK and EU, is a contracting Party to NASCO. Atlantic salmon stocks in general are in serious decline with some stocks threatened with extinction. As a conservation measure DCAL introduced a series of regulations in March 2014 including the closure of commercial salmon fisheries and mandatory catch and release of salmon caught by anglers within its jurisdiction.
- 12.4.17 The salmon is an anadromous species having both a freshwater stage and a marine stage to its life cycle. The adults mature at 2-4 years of age and spawning generally takes place in November or December, notably in the upper reaches of the Bann. The young fish remain in freshwater for 1 or 2 years before migrating to sea as smolts during April and May. During the following year these fish return to the river as grilse. The upstream migration depends on there being sufficient rainfall to raise river flows but generally takes place from June to October- in dry years this can be considerably delayed. Salmon stocks in the Bann have improved considerably in recent years. Of the rivers within the study area, Atlantic salmon are present mainly within the Upper Bann.

### Lamprey

- 12.4.18 The three lamprey species (Sea, River and Brook, see Conservation Designations and Significant Aquatic Species in Section 12.3.1) are included in Annexe II of the Habitats Directive. All three species have larval ammocoete stages that may be up to five years duration with habitat mainly constrained to burrows within fine river sediment/ silts. River and Sea lamprey undergo metamorphosis to "transformers" and migrate downstream to estuaries and the sea before maturing and migrating upstream for spawning. In Lough Neagh, a landlocked, freshwater feeding population of River lamprey was identified (Ref. 12.16). Brook lamprey do not feed as adults and remain in the river after metamorphosis before spawning. Adult river and brook lamprey tend to have similar habitat requirements during spawning to that of salmonids, using silt-free gravel and pebble areas in shallow running water (Ref. 12.15). Spawning for all lamprey species takes place in the tributary river systems, and for the landlocked river lamprey in Lough Neagh, spawning may include the Upper Bann. Brook lamprey are widely distributed in the Lough Neagh system and are present in the Upper Bann. Sea lamprey have been reported in Lower Bann but not in Lough Neagh or the Upper Bann, with the upstream distribution apparently limited by a series of weirs on the main Lower Bann (Ref. 12.17).

## Eel

- 12.4.19 The European eel stock has been in rapid decline throughout its range since around 1980. This led to the passing of the European Eel Regulation (EC) 1100/2007 which aims to return the European eel stock to more sustainable levels of adult abundance and juvenile eel recruitment. Member States were required to implement Eel Management Plans in each eel river basin, in this case the Neagh-Bann River Basin District. Following the UK exit from the EU, the European Union (Withdrawal) Act 2018 brought the EC Regulation 1100/2007 into UK law to enable its continual implementation by the UK.
- 12.4.20 The European eel is not listed under Annexe II but, in 2014, was added to the International Union for Conservation of Nature (IUCN) Red List of Threatened Species in the category of Critically Endangered (see King et al, 2011, Ref. 12.14). Eel are widely distributed throughout the Lough Neagh basin and inflowing tributaries such as the River Bann.

## Brown trout

- 12.4.21 Brown trout are a priority species for conservation action in Northern Ireland, as required under the Wildlife and Natural Environment Act (Northern Ireland) 2011. The brown trout is a highly adaptable fish and occurs throughout the entire course of the Upper Bann. However, spawning and the juvenile stages are restricted to the upper and middle reaches of the river where the gradient and substrate are more suitable. Trout mature at 3 or 4 years old and spawning takes place during October and November. Adult trout are present in modest numbers in the lower reaches of the Bann but the migrant variety, known as dollaghan, pass through the lower reaches as both juveniles and adults on their way to and from Lough Neagh. Angling interest in brown trout is mainly upstream of the scheme area from Gilford upstream.

## Fisheries data

- 12.4.22 The following fish species are recorded as widely distributed in the Upper Bann catchment (AFBI & DAERA, unpublished data):
- Atlantic salmon (*Salmo salar*);
  - Brown trout (*Salmon trutta*);
  - Eel (*Anguilla anguilla*);
  - River/Brook lamprey (*Lampetra* sp);
  - Minnow (*Phoxinus phoxinus*);
  - Three-spined stickleback (*Gasterosteus aculeatus*);
  - Stone loach (*Noemacheilus barbatula*); and
  - Gudgeon (*Gobio gobio*).
- 12.4.23 In addition, the following species are largely confined to the lower reaches downstream of Gilford:
- Pike (*Esox lucius*);
  - Perch (*Perca fluviatilis*);
  - Roach (*Rutilus rutilus*); and
  - Bream (*Abramis brama*).

## Pike

- 12.4.24 Pike are solitary, territorial fish living on a totally piscivorous diet in adult life. In the upper and lower reaches of the Bann there is an abundant supply of fodder fish, mainly in the form of roach and bream, but also including perch, trout and possibly salmon smolts during their downstream migration in spring. Both

male and female pike mature within their first two years of life and spawning takes place between February and April when the water temperature is around 9-10°C. In the Bann, as elsewhere, pike tend to be pursued by specialist pike anglers.

### **Roach**

- 12.4.25 It is believed that roach first appeared in the Lough Neagh system in the late 1960s or early 70s, having initially escaped into the Lough Erne system. As elsewhere, the roach stock has been able to expand very rapidly to dominate the lower and upper reaches of the Bann where it can be observed in large shoals. This is due to the species' exceptionally high fecundity rate and maturation at a young age - both males and females mature at 3 years old. Spawning takes place between May and mid-June when water temperatures have reached 13-15°C. On the Bann it is believed that roach spawn upstream of Portadown where the substrate is stonier with extensive submerged vegetation. Roach have become a major attraction for anglers on the river in the Portadown area and some exceptional catches have been recorded.

### **Bream**

- 12.4.26 The bream is another shoaling species which can be present in the Bann in large numbers and has been a mainstay in angler's catches. The females mature at 7-10 years old and spawning occurs during May when the water temperature reaches 13-15°C. Bream are known to spawn in large numbers in the Bann just below Portadown. Hybrids with roach are commonly observed on the Bann.

### **Juvenile salmonid stock status**

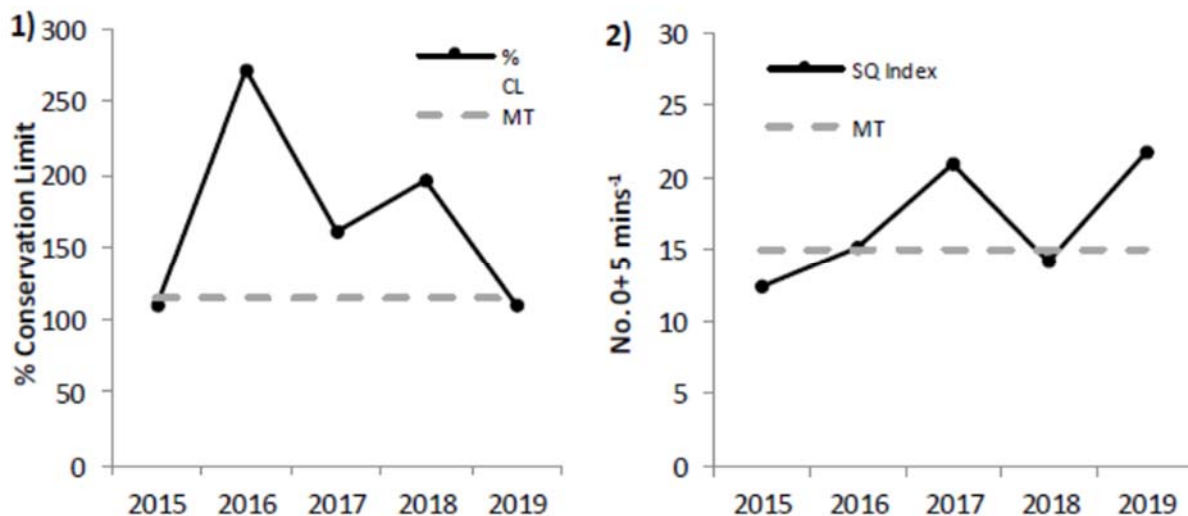
- 12.4.27 Trends in abundance of juvenile salmon and trout are monitored by DAERA/AFBI through intermittent semi-quantitative electrofishing surveys according to a methodology developed by Crozier & Kennedy (Ref. 12.15). However, the most recent survey data for the Upper Bann was for 2010 and so may not reflect current status. Nonetheless, as shown in **Figure 12.2, Volume 4**, the distribution of juvenile salmon and trout fry was largely restricted to sites that occur much further upstream of the scheme watercourses where habitat is more suitable for spawning and nursery, rather than the generally deeper and more sluggish watercourses that occur within the scheme area. For example, salmon fry occurred from over 15km upstream of Portadown near Lawrencetown to the upper reaches of the Bann at Rathfriland, Hilltown and the smaller tributaries draining the Mourne Mountains. This reflects a lack of suitable spawning habitat in the lower reaches of the river, particularly in the scheme area. In 2010, trout fry had a slightly wider distribution from below Gilford to the Mourne headwater tributaries of the Bann, although some spawning and recruitment occurs in some watercourse sections within the scheme area (see habitat observations below).

### **Adult salmon runs and conservation limits**

- 12.4.28 A key factor in assessing the status of salmon stocks is determination of Conservation Limits for individual river systems. The Conservation Limit for Atlantic salmon is defined by NASCO as: the spawning stock level that produces long term average maximum sustainable yield as derived from the adult-to-adult stock and recruitment relationship. In simpler terms the Conservation Limit for a river is the number of spawning salmon required to ensure that salmon are reproducing in sufficient quantities to produce the next generation of fish.
- 12.4.29 DAERA IFD operates a management regime for salmon rivers within its jurisdiction which aims to manage salmon fisheries and spawning populations in a sustainable manner. Management targets (MT) and spawning targets are set for each river catchment with egg deposition levels set according to the area and quality grading of each section of nursery habitat. 25% is deducted from the management target allowing for loss of salmon by angling (15%), and poaching and predation (10%). The remaining figure is referred to as the conservation limit/spawning target (CL). There are eight monitored salmon "indicator" stocks in Northern Ireland that are used to provide management advice that underpins conservation and advice on commercial exploitation of salmon stocks; only the Lower River Bann (below Lough Neagh) is an index river with both fish counter and juvenile stock assessment data used to assess achievement of the MT. Although the MT was achieved in 2020 for the Lower Bann, the fishery was determined as "catch and release" because of the presence of several discrete salmon sub-populations within the catchment (above the main fish counter) of this mixed stock fishery (MSF) many of which are deemed to be below their CL (Ref. 12.18).

- 12.4.30 While the Upper Bann is not an index river, DAERA manages the fishery using data on rod catches and juvenile fish stocks. The Agri-Food and Biosciences Institute (AFBI) collects more up to date juvenile fish stock data as part of its investigation of recruitment of salmon in the Upper Bann. A management target of 1.98 million eggs for Atlantic salmon has been set for the Upper Bann, which equates to a conservation limit/spawning target of 1.72 million eggs (Ref. 12.18).
- 12.4.31 Plate 12.1 shows the adult salmon escapement against the Management Target (115% CL), and the index of juvenile salmon recruitment, for the Upper Bann River. The number of adult fish – expressed as a percentage of the conservation limit – has exceeded the management target in 3 of the last 5 years while juvenile recruitment has met or exceeded the management target value of 15 fry per 5-minute electrofishing also in 3 of the last 5 years.

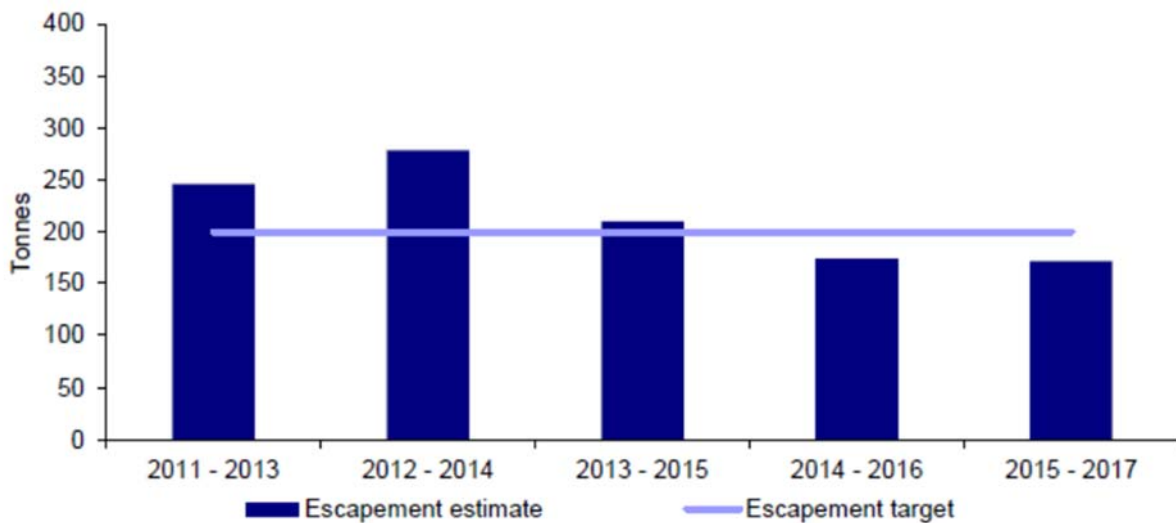
Plate 12.1 Conservation limits in relation to management targets for (1) adult salmon escapement and (2) juvenile salmon recruitment 2015-2019 for the Upper Bann (Source: Kennedy *et al.* 2020, Ref. 12.18)



### Eel stock status

- 12.4.32 As required under the European Eel Regulation, and the established eel management plan for the Neagh/Bann RBD, an overall escapement target of 200 tonnes of silver eels has been set for catches in the lower River Bann at Toome and Kilrea weirs (DAERA, 2019). The overall escapement also includes the catchment area upstream of Lough Neagh, including the Upper Bann. In the 10 years, since 2011, there has been a gradual decline in estimates of eel escapement as compared to the target with a more recent failure to meet the target (Plate 12.2). This decline also coincides with a decline in total weight of silver eel catches over the same period, and a longer-term decline in glass eel recruits to the fishery, with a greater proportion of glass eels now stocked as compared to natural recruitment.

Plate 12.2 Eel escapement estimates for the Neagh/ Bann River Basin District from 2011-2017. (Source: DAERA, 2019)



### Angling interests

12.4.33 The Upper Bann provides a variety of recreational angling opportunities but is particularly renowned for the quality of its coarse fishing in the lower reaches of the river in and around Portadown. However, there is some excellent brown trout fishing further upstream between Gilford and Katesbridge., with a significant run of migratory trout (dollaghan) from Lough Neagh also occurring. Over the last 50 years there has been an increasing run of salmon which supports rod angling for salmon, particularly upstream of the scheme area between Gilford and Banbridge and in the upper reaches between Katesbridge and Hilltown.

### Coarse fishing

- 12.4.34 DAERA manages the coarse fishery on the River Bann between the confluence with the Cusher River near Knock Bridge (ca. 5km upstream of Portadown) downstream to Lough Neagh. This is one of the best known coarse fisheries in Europe and the town stretches are well established venues for major competitions having hosted the World Coarse Angling Championships during the 1970's. Angling was particularly good during the 1980's and in 1984 a world record for a 4-hour match was established with a catch of 194 lbs. Subsequently angling deteriorated for several years but has recently improved with several key fishing areas developed by DAERA in the immediate town area adjacent to the main River Bann flood defence locations with some access by arrangement with landowners (see **Figure 12.3, Volume 4**).
- 12.4.35 Angler access extends on the west side along the River Bann Boulevard from the Cusher River confluence to the boathouse. Armagh City, Banbridge and Craigavon Borough Council has developed a further footpath from the boathouse to Shillington's Bridge with fishing stands and an amenity area. Downstream of Shillington's Bridge are two popular stretches fishable from either bank via farmland - Portadown Park (west bank) and Hoy's Meadow (east bank). The Council has developed a further section of Hoy's Meadow with specialist stands for disabled anglers closer to Shillingtons Bridge on the true right bank. Additionally, there is a private fishing stand, with private access, on the true right bank at Foundry Street.
- 12.4.36 The town stretches are used extensively particularly between December and April with the best fishing consistently from Shillington's Bridge up to the boathouse. Competitive events are held regularly but there is also a demand from individual pleasure anglers. The main quarry species is roach but resident bream feature more in summer and autumn. During the 1980's Hoy's Meadow provided the best fishing but this area is now fished more for pike.
- 12.4.37 There are no coarse fishing clubs on the Bann although at one time there was a club based in Portadown. A specialist pike club from Lurgan fishes the river regularly.

## Game fishing

- 12.4.38 Good quality trout fishing is available on the Bann from Gilford upstream but there is little doubt that it has, in common with many rivers in the province, deteriorated over the years. Nevertheless, there are still some excellent trout to be had from different stretches of the river. Theories for the general decline in trout stocks are many and varied but include: drainage, pollution, disease, poaching, predation and overfishing. On the Upper Bann it seems that the drainage scheme in the 1960's was a very significant factor, which had an immediate impact on fish stocks in general. Dredging of spawning and nursery areas would have destroyed much of the habitat required by brown trout at different stages of their life cycle. However, the river has largely recovered from this scheme and although many of the favourite dams, runs and pools are gone or radically altered, trout stocks have now recovered significantly and the fishing has gradually improved. The other factor of major significance to the Bann has been pollution, originally from industrial sources in the Banbridge area, but more recently from agriculture, sewage and water treatment.
- 12.4.39 In the past there was also a significant run of migratory trout (dollaghan) from July onwards but this has now declined to a much reduced level, although local angling groups are now engaged in a programme of stock enhancement. The river is increasing in popularity as a salmon fishery, particularly in the Rathfriland club area which can attract many visiting anglers in a good season. Salmon runs to the river appear to have improved over the last 15-20 years. The salmon run is influenced by a number of factors, not least of which, is the amount of rainfall and resultant river level. Normally the run of salmon is late-season but in a wet season the river can receive a run of fish much earlier – in some years there have been reports of salmon reaching the Hilltown area by late June.
- 12.4.40 There are several fully constituted game angling clubs on the Bann each with access to separate stretches of the river, although all are upstream of Portadown and the scheme area.

### Gilford Angling Club

- 12.4.41 The Gilford Club was founded in the early 1960's and currently has a membership in the order of several hundred. Fishing extends upstream from Dynes Bridge through Gilford to Hazelbank Weir, a distance of about 10.5km. The club has access to these waters by arrangement with local landowners. Brown trout are the main attraction in this stretch although there are some good areas for salmon and with increasing runs salmon fishing is gaining in popularity. Dollaghan can also be taken late in the season.

### Banbridge Angling Club

- 12.4.42 This is the oldest and largest club on the river; formed in 1946 with several hundred members. Members can fish from Hazelbank Weir up through Banbridge to Katesbridge, a total river length of 16.7km. Most anglers are mainly interested in brown trout although later in the season dollaghan can be taken and again salmon are a growing attraction. Access to most parts of this sizeable stretch of river has been negotiated by formal arrangement with local farmers and landowners.

### Rathfriland Angling Club

- 12.4.43 This club was formed in 1960 and now has about 120 full members with a further 120 associated and around 80 juveniles. Members have access to the stretch of river from Katesbridge up to Hilltown which is similar in length to the Banbridge water i.e. 16.7km. On this stretch salmon fishing is more popular, particularly with the better runs of fish experienced in recent years. In a good season considerable numbers of visiting anglers come to this area in pursuit of salmon. Brown trout are also valued by the club and again dollaghan can be taken in late season. The club has secured access to the fishing by agreement with local riparian owners and the Downshire Estate who own a section of fishing in the Bannfield area.

## Aquatic Invasive Species

- 12.4.44 A desk assessment of AIS, specifically plants/ algae, within watercourses of the scheme area and surrounds (NBN Atlas for Northern Ireland) found the following reported Schedule 9 listed species;
- Canadian Pondweed - *Elodea canadensis* - widely distributed in the scheme area;
  - Nuttall's Pondweed - *E. nuttallii* - more restricted to the main River Bann;

- Oxygen Weed - *L. major* - not present as yet within the scheme river catchments although there is a record north-east of Lough Neagh at Massarene golf club;
- Water Fern - *A. filiculoides* - widespread around the shores of Lough Neagh and there is a single record for Brackagh Moss drain near Portadown where some mats were observed along a "ditch";
- Floating Pennywort - *H. ranunculoides* - present outside of the Bann catchment in isolated areas;
- Fringed Water-Lily - *Nymphoides peltata* - present in Killee Lough south of Lough Neagh but outside of the Bann catchment; and
- Parrot's Feather - *Myriophyllum aquaticum* is present in Lough Gullion to the east and outside of the Bann catchment.

## Field survey

### Initial walkover screening assessment

12.4.45 There were twenty one key locations where a potential interaction/ intersection between a watercourse and a flood defence location was identified (Table 12.10; **Figure 12.4, Volume 4**). Initial walkovers to record salmonid habitat, aquatic ecological potential and general physical habitat determined that 5 site locations could be screened out from further full baseline assessment; several sites with unclassified salmonid habitat, very poor ecological potential, and poor physical habitat quality were recommended for AIS surveys only because of in-channel works proposed at these locations. All other sites were recommended for full baseline assessment based on salmonid habitat, AIS, invertebrate surveys, and physico-chemistry. Each location is discussed separately below with supporting field data observations provided in referenced **Figures 12.5-12.17, Volume 4** that also include photographic evidence of the habitat quality in each watercourse.



Table 12.10: FAS locations screened in/ out of further assessment. Sites screened out are indicated in bold font. The required survey type for sites screened in for further baseline assessment is indicated.

Site ID	Description	watercourse	in-channel works	Survey requirements	Rationale for screening/ survey	easting	northing
<b>1</b> Figure 12.5	<b>Site O Rear of 313 Tandragee Road</b>	<b>Un-named drains</b>	<b>no</b>	<b>screened out</b>	<b>very poor expected ecological-based water quality; unclassified salmonid fisheries habitat</b>	<b>301284</b>	<b>350242</b>
<b>2</b> Figure 12.6	<b>Site N2 The Fairways</b>	<b>Cusher Drain</b>	<b>yes</b>	<b>screened out</b>	<b>channel largely dry</b>	<b>301558</b>	<b>352183</b>
3-control Figure 12.6	Site N Olde Golf Links / Annagh FC	Annagh River	yes	full baseline	unclassified salmonid habitat; roach possible; ext. macrophytes; proposed in-channel works	301148	352193
3-impact Figure 12.6		Annagh River	yes	full baseline	as above	301073	352290
3b-impact Figure 12.6	Site N Olde Golf Links / Annagh Football Club	Ballyworkan Drain	yes	full baseline	unclassified salmonid habitat; extensive macrophyte growths, channel openness & proposed in-channel works	301445	352261
<b>4</b> Figure 12.7	<b>Site Q Ripley Mews</b>	<b>Kingsway Drive Drain</b>	<b>no</b>	<b>screened out</b>	<b>channel overgrown &amp; largely dry silted bed.</b>	<b>300539</b>	<b>352696</b>
5-impact Figure 12.8	Site M Annagh Hill Industrial Estate	Annagh River	yes	full baseline	large channel but very poor salmonid habitat; roach possible; extensive macrophytes; proposed in-channel works	301353	353281
6 Figure 12.8	Site K Health Centre	Annagh River	no	covered by site 5-impact	as above	301409	353451

Site ID	Description	watercourse	in-channel works	Survey requirements	Rationale for screening/ survey	easting	northing
7-impact Figure 12.9	Site R Corcullentragh Road	Ballybay	yes	full baseline	Moderate quality salmonid habitat; trout present, flow diversity – riffle, run, glide, pool	298946	353618
7-control Figure 12.9	Corcullentragh Road	Ballybay	yes	full baseline	Upstream Control reach for above sensitive reach and Ballybay River overall	298857	353311
8 Figure 12.10	Site S Corcrair Drive	Ballybay	no	7-impact = u/s control; 10-impact = d/s impact	Trout present; Corcrair Drive options 100-245m from watercourse but small drains could convey drainage to Ballybay	299599	354131
9 Figure 12.10	Corcrair Drive	Ballybay	no	As above	as above	299836	354186
10-impact Figure 12.11	Site A1 Corcrair Mews	Ballybay	yes	full baseline	U/s of bridge moderate trout pools becoming weed choked; d/s of bridge moderate nursery/ possible moderate spawning; expect low/ mod. ecologically-based water quality	300118	354583
11-14-impact Figure 12.12	Sites F, E, D and C - R. Cottages, Parkside, .P. Park, & W. Green	Ballybay & Garvaghy Drain	yes	full baseline	Sal. habitat v. poor but roach observed in open areas; extensive macrophytes & in-channel works proposed	301065	354374
15-17-impact Figure 12.13, Figure 12.14	Sites C, L, I and J - W.Green to Bw. Green (incl. Foundry St & Irwins Mill)	L. Ballybay & R. Bann	yes	full baseline	Sal. habitat v. poor but R.Bann key fisheries habitat; ext. marginal macrophytes; in-channel works proposed	301227	354662
15-17-control	Site J Bowling Green & site L Irwins Mill	R. Bann	no	full baseline	as above	301555	353604
18-impact Figure 12.15	Site A Ashgrove Road	Drain - R. Bann	yes	AIS only	unclassified sal. habitat; very poor ecological potential but in-	300757	355257

Site ID	Description	watercourse	in-channel works	Survey requirements	Rationale for screening/survey	easting	northing
					channel works proposed & macrophytes extensive		
19-impact Figure 12.16	Site B Derryanvil Road	Drain - R. Bann	no	screened out	<b>Two farm drains with expected very poor ecological-based water quality; unclassified salmonid habitat, no in-channel works</b>	301209	355519
20-impact Figure 12.17	Site P Derryvore Lane	Un-named drain	yes	AIS only	v. low expected ecol-based water quality; unclass. salmonid habitat; in-channel works & ext. macrophytes	301820	356524
21-impact Figure 12.17	Derryvore Lane	Un-named drain	yes	AIS only	As above	301648	356480

### Site 1 – Site O to Rear of 313 Tandragee Road.

- 12.4.46 This location has the potential to interact with two small drains that lie east, running parallel north-south, and south, running east-west, to the FAS locations, which are indicated in the client-provided base maps as standing water/ drain. These drains ultimately connect to Brackagh East Drain, a tributary of the Cusher River ca. 300m d/s (**Figure 12.5, Volume 4**). The north-south drain is initially narrow with a wetted width of ca. 0.8m, not flowing, underlain by deep peat and covered by floating *Lemna* spp. (**Figure 12.5; Plate 1**). It widens further south, parallel to the proposed option location, to ca. 2.8-3.5m; here the drain is dominated by large clumps of green algae and has a water column depth to 0.3m underlain by very deep silt/ peat and no obvious flow (**Plate 2**). Overall, the channel has unclassified salmonid habitat and would not be expected to support roach although stickleback may be present. The smaller drain that enters from the west is of very poor quality at up to 0.7m width and ca. 0.25m water depth with very deep underlying silt (**Plate 3**). Further downstream of where the small drain enters the larger north-south drain, and the most southerly extent of the proposed flood defence, the channel remains largely, homogeneously, poor with increased surface cover by *Lemna* spp, and greater encroachment in the margins of *Sparganium erectum* (**Plate 4**). There are no planned in-channel works and overall these watercourses have no salmonid fisheries interest and would be expected to have very low ecological quality. These watercourses were screened out from further baseline assessment.

### Site 2 – Site N2 The Fairways

- 12.4.47 This location is parallel to two un-named drainage ditches running n/s & e/w though both were dry (**Figure 12.6; Plate 5**). Surveys were conducted during a period of low rainfall. The bed of each ditch had underlying deep sediment (gauged by rod) and signs of recent wetting. Channel margins and middle were dominated by willow, *Phalaris*, and grasses and the habitat was unclassified and clearly unsuitable for fish. Overall, both drains had no to very low aquatic ecological quality as they may be intermittently dry/ wet. The drains meet and ultimately merge with Brackagh East Drain 130m d/s which appeared static with a surface 100% covered by the Schedule 9 listed *Azolla filiculoides* (**Figure 12.6; Plate 6**). Water depth was >1.0m with a deeply silted bed and the overall salmonid habitat and assessed fisheries value was unclassified value, though stickleback may be present. Despite the presence of *Azolla* in Brackagh East Drain, it is not directly linked via a permanent surface hydrological connection to the proposed flood defence and no mitigation is required.

### Site 3 – Site N Old Golf Links & Annagh Football Club

- 12.4.48 This location is parallel to the main Annagh River Diversion channel and the linked and outflowing Ballyworkan Drain (**Figure 12.6**). Circa. 150m of proposed hard defences run parallel north-south with the Annagh River Diversion Channel while ca. 350m run parallel east-west with Ballyworkan Drain, a non-designated watercourse which ultimately meets the lower Cusher via a system of drains over 600m eastward. The main Annagh River channel had its entire surface covered by floating *Lemna* spp. and emergent macrophytes (largely *Sparganium erectum*) (**Plates 7-9**). The channel is historically drained with high banks and little observed flow. Width is 3.8-4.2m with a depth >1.0m and a bed of very deep silt that is unsafe for wading. The channel is graded as unclassified for salmonids but roach may be present. Given the channel size, potential for in-channel works and the spread of AIS, full baseline surveys are required.
- 12.4.49 Ballyworkan Drain exits the Annagh River on the south-west side of the scheme and flows sluggishly eastwards (**Figure 12.6; Plate 10**). The channel is 1.8-2.2m wide, up to 0.8m deep with a heavily silted bed and significant suspended sediment resulting in very poor water clarity. Emergent, submerged and floating plants partly restrict the availability of open water while the riparian area on the true left side of the channel is rank grass backed by the residential development and the true right bank thick vegetation backed by grazing pasture (**Plate 11**). Further downstream to the east beyond the FAS location extent, the channel becomes more open, and deepens although the flow remains almost imperceptible with high bed silt and suspended sediment (**Plate 12**); the lower part of Ballyworkan Drain also is unsuitable for salmonid fish but may support some roach. A full baseline survey is required given the openness of the channel, extensive macrophytes, and AIS risk with the proposed in-channel works.

### Site 4 – Site Q Ripley Mews

- 12.4.50 This location is parallel to two small undesigned drains that feed into Kingsway Drive Drain, a non-designated waterbody, that ultimately drains to the Annagh River to the east (**Figure 12.7; Plates 13-14**). The true left bank is a thick grassy riparian area backed by residential and industrial land while the true right bank is a large overgrown and ungrazed wet meadow. To the east of Ripley Mews, the drain is ca. 1.0m wide, dry with a cobble and silt bed and clearly of no fisheries or aquatic ecological value (**Plate 13**). Further downstream, a drainage ditch 1.0-1.5m wide was a mixture of dry and wet patches, non-flowing with heavy bed siltation and no fisheries interest and very low aquatic ecological value (**Plate 14**). A larger drainage channel occurs just to the east of Ripley Mews running eastward (**Plate 15**); the channel is 1.8-2.0m wide and completely overgrown with grass, rushes and plants including meadowsweet with no open water and a largely dry and deeply silted bed with no fisheries or aquatic ecological interest. The drainage ditches at this location were screened out from further baseline assessment.

### Site 5 – Site M Annagh Hill Industrial Estate & Site 6 – Site K Health centre

- 12.4.51 An undesigned drainage ditch running parallel to the main scheme intercepts drainage from a wider grazing field to the east/north-east with the channel initially 0.8m wide and dry, and becoming wetter, and wider (to 1.5m) as drainage from the eastern channels is added (**Figure 12.8; Plates 16 and 17**); however, all of these channels are heavily overgrown and weed choked with no open water, a bed of deep silt and have no fisheries interest. The small drainage ditch running north, parallel to the scheme, is initially dry with wet patches but becomes wetter towards its confluence with the Annagh River Diversion main channel (**Plates 18 and 19**). It remains heavily choked with no open water and a bed of deep silt throughout.
- 12.4.52 The drain meets the Annagh River Diversion channel, a designated waterbody, at a footbridge (**Figure 12.8; site 5**) with the main channel highly modified, straightened and completely constricted by macrophytes and grasses (**Plate 20**). The channel width is ca. 2.5m and flow is imperceptible with a deep layer of silt rendering the channel unsuitable for wading. Ca. 130m downstream of the FAS option intersection and footbridge, the channel becomes less weed-choked but an outflow on the true left bank meets the river via a storm-flap, through which a consistent flow of unknown organic waste liquid is discharging (**Plate 21**). The discharge is resulting in a grey discoloration, high levels of suspended sediment and a visible effect that is carried downstream to the confluence with the main River Bann, ca. 350m downstream, where the channel becomes increasingly constricted by macrophytes and grasses (**Plate 22**). There is a strong odour of organic pollution and the entire channel from the flood defence intersection is unclassified for salmonids and would be expected to have very low aquatic ecological value. Given several sections of more open water, species such as roach may be present but the organic pollution severity and extent would be expected to extirpate any fish species. Given the more open nature of this channel, the existing pollution, and expected in-channel works, this site is recommended for a full baseline assessment including AIS surveys. This assessment of the Annagh River section also is relevant to the location for the Health Centre (**Figure 12.8; site 6**) although the defences will be at a minimum of 67m from the main Annagh River channel and so no in-channel works are proposed.

### Site 7 – Site R Corcullentragh Rd.

- 12.4.53 This defence option location lies along the Upper Ballybay (Corcrain) River with a short section parallel to the main river channel (**Figure 12.9, Volume 4**). The channel in the immediate vicinity of the proposed defences occurs for approximately 30m upstream and 35m downstream of a small footbridge. Immediately upstream of the foot bridge, the channel is up to 5.0m wide with the true right bank defined by a large moderately steep embankment; there is a moderately deep well-shaded grade 2 salmonid resting pool that becomes shallower further upstream and would hold trout despite extensive brown algal mats and deposited silt (**Figure 12.9; Plate 23**); upstream of this the channel is 2.8-4.0m wide, flanked by boulder revetment vertical banks up to 1m high with a low stream bed lacking in coarse material and indicative of historical drainage. Upstream, the channel becomes heavily colonised by emergent macrophytes resulting in areas of unclassified habitat (**Plate 24**). Above this, areas of thick macrophyte growths are interspersed with at best grade 3 resting pools and grade 3 nursery in open areas where the bed remains hard and shallower; while there are scattered patches of cobble and pebble, silt and brown algal mats are common features of the bed.

- 12.4.54 Downstream of the footbridge, there is a very deep, grade 1, pool where trout were observed rising; below this, a gradient change results in some good quality, flowing, riffle/ run habitat consistent with some grade 2 and predominantly grade 3 nursery habitat, although brown algal mat cover is high with frequent filamentous green algae indicative of enrichment (**Plates 25 and 26**). The pools immediately above and below the footbridge support adult trout while the nursery habitat downstream is likely to support small to moderate abundance of juvenile trout, assuming suitable spawning gravels, which were not obvious in the walkover survey. In terms of salmonid fisheries significance, this site is the most sensitive of all watercourses surveyed in the study area, although given the poor fisheries value of most watercourses (see below), this area is moderately sensitive and a full baseline assessment at both upstream control and downstream impact reaches is required (see **Table 12.10**).

### **Sites 8 & 9 – Site S Corcrain Drive**

- 12.4.55 The proposed hard defences are situated from 100m to 245m from the main channel of the Ballybay River and so although works will not interfere with the main river channel, there is the possibility that site works run-off may be conveyed to the channel via small drains (observed to be dry during surveys) during wetter conditions (**Figure 12.10, Volume 4**), and possibly from any works at the Corcullentragh Road location much further upstream (see site 7 above). The channel was mapped for salmonid habitat over a length of approximately 565m; width varied from 3.0-3.8m with depth varying 0.3m to 0.8m along a channel that was initially of poor quality with emergent vegetation partly constricting flow, which was very low. The riverbed had moderate to high abundance of brown algal mats that were infiltrated with deposited fine sediment as silt, and in places suspended sediment was high resulting in poor water clarity. Salmonid habitat was a mixture of grade 3 holding pools (**Figure 12.10; Plate 27**), unclassified habitat due to large deep sections with high macrophyte cover, constricted flow and high sediment cover (**Plates 28, 30 & 31**), and shallower runs consistent with barely grade 3 nursery habitat (**Plate 29**). Aged 1+ (trout of at least 1 year old) and older trout were observed in a pool towards the downstream end of the survey section supporting the assessment of Grade 3 Holding Pools (P3), while a local person informed that small fish could be observed in the channel in spring.

### **Site 10 – Site A1 Corcrain Mews**

- 12.4.56 Approximately 130m of this flood defence runs parallel to the main channel of the Ballybay (Corcrain) River upstream of Corcrain Road, while a small section lies perpendicular immediately downstream of the bridge (**Figure 12.11, Volume 4**). The channel upstream of the bridge was ca. 5-6m wide, up to >1.0m deep and partly overgrown by macrophytes with some in-stream boulder, building works, rubble, and deposited silt; salmonid habitat was classified as grade 1 to 3 resting pools although further upstream the channel narrows and becomes weed choked with unclassified or grade 3 pool habitat (**Figure 12.11; Plates 32 and 33**). Enhancement options would be limited here because of the water depth and the lack of gradient with which to augment flow via narrowing or creation of juvenile fish habitat by placement of rubble mats.
- 12.4.57 Downstream of the Corcrain Road bridge, there is a gradient change with the channel flowing through mainly commercial properties banked by concrete walls on the true left bank and a rubble constructed steep bank on the true right. The gradient change increases flow and produces a series of shallow riffle/ runs dominated by pebbles although bed siltation is high. Salmonid habitat is largely grade 2 and 3 nursery habitat with a small area of grade 3 spawning habitat whose potential quality is undermined by siltation (**Plate 34**). Further downstream, the flow reduces and the gradient shallows such that habitat is largely grade 3 resting pools with increased vegetation constricting flow and trapping silt (**Plate 35**).
- 12.4.58 Overall, there is low to moderate potential for the section below the flood defence location to support some trout spawning and juvenile recruitment and this sensitivity will require a full baseline assessment to inform on potential impacts (see **Table 12.10**).

### **Sites 11-13 – F Rose Cottages, E Parkside and D Peoples Park.**

- 12.4.59 At Rose Cottages (site 11) and Parkside (site 12), the hard defences will be at a minimum distance of 17m and 60m, respectively, from the Ballybay/ Corcrain River main channel and will not require in-channel works or associated AIS surveys, whereas the defence at People's Park will require in-channel works (Site 13; **Figure 12.12, Volume 4**). As such, a full baseline impact reach assessment that covers sites 11-14 is required (see **Table 12.10**).

- 12.4.60 Upstream and adjacent to the Rose Cottages proposed defence, the channel has been historically drained with steep banks up to 4m high; there is little flow and a high cover of macrophytes with extensive deep silt (**Figure 12.12; Plate 36**). The depth varies from 0.2m to >0.8m and the width up to 3m. Salmonid habitat is generally poor with some open water silted areas corresponding to grade 3 resting pools at best with shoals of fry and older Age classes of roach noted; the remainder of the habitat is largely unclassified due to macrophyte congested sections (**Figure 12.12; Plates 36-38**).
- 12.4.61 Downstream of the eastern extent of the Rose Cottages defence, and north of the Parkside defence, the channel is a mixture of grade 3 resting pools and unclassified, weed-choked habitat (**Plate 39**), and below the footbridge the channel becomes completely weed-constricted and unsuitable for salmonids or roach (**Plate 40**).
- 12.4.62 From the section north of and parallel to the People's Park proposed defence, a small area upstream of the footbridge is shallower with run type flow habitat merging to a grade 3 resting pool where roach fry occurred. Downstream of the footbridge, the channel is 2.8m to 3.5m wide with a short section that is very shallow and silted followed by a longer unclassified section where there is extensive channel congestion by macrophytes, a short section of more open grade 3 resting pool habitat followed by increased channel congestion by emergent macrophytes leading to unclassified habitat (**Plates 41 and 42**).
- 12.4.63 Overall, the section from Rose Cottages to People's Park will require a full baseline assessment given the channel size, extent of proposed flood defences, extent of macrophyte growth and open water areas, and proposed in-channel works at People's Park though sampling should be focused to the channel adjacent to Woodside Green to act as a downstream impact survey reach (site 14; **Table 12.10**, and see below).

#### **Sites 14 & 15 – C Woodside Green**

- 12.4.64 This section of the lower Ballybay/ Corcraun River in the vicinity of the Woodside Green site is completely blocked by emergent macrophytes with a deep heavily silted bed; the banks downstream of Garvaghy Road are sloping rock armour and the habitat is unclassified downstream to the confluence with the main channel River Bann (**Figure 12.13, Volume 4; Plates 43 and 44**). Overall, the section from Woodside Green to the River Bann confluence will require a full baseline assessment given the channel size, extent of proposed defences, extent of macrophyte growth and open water areas, and proposed in-channel works (see **Table 12.10**; impact site 11-14). This site also will provide a baseline for potential impacts arising from works upstream at Rose Cottages, and Parkside.
- 12.4.65 In the River Bann immediately upstream and downstream on the true left bank along the extent of the Woodside Green proposed defence, the channel is deep (>1.0), wide (up to 40m) and non-wadable. The entire channel here is sufficiently large and deep to provide grade 1 resting pools for adult salmonids and act as a migration corridor for adult and juvenile salmon, migratory trout, eel and possibly lamprey spp. The margins of the channel are variously populated by a riparian zone of grass, sedge, lilies, and submerged and emergent vegetation that would provide good spawning and nursery habitat for coarse fish species such as roach, bream and perch, and good cover for eel and pike (**see Plates 45 and 46**). The northern extent of the hard defences parallel to the river channel (**Plate 47**) also have a thick riparian zone with good marginal macrophyte cover for fish. The true right side of the channel north of the A3 road is a park area (Hoy Meadows) that has several hard platform fishing stands further supporting the importance of this section for various coarse and game fish species (**Plate 48**). To the south of the outlet of the Ballybay River on the true left side of the channel is a public towpath that runs for several kilometres south of this point.

#### **Sites 16 & 17 – Site H Castle St/ Site I Foundry St. and Site J Bowling Green/ Site L Irwins Mill**

- 12.4.66 The proposed defences along the main River Bann upstream of Woodside Green include section pairs that run largely parallel along both banks over a channel distance of ca. 730m (**Figure 12.14, Volume 4**);
- Site 16 – Castle Street (true left bank towpath) and Foundry Street (true right bank).
  - Site 17 – Bowling green (true left bank towpath) and Irwins Mill (true right bank)
- 12.4.67 The River Bann here is deep and wide, as indicated for Woodside Green earlier, and consistent with salmonid habitat that is classified as Grade 1 resting pools (**Figure 12.14; Plates 49-52; Plates 56 and**

**57**). As for Woodside Green, these sections include expansive vegetated margins (7-8m wide) of floating and submerged macrophytes and overhanging grasses that provide spawning and nursery habitat and cover for a variety of coarse fish species, habitat for salmonids and eels, as well as providing a corridor for migratory fish species including Atlantic salmon; roach fry were observed in abundance along the entire towpath margin on the true left bank.

- 12.4.68 Adjacent to the Castle Street defence option runs the towpath with a boat mooring area, slip way and a disabled fishing stand that is set well back from the open channel (**Figure 12.14; Plates 50 and 51**). On the opposite true right bank, the Foundry Street proposed defence is backed by industrial buildings and fencing or stone and brick walls, though there are vegetated margins including submerged and floating macrophytes that would provide habitat for fish, and a private fishing stand (**Plate 49**).
- 12.4.69 Further upstream along the Bowling Green section, there are numerous fishing stands running parallel with the towpath with a larger disabled angler stand (**Plate 54**) and others to the south that are composed of gravel rectangular areas (**Plate 55**); these stands are set well back from the open channel because of an extensive riparian zone and marginal macrophytes (**Plate 56**). The true right side of the channel adjacent to the Irwins Mill proposed defence is vegetated with a more continuous line of trees including sycamore and willow that would provide partial channel shading during periods of intense sunlight and would enhance marginal refuge areas for fish (**Plate 53**). Upstream of the uppermost area of proposed hard defences at Bowling Green, the river channel is also deep and wide with similar fish habitat provisions as described earlier (**Plate 57**).
- 12.4.70 Overall, the section of the River Bann from upstream of Bowling Green to downstream of the Woodside Green proposed defences will require a full baseline assessment given the channel size and fisheries importance, extent of proposed flood walls, extent of macrophyte growth and open water areas, and proposed in-channel works at Irwins Mill, Foundry/ Castle Street, and Woodside Green; both an upstream control and downstream impact reach will require assessment (see **Table 12.10**; site 15-17 impact and control).

#### Site 18 – Site A Ashgrove Road

- 12.4.71 The proposed flood defence intersects a small un-named and undesignated drain along Island Road just off Ashgrove Road (**Figure 12.15, Volume 4**). The drain appears to be linked to a series of similar small drains to the north but becomes shallower in its apparent source to the south. To the south of Island Road, habitat is very poor with no obvious flow, a channel that varies from 1.2-2.4m wide from south to north, and is characterised by high levels of suspended sediment and small open water areas interspersed by a section constricted by significant macrophyte growth including floating *Lemna* spp. (duckweed), emergent *Iris* and *S. erectum* with marginal *Phalaris* spp (**Figure 12.15; Plates 58 and 59**). The channel is not safe for wading with a water depth up to 0.8m underlain by a very deep layer of fine sediment largely comprised of silt. Considerable debris and domestic rubbish is also strewn throughout the drain (**Plates 60 and 61**). North of Island Road, the channel remains largely static with a slightly perceptible flow in open water patches. The channel is constricted by macrophyte growth and overhanging vegetation and grasses, interspersed with open areas covered by *Lemna* spp. and high levels of suspended sediment and deep bed silt (**Plates 62 and 63**). Overall, the entire surveyed stretch of the drain does not support habitat that is suitable for salmonids (i.e. is unclassified), is of very poor aquatic ecological quality and is also unsuitable for standardised kick sampling of flowing waters, but may contain stickleback. A full baseline survey is therefore not required although an AIS assessment will be required given the proposed in-channel works and extent of macrophytes present (see **Table 12.10**).

#### Site 19 – Site B Derryanvil Road

- 12.4.72 Two farm drains, ca. 1.4-1.7m wide, are sourced near to the farm buildings and proposed hard defence with none having any apparent flow, dominated by floating duckweed, emergent macrophytes and thick marginal vegetation (**Figure 12.16, Volume 4; Plates 64-66**). Both drains are up to 1m deep with a deep underlying layer of silt and have deeper water towards the west at the apparent source than east towards the River Bann. As they apparently flow east, they meet approximately 170m from the River Bann (**Plate 67**), eventually becoming narrower with less water before passing under the embankment to meet a wet area beside the main Bann (**Plate 68**). Both drains have no salmonid fisheries value and would be expected



to have very poor ecologically-based water quality and should be screened out from further full baseline assessment (**Table 12.10**).

### Sites 20-21 – Site P Derryvore Lane

- 12.4.73 A series of small undesignated drainage ditches occurs at the site along Derryvore Lane (sites 20-21 inclusive) where there are proposed FAS defences options (**Figure 12.17, Volume 4**). All appear to drain the Area of Special Scientific Interest known as Derryvore ASSI, which is designated for its wetland flora and fauna including a diverse, herb rich, wetland with a number of unusual fen communities within a flood plain on cutover peat. None of the sites is however within the ASSI boundary.
- 12.4.74 Site 20 is located in a small area on Derryvore Road perpendicular to a small drain that on walkover inspection was not flowing. The drain was up to 0.6m deep with a deep underlying layer of silt and high suspended sediment, and a surface with up to 50% cover of duckweed (*Lemna* spp.) and patchy emergent macrophytes (**Figure 12.17; Plate 69**). The drain does not connect directly to the River Bann but appears linked to the Derryvore ASSI although no flow was apparent. The drain is not suitable for sensitive fish such as salmonids although stickleback may be present, and overall has very low aquatic ecological sensitivity in terms of fauna expected in running waters.
- 12.4.75 Site 21 is located perpendicular to Derryvore Lane, appears to drain the ASSI area, and is linked to the main River Bann some 540m downstream (**Figure 12.17**). The channel is ca. 1.8-2.2m wide and is initially weed constricted with patches of open water covered by duckweed (**Plate 70**). The main channel is met by a drain on the true left bank ca. 250m downstream of the road which remains of very low quality (**Plate 71**). After several hundred metres downstream of Derryvore Lane, the channel is more open but the entire surface is covered by duckweed (*Lemna* spp.) with little flow apparent (**Plate 72**). The depth is greater than 1m in places with a deep silt layer and is unsafe for wading. The entire channel is unsuitable for salmonids and is unclassified while the habitat type is inconsistent with the aquatic ecological assessment method based on kick sampling of shallow running water benthic macroinvertebrates.
- 12.4.76 In summary, each of the sites along Derryvore Lane has no salmonid fisheries value and are expected to have very low aquatic ecological water quality such that full baseline surveys are not required. However, the extent of proposed in-channel works and the presence of extensive macrophytes indicates a requirement for AIS surveys in sites 20-21 (**Table 12.10**).
- 12.4.77 In summary, of the twenty one proposed flood defence locations, full baseline surveys were used to assess fisheries and aquatic ecological sensitivity in specific sections only where;
- in-channel works are proposed and extensive macrophyte growths were noted in the walkover assessment;
  - trout were confirmed present or habitat was potentially supportive of trout; and
  - there was potential to support coarse fish species such as roach.
- 12.4.78 As a result, four of the twenty one flood defence locations were screened out of further baseline sensitivity assessment, including;
- site 1 rear of 313 Tandragee Rd;
  - site 2 The Fairways;
  - site 4 Ripley Mews;
  - site 19 Derryanvil Rd; and
  - site 23 at Derryvore Lane.
- 12.4.79 These sites had either a lack of water or very low expected aquatic ecologically-based water quality, and/ or no proposed in-channel works (see bold font, **Table 12.10**).

### Full Baseline field survey assessment

- 12.4.80 Of the 18 remaining locations where flood defences are proposed, a full baseline assessment, using both benthic macroinvertebrate and AIS indicators (in addition to the salmonid habitat surveys already conducted during preliminary walkovers), was conducted to account for sensitivities across the following locations;
- The Old Golf Links/ Annagh Football Club on the Annagh River and Ballyworkan Drain (site 3);
  - Annagh Hill Industrial Estate on the Annagh River (site 5);
  - Corcullentragh Rd on the Ballybay River (site 7);
  - Corcraun Mews on the Annagh River (site 10);
  - a section that includes Rose Cottages, Parkside, Peoples Park & Woodside Green defences on the Annagh River (sites 11-14); and
  - a section that includes defences for lower Woodside Green upstream to and including Bowling Green on the main River Bann (sites 15-17).
- 12.4.81 For these proposed defence locations, full baseline surveys were planned based on the BACID approach described earlier to include both control and impact reaches (see **Figure 12.18, Volume 4**). It should be noted that where a series of hard defence locations occurred sequentially along a watercourse (e.g. Ballybay River sites 11-14 or River Bann sites 15-17), single impact survey reaches were selected to capture the "impact" baseline for that section of river and to account for potential impacts that construction phase works from proposed defences located further upstream could have. For example, the selection of an impact survey reach on the Ballybay River adjacent to Woodside Green (11-14-impact) accounts for potential impacts from works at sites located further upstream such as from Rose Cottages downstream to Woodside Green. Likewise, the selection of an impact reach on the Ballybay River downstream of the Corcraun Mews defences (site 10-impact), also acts as an upstream control reach for sites 11-14 downstream. For the Lower Annagh River, a single impact site downstream of Annagh Hill Industrial Estate (5-impact) also provides baseline assessment for potential impacts arising at site 6 despite the location of proposed defences occurring up to 70m from the river channel.
- 12.4.82 The remaining three locations (sites 18 and 20-21) were screened in only because of a requirement to assess AIS; these locations had unclassified salmonid fisheries habitat and expected very poor ecologically-based water quality, but had extensive macrophyte growths and are locations where in-channel works are proposed (Table 12.4; **Figure 12.13, Volume 4**); the assessment of AIS will underpin recommended mitigation during the construction phase.

### Fisheries Habitat Quality

- 12.4.83 The outcome of the assessment of salmonid fisheries habitat quality was summarised under the initial walkover screening section, where it was a key indicator determining screening in/ out of proposed defence locations (see Fisheries Habitat Quality Assessment, Section 12.3.1)

### Reach-scale physical habitat quality

- 12.4.84 A summary of physical habitat quality at impact and control sites, covering the watercourses potentially draining/ interacting with the proposed flood defence locations retained for full baseline assessment (including general physical habitat), is provided in Table 12.11. It was not possible to conduct full transect habitat surveys at most of the watercourse survey reaches, largely because of prohibitive depth and / or deep underlying bed silt; this again underlines the generally very poor physical habitat quality at most of the watercourses potentially interacting with the scheme (as already outlined in the preliminary assessment above).
- 12.4.85 For example, the upper Annagh River proximate to the scheme at the Olde Golf Links and Annagh FC (survey sites 3 control and impact) was deep, heavily silted, significantly constricted by macrophytes, and had little flow (Table 12.11; **Figure 12.6 Volume 4**; and see previous description under preliminary walkovers). The nearby Ballyworkan Drain survey site (site 3b impact), adjacent to the same scheme

locations, was also unsafe for wading, sluggishly flowing, with a bed largely of deep silt. In the main Annagh River further downstream and adjacent to the Annagh Hill Industrial Estate and Health Centre sites (survey site 5 impact), depth and siltation again precluded any in-stream transect assessments.

- 12.4.86 In the Upper Ballybay River adjacent to the Corcullentragh Road scheme, both an upstream control and downstream impact reach were deemed suitable for survey (sites 7 control and 7 impact; Table 12.11). Impact reach 7, used for baseline sensitivity assessments, had moderate flow, shallow depth, and characteristic riffles and runs, though deposited fine sediment was just above the 20% cover threshold where impacts on benthic invertebrates and fish are more likely (see Clapcott et al. 2011). The substrate was of intermediate coarseness and mainly of cobbles although the coarseness index was lower than 4.0, and thus below values associated with good salmonid fish habitat reported elsewhere in Northern Ireland (see Johnston, 2012). In addition, significant growths of brown and green algal mats supported at least moderate nutrient enrichment (see also **Figure 12.9, Volume 4** discussed above). The upstream control reach (site 7 control), was of much poorer physical habitat quality, as reflected in the slower flow, extensive macrophyte growths and very high levels of deposited silt, which influenced the lower substrate coarseness (Table 12.11).
- 12.4.87 Further downstream in the Ballybay River, the survey of impact site 10 provided a baseline with which to assess the sensitivity for the Corcrair Drive and Corcrair Mews scheme. The reach had moderate flow, shallow depth, and a substrate largely of pebbles in riffle and run flow habitat, though fine sediment as silt was considerably higher than the 20% cover threshold (Table 12.11). The predominance of pebbles was reflected in the coarseness index which, although lower than 3.0, has some potential to support trout spawning (see also earlier and **Figure 12.11, Volume 4**).
- 12.4.88 It was not possible to conduct full transect surveys of the impact reach (site 11-14 impact) in the lower Ballybay River downstream of the Rose Cottages, Parkside, Peoples Park and Woodside Green sites owing to depth and deep siltation. However, as described in the preliminary walkover assessments, the channel here was slow flowing, of moderate width, deep and highly silted, and significantly choked by macrophytes (Table 12.11; see also **Figure 12.12, Volume 4; Plate 42**).
- 12.4.89 The physical habitat sensitivity assessment of the River Bann adjacent and downstream of the Woodside Green, Bowling Green, Foundry Street, and Irwins Mill defences was descriptive owing to the prohibitive depth of this large river channel for wading (site 15-17 impact; Table 12.11). The channel here was up to 40m wide with mid-channel depths exceeding 1.0m; although some margins were firm underfoot, the bed became deeply silted several metres from the channel edge. From a substrate coarseness perspective, and associated salmonid habitat suitability, this reach of river is largely a migratory corridor for salmonid fish and would not provide habitat for spawning or nursery (see preliminary assessment and also **Figures 12.13 & 12.14, Volume 4**). The upstream control reach (site 15-17 control), comprised similar habitat as the impact reach (Table 12.11).

Table 12.11: Stream physical habitat quality at each site ascertained from baseline surveys

Site	FAS option	River	Sediment cover (%); type	Mean width (m)	Mean water depth (m)	Mean flow velocity (ms <sup>-1</sup> )	Coarse-ness index (CI)	Substrate heterogeneity (SD)	Inferred substrate
3-control	Site N Olde Golf Links / Annagh FC	Annagh River	100; silt	3.8-4.0	>1.0	<0.05	N/A	N/A	Not possible to conduct a transect survey; steep banks, deep water & v. deep silt
3-impact		Annagh River	As above						
3b-impact	Olde Golf Links / Annagh Football Club	Ballyworkan Drain	100; silt	1.8-2.2	0.17	<0.05	N/A	N/A	channel with deep marginal silt and unsafe for wading; description only
5-impact	Site M Annagh Hill Industrial Estate	Annagh River	100; silt	2.5-3.5	>1.0	<0.05	N/A	N/A	Not possible to conduct a transect survey; steep banks, deep water & v. deep silt
6	Site K Health Centre	Annagh River	As above						
7-impact	Site R Corcullentragh Rd	Ballybay/ Corcrain River	24.6; silt	3.79	0.12	0.16	3.76	1.12	mixture; intermediate coarseness
7-control	Corcullentragh Rd	Ballybay/ Corcrain River	75.2; silt	3.55	0.135	0.09	2.88	1.16	mixture; intermediate coarseness
8	Site S Corcrain Drive	Ballybay/ Corcrain River	Both locations distant from river but site 7-impact acts as an upstream control reach; site 10-impact = downstream impact reach						
9	Corcrain Drive	Ballybay/ Corcrain River							
10-impact	Site A1 Corcrain Mews	Ballybay/ Corcrain River	34.2; silt	3.28	0.07	0.17	2.92	0.86	mixture; intermediate coarseness

Site	FAS option	River	Sediment cover (%); type	Mean width (m)	Mean water depth (m)	Mean flow velocity (ms <sup>-1</sup> )	Coarse-ness index (CI)	Substrate heterogeneity (SD)	Inferred substrate
11-14-impact	Sites F-R. Cottages, site E Parkside, Site D- P. Park, & site C - W. Green	Ballybay/ Corcrain River	100; silt	2.5-4.0	0.5->1.0m	<0.1	N/A	N/A	Not possible to conduct a transect survey; steep banks, deep water & v. deep silt
15-17-impact	Site C - W.Green to site J - Bw. Green (incl. Foundry St & Irwins Mill)	R. Bann	N/A	Ca. 40m	>1.0	N/A	N/A	N/A	Large deep channel unsuitable for wading
15-17-control	Site J Bowling Green & site L Irwins Mill	River Bann	N/A	Ca. 40m	>1.0	N/A	N/A	N/A	Large deep channel unsuitable for wading

## Ecological quality/water quality

12.4.90 It was not possible to conduct full riverbed sampling of macroinvertebrates at several of the survey reaches because of prohibitive depth and / or deep underlying bed silt that prevented wading. Therefore, at sites 3 (control and impact), 5, 11-14, and 15-17 (control and impact), a sweep sample was taken along the banks, marginal vegetation, and bed where possible (as per Ref. 12.19). Recorded macroinvertebrate community metrics at impact and control sites covering the watercourses potentially draining/ interacting with the locations retained for full baseline assessment is provided in Table 12.12.

Table 12.12: WFD-based ecological quality classes and basic physicochemical parameters at each site. Ecology quality is derived from benthic invertebrate baseline surveys

Site	River/stream	BMWP WHPT score	No. of taxa	N-TAXA-based class	WHPT ASPT	ASPT-based class	Diss. oxygen (mg/L; %sat.)	Conductivity (µS/cm)	pH
3-control	Annagh River	51.2	14	Moderate	3.65	Poor	6.1; 62	760	7.3
3-impact	Annagh River	53.2	15	Moderate	3.54	Bad	6.0; 60	765	7.3
5-impact	Annagh River	14.7	6	Bad	2.45	Bad	1.9; 20	640	8.1
7-impact	Ballybay/ Corcrain River	73	14	Moderate	5.21	High	6.7; 69	608	7.7
7-control	Ballybay/ Corcrain River	99.5	20	High	4.97	Good	7.2; 77.3	625	7.7
10-impact	Ballybay/ Corcrain River	77.1	14	Moderate	4.53	Moderate	6.4; 67	663	7.8
11-14-impact	Ballybay/ Corcrain River	68.8	19	High	3.62	Poor	4.9; 52.6	525	7.7
15-17-impact	River Bann	84.2	23	High	3.66	Poor	6.6; 70.2	303	7.55
15-17-control	River Bann	71.6	20	High	3.58	Bad	6.2; 65	291	7.6

12.4.91 Across all the scheme watercourses, the highest ecological quality class determined was "Good", occurring at site 7 control on the Ballybay/ Corcrain River, above all potential scheme effects (Table 12.12). For watercourses downstream or adjacent to the scheme, the highest ecological quality class determined was "Moderate" only, occurring at impact sites 7 and 10, both on the middle to lower Ballybay/ Corcrain River. At impact site 10, both the NTAXA and WHPT-ASPT derived classification was Moderate whereas at impact site 7, "Moderate" was assessed for N-TAXA and "High" for WHPT-ASPT; based on the "one out, all out" philosophy of WFD, the lower of the index derived classes determines the final classification. The remainder of the watercourses were assessed either at "Poor" or "Bad" ecological quality. For example, impact sites 3 and 5 on the Annagh River, were assessed as having Bad ecological quality.

12.4.92 These quality classifications generally reflect the physical habitat conditions present at each site, with shallow, faster flowing reaches (Ballybay River sites 7 control and impact, and site 10 impact) having improved quality compared to deeper, sluggishly flowing or macrophyte choked reaches (e.g. Annagh River sites 3 and 5; Ballybay sites 11-14 impact; River Bann sites 15-17 control and impact). However, the Bad

quality assessment at impact site 5 on the lower Annagh River just upstream of the River Bann confluence, and the River Bann control site 15-17 (occurring just downstream of the Annagh River inflow), most likely reflects the very polluted conditions observed in the lower Annagh River during both walkover and baseline surveys, where an organic discharge was observed (see **Figure 12.8, Volume 4** and walkover assessment above).

- 12.4.93 The physico-chemical assessment of water quality at each full baseline site also corresponded with the ecological quality assessments. Many survey reaches had very poor dissolved oxygen levels and were assessed as Poor/ Bad ecological quality. For example, in the Annagh River, dissolved oxygen concentrations and percent saturations were at circa. 6.0 mg/L (62%) down to 1.9 mg/L (20%); while in the lower Ballybay River (sites 11-14 impact) concentrations were 4.9 mg/L (52%); in the River Bann (sites 11-14 control and impact) concentrations were 6.2-6.6 mg/L (65-70%). Such low dissolved oxygen concentrations are at or well below the 10th percentile threshold levels recommended for oxygen sensitive salmonid fish species such as salmon and trout, which is 65-75% saturation, and are similar or much lower, than the 10th percentile recommended for more tolerant cyprinid fish species of 60% (Ref. 12.20). Even in the reaches with the higher ecological qualities, such as the Ballybay River sites 7 and 10, dissolved oxygen levels ranged from 6.4-7.2 mg/L (66-77%).
- 12.4.94 Note that spot physico-chemical water samples taken here provide only a snap-shot of general baseline water quality, which can vary seasonally and with changes in flow. However, the assessment's robustness is supported by additional baseline ecological quality data that tends to integrate variation in environmental conditions over longer time-scales due to the diversity and variability in mobility of benthic macroinvertebrates. Thus, overall, the assessment of ecological and water quality is consistent with the generally very poor salmonid fisheries habitat and general physical quality of most sites.

### Aquatic Invasive Species (AIS) surveys

- 12.4.95 Twelve sites/ reaches were surveyed for AIS to describe the baseline and ensure coverage of reaches where there are proposed in-channel works (Table 12.13). In Table 12.13, the suffixes "a" and "b" sites indicate where more extensive sampling was required at locations with long continuous proposed hard defences parallel to watercourses (sites 11-14 and 15-17). As described in the Methodology section, each site covered a channel length of ca. 150m with 10 sub-sampling transects each separated by ca. 15m of channel length; an exception was the lower Annagh River (site 5-impact) where sampling was conducted intermittently over ca. 390m of channel due to the presence of two bulls. A full inventory of the aquatic plant species identified at each reach, together with relative abundance, is provided in **Appendix 12.1, Volume 3**. A total of 22 aquatic plant species was recovered across all sites with the lower Ballybay/ Corcraun River (site 11-14-impact) and the main River Bann (site 15-17b impact) having the highest species richness (10 and 12 species, respectively). The middle to lower Ballybay River sites (7-impact and 10-impact) had the lowest aquatic plant species richness possibly due to the shallow depth, faster flow and unstable substrate of these sites providing a habitat unsuitable for rooted and floating plants.
- 12.4.96 Only two species of plants listed on Schedule 9 of the Wildlife (NI) Order 1985 were identified in watercourses potentially interacting with the scheme where in-channel works are proposed;
- Nuttall's Pondweed/ Waterweed (*E. nutallii*); and
  - Canadian Pondweed/ Waterweed (*E. canadensis*).
- 12.4.97 Both pondweed species co-occurred at 2 sites; on the main River Bann from the lower Woodside Green location (site 15-17a) upstream to the Bowling Green and Irwins Mill (site 15-17b) (**Figure 12.18, Volume 4**). Nuttall's Pondweed alone occurred at three sites; on the main Annagh River at Olde Golf Links/ Annagh FC (site 3-impact), the hydrologically connected Ballyworkan Drain at Olde Golf Links and Annagh FC (site 3b-impact), and on the lower Annagh River at Annagh Hill Industrial Estate (site 5-impact; **Figure 12.18, Volume 4**). Canadian Pondweed alone occurred at two sites, from the middle to lower Ballybay River from Rose cottages (site 11-14a-impact) to Woodside Green at Ulster Carpets (site 11-14b-impact; **Figure 12.18**). The presence of both species at these specific locations corroborates the general distribution of both identified in the desk study; Canadian Pondweed was discussed as being widely distributed in watercourses of the scheme area, while Nuttall's Pondweed was considered more restricted to the main River Bann.

Table 12.13: Locations of AIS surveys covering the main FAS option locations where in-channel works are proposed.

Site ID	FAS options area covered	watercourse	Surveyed from		Surveyed to		Schedule 9-listed AIS presence & identity
3-impact	Site N Olde Golf Links / Annagh Football Club	Annagh River	301055	352346	301139	352216	Nuttall's Pondweed
5-impact	Site M Annagh Hill Industrial Estate	Annagh River	301540	353435	301231	353172	Nuttall's Pondweed
10-impact	Site S and A1 Corcrain Drive/ Mews	Ballybay	399650	354321	399825	354427	None
11-14a-impact	Site F and E Rose Cottages to Parkside	Ballybay & Garvaghy Drain	300567	354173	300725	354194	Canadian Pondweed
11-14b-impact	Site C Woodside Green/ Ulster Carpets	Ballybay River	301171	354485	301068	354378	Canadian Pondweed
15-17a-impact	Woodside Green (inc. Foundry St & Castle St.)	R. Bann	301227	354355	301283	354155	Nuttall's Pondweed; Canadian Pondweed
15-17b-impact	Site J Bowling Green & Site L Irwins Mill	R. Bann	301447	353886	301521	353708	Nuttall's Pondweed; Canadian Pondweed
18-impact	Site A Ashgrove Road	Drain - R. Bann	300764	355276	300747	355164	None
20-impact	Site P Derryvore Lane	Un-named drain	301807	356519	301889	356607	None
21-impact	Derryvore Lane	Un-named drain	301577	356371	301655	356497	None



## 12.5. Evaluation (Value of Resource or Sensitivity of Receptors)

12.5.1 Using the information assembled through the baseline condition assessment, the fisheries and aquatic ecological significance/sensitivity for the main watercourses potentially intersecting/ interacting with the scheme are shown in **Table 12.14**. As previously outlined in **Table 12.5**, a watercourse was deemed to have a High/ Very High sensitivity if its WFD class was at least Good and/or Annex II listed species were present (e.g. salmon, lamprey); Medium sensitivity was attributed to a watercourse with a WFD class of Moderate and/ or the presence of trout or suitable trout habitat, and/ or its occurrence at or upstream of a locally important fishery (coarse or game angling); Low/ Negligible sensitivity was determined for a watercourse if its WFD class was Bad/ Poor, salmonid fish were absent, and/ or habitat quality was unsuitable for salmonids. Note that although several watercourses were screened out after preliminary assessment, their sensitivity is included in **Table 12.14** and assessed as Negligible.

Table 12.14: Sensitivity of watercourses potentially interacting with the scheme. Sites in which watercourses were screened out after preliminary assessment are indicated in bold.

Site ID	FAS option name	watercourse	Key species/ receptors	WFD ecological quality class	Sensitivity
<b>Local sensitivity</b>					
2	<b>Site N2 The Fairways</b>	<b>Cusher Drain</b>	<b>screened out</b>	-	<b>Negligible</b>
3	Olde Golf Links/ Annagh FC	Ballyworkan Drain	unclassified salmonid habitat; chemical pollution	Bad	Negligible
4	<b>Site Q Ripley Mews</b>	<b>Kingsway Drive Drain</b>	<b>screened out</b>	-	<b>Negligible</b>
5	Site M Annagh Hill Industrial Estate	Annagh River	Unclassified salmonid habitat; chemical quality unsuitable for coarse fish species	Bad	Negligible/ Low
7	Site R Corcullentragh Road		Trout present; eels likely; moderate quality salmonid nursery habitat & resting pools		
8 & 9	Site S Corcrain Drive	Ballybay River	Trout present; salmonid habitat mainly grade 3 resting pools; eels likely; distant from FAS options	Moderate	Medium
10	Site A1 Corcrain Mews		Trout likely present; fair-moderate quality salmonid nursery; fair quality		

			salmonid spawning gravels; eels likely		
11	Site F Rose Cottages,				
12	Site E Parkside				
13	Site D People's Park	Ballybay River	Trout possibly present but habitat quality unclassified & grade 3 resting pools; eels likely present; roach fry & adults observed	Poor (PJA Ltd) Moderate (official WFD assessment)	Medium
14	Site C Woodside Green Upper				
15	Woodside Green (Ulster Carpets)				
16	Site H Castle St./ Site I Foundry St.				
17	Site J Bowling Green/Site L Irwins Mill	River Bann	Annex II Atlantic Salmon present (migration corridor); possible presence of Annex II river/Brook lamprey; trout present; diverse coarse fish community; Internationally renowned coarse fishery;	Poor (PJA Ltd assessment); Poor Ecological Potential (official WFD assessment)	Very High
18	Site A Ashgrove Road	Drain of River Bann	Screened out but AIS assessment only for in-channel works	-	Negligible
19	<b>Site B Derryanvil Road</b>	<b>Two farm drains of River Bann</b>	<b>screened out</b>	-	<b>Negligible</b>
20	Site P Derryvore Lane	Drain of River Bann	Screened out but AIS assessment only for in-channel works	-	Negligible
21	Derryvore Lane	Drain of River Bann	Screened out but AIS assessment only for in-channel works	-	Negligible
<b>Downstream sensitivity</b>					
		River Bann	Annex II Atlantic Salmon present (migration corridor); possible presence of Annex II river/Brook lamprey; trout present; diverse coarse fish community; Internationally renowned coarse fishery;	Poor Ecological Potential (official WFD assessment)	Very High

## 12.6. Impact Assessment

### Construction

- 12.6.1 Numerous structures and techniques are under consideration during the construction phase with the aim of minimising impacts to the surrounding area. The following construction operations are under consideration;
- raised flood embankments;
  - reinforced concrete walls;
  - landscaping;
  - sheet pile walling;
  - embedded walls;
  - raised footpath / walkways;
  - embedded cantilever wall;
  - secant piling;
  - culvert installation;
  - bridge works; and
  - fishing platform reinstatement.
- 12.6.2 These options will require various types of plant and the construction of piling rigs from both land and floating barges, use of excavators and earth movers, use of piling rigs and hammers, concrete pumps and delivery trucks, mobile cranes and barges. Various foundation types are required with the preferred method dependent on site conditions. The built-up nature of many of the sites means that there also will be a requirement for reinstatement and tying in of works to existing structures. Structure designs will adopt the Eliminate, Reduce, Inform, Control (ERIC) Framework to ensure that designs are integrated with the environment, are appropriate, and will reduce the risk of maintenance; once complete, maintenance will be the responsibility of DfI Rivers.
- 12.6.3 Therefore, the main activities and potential impacts associated with this phase of the scheme will be ground disturbance and the entrainment of sediments in surface water runoff and the risk of other pollutants associated with plant, machinery, and concrete pouring. Other potential impacts would be associated with the construction and operation of piling platforms and any temporary crossings which could obstruct or disturb fish passage, cause compaction of the riverbed, alter fish behaviour, and cause mortality of sensitive life-stages. Where construction of flood walls and piles involves hammers or drilling, there will be a risk of noise and vibration effects on sensitive life-stages of fish, including developing eggs and juveniles, and on the behaviour of other life-stages such as migratory adult fish. Finally, where in-channel works are proposed, there is a risk of the unintentional transfer and spread of AIS plants.
- 12.6.4 Potential impacts of the construction phase were therefore assessed to cover the discharge of suspended solids, release of other pollutants, temporary interruption of fish passage, removal/ mortality of fish, noise and vibration, and temporary interruption of access to anglers. Impact assessments are primarily based on their effect on salmonids given their greater sensitivity to environmental stressors, either directly or upon their habitats. However, these assessments would be equally relevant to eels and lamprey if present in these waters, and to cyprinid and percid fish species such as bream, gudgeon, roach, stone loach, rudd, pike and perch.
- 12.6.5 Impacts for each site are summarised in **Appendix 12.2 in Volume 3**.

## Sediment release and entrainment

- 12.6.6 Sediment, and in particular that of grain size <2mm, and more so <1mm (see Ref. 12.21), is the major cause of documented negative environmental impacts, particularly for construction projects that involve the installation of infrastructure at or near watercourses (Ref. 12.26; Ref. 12.23; Ref. 12.24). Salmonids such as brown trout and Atlantic salmon are highly vulnerable to suspended and deposited sediment in spawning gravels and nursery habitats (Ref. 12.25; Ref. 12.26). Suspended sediment can lower water clarity leading to reduced prey capture efficiency and may affect respiration rates by clogging of gills. In addition, suspended sediment can adsorb heat energy causing water temperatures to rise (Ref. 12.27). Deposited sediment, particularly in the form of fine silts and clays, can reduce habitat complexity and quality by in-filling of substrate, occlusion of water flow and inhibition of oxygenation of incubating eggs, and may indirectly reduce growth and survival by negatively impacting on habitat quality of fish prey species (Ref. 12.28; Ref. 12.21).
- 12.6.7 In contrast to salmonids, coarse fish species (cyprinids such as bream, roach, and tench; percids such as perch and pike), tend to broadcast their eggs, which adhere both to substrate and vegetation, and the species are generally better adapted than salmonid fish to habitats with high fine sediment background levels, lower oxygen levels, and higher temperatures (Ref. 12.29; Ref. 12.26). However, by causing light attenuation, increases in turbidity associated with suspended sediment can reduce habitat quality and area available for recruitment and use by fish species that prefer vegetation, and in particular juvenile life-stages that seek refuge in bankside marginal areas where sediment plume concentrations may be high during runoff incidents (Ref. 12.26). High levels of sediment also have the potential to reduce the viability of developing eggs by reducing oxygen exchange but would be expected to be more tolerant than would salmonid eggs.
- 12.6.8 Although adult salmonids are prone to gill-clogging and visual impairment at high levels of suspended sediment, they are much less reliant on substrate complexity, tending to occupy deeper pools, particularly during the spawning season. Adult salmonids (and also cyprinids and percids) also are more mobile than sessile egg or juvenile stages, and thus more capable of avoiding adverse local conditions (Ref. 12.26).
- 12.6.9 Freshwater benthic macroinvertebrates also are an important component of river ecosystems, acting both as sentinels of general water and habitat quality, and as a key food resource for higher trophic levels such as fish and birds. Pulses of fine sediment can cause invertebrate behavioural drift, whereas excessive fine sediment can reduce the quality of physical habitat by smothering and blocking of interstitial spaces and water flow (Ref. 12.30). As fine sediment infiltration increases, invertebrate abundance and community diversity is reduced, resulting in the replacement of sensitive taxa (mayfly, stonefly and caddis) by more tolerant types (worms, midge larvae, molluscs; Ref. 12.6; Ref. 12.26).
- 12.6.10 Fine sediment was historically managed by the water quality objectives and standards of the EC Freshwater Fish Directive 2006/44/EC (FWFD), where a mean total suspended solids (TSS) concentration of 25 mg/L was specified for salmonid and cyprinid waters. While Article 6 of the Water Framework Directive has now repealed the FWFD, new standards that provide the same level of protection have been proposed (Ref. 12.31). There is no national environmental standard or guideline for deposited fine sediment in the United Kingdom. However, fine sediment above a threshold bed cover of 20%, based on recommendations in New Zealand by Clapcott *et al.* (Ref. 12.9), and published research (e.g. Ref. 12.32; Ref. 12.26), provides a general indication of increasing risk to habitat quality, viability, and survival of both invertebrates and fish.
- 12.6.11 Potential sources of fine sediment during the construction phase would include:
- construction and removal of bank-based piling platforms;
  - construction and removal of temporary crossing or plant platforms in watercourses and associated movement of plant machinery;
  - soil and vegetation clearance;
  - plant movement along river banks;
  - reinstatement of bank soils and vegetation;

- run-off from spoil storage and overlying road;
- water over-pumping and discharge of sediment laden water back to the watercourse; and
- installation of sheet piling or coffer dams.

- 12.6.12 Given the assessment of fisheries and aquatic ecological sensitivity outlined in Table 12.14, fine sediment would have a greater impact at watercourses potentially interacting with the scheme locations that are of at least Medium sensitivity and where fish species that are more sensitive, such as salmonids, are present/likely to be present. Construction activity occurring directly upstream of, or adjacent to, a sensitive reach, such as in the Ballybay/ Corcrain River (sites 7-15 inclusive), could have more severe adverse effects by causing direct reductions in trout abundance (e.g. see Ref. 12. Ref. 12.42) or significant siltation of riverbed habitat; as per DMRB guidance, this would equate to **Moderate** magnitude of impact (**Appendix 12.2, Volume 3, Table 1**).
- 12.6.13 For scheme locations that are likely to interact with the main channel River Bann (sites 15-17, including lower Woodside Green, Foundry & Castle St., Irwins Mills and Bowling Green), and where overall sensitivity was assessed as Very High, the most severe effects arising from sediment run-off are likely to be on specific migratory stages of sensitive fish species. For example, spawning and nursery habitat for Annex II Atlantic salmon and lamprey spp., and Brown trout (including migratory Lough Neagh dollaghan), all would occur distantly upstream of the proposed scheme in fast flowing shallower reaches where there is a good mix of clean cobble and gravel in the riverbed and so there is no risk to these life stages from fine sediment input. However, a major fine sediment pulse has the potential to impact on the behaviour and physiology of any migratory fish species moving upstream or downstream adjacent to the works area. If such an event occurred, the pulse would be expected to adhere more closely to the river channel side adjacent to the works with a gradual dispersal with increasing distance downstream. If a sediment input event occurred in tandem with a major upstream run of migratory adult salmon and dollaghan or the downstream movement of smolts, this could cause some temporary change in behaviour with, at worst, a small change in the abundance of fish that is more likely to affect sensitive smolts; as per the DMRB guidance, this would correspond to an at worst impact of **Minor** magnitude. The magnitude of impact on coarse fish species such as perch, gudgeon, roach, bream, pike and eels, is likely also to be **Minor** because, despite potentially greater tolerance to sediment than salmonid fish given their association with weedy habitat and more silted riverbed and water column conditions, these species are likely to be locally resident most of the year, with egg and juvenile stages present within the extent of the scheme and so would have greater temporal exposure to scheme effects.
- 12.6.14 Of the remainder scheme locations, sites 3, 5 and 6 (Old Golf Links/ Annagh FC, Annagh Hill Industrial Estate, and Health Centre) have the potential to interact with the Annagh River but overall sensitivity was assessed as Negligible/ Low. While there is a possibility that fish species such as roach would use the very limited open area habitat in the Annagh adjacent site 3, this is tempered by the very poor habitat quality at these locations, coupled with a WFD-based status of Bad, and locations with severe organic pollution (sites 5 and 6). As such, sediment release to the Annagh is unlikely to be of sufficient magnitude to affect the integrity of the rivers use (as per DMRB) and would equate to an impact of **Negligible** magnitude (**Appendix 12.2, Volume 3, Table 1**).
- 12.6.15 All of the remaining watercourses potentially interacting with the scheme that were either screened out from further assessment, or were screened out but required assessment of AIS only because of proposed in-channel works, were assessed at Negligible sensitivity (sites 1, 2, 4, and 18-21). All had baseline levels of high channel bed siltation and so an impact of sediment of no more than **Negligible** magnitude is expected.

### Release of other pollutants

- 12.6.16 All proposed flood defences potentially adjacent to or within watercourses pose a risk of the release of other pollutants such as hydrocarbons (spillage of diesel, petrol, oils and lubricants) and concrete slurries associated with plant use, liquid storage and concrete wall reinforcement. Hydrocarbons can have large impacts on fish and aquatic species and on watercourses downstream, ranging from reducing oxygen exchange at the water-air interface or through causing direct mortality of invertebrates and fish (Ref. 12.33). The release of other pollutants could potentially cause impacts of **Major** magnitude at all sites of at least Medium sensitivity and additionally on downstream receiving habitats in the main channel River Bann

(Appendix 12.2; Table 1). Impacts of **Moderate** magnitude at sites of Negligible to Low sensitivity are expected; such effects are greater than would be expected from sediment because of direct toxicity and greater environmental persistence.

### Removal / loss of sensitive species

12.6.17 The potential for the removal or loss (by causing mortality) of sensitive species within watercourses is likely where there is excavation or disturbance of the riverbed to install culverts, conduct bridge works/ repairs, install walls/ sheet piling, and other hard defences. For example, any coffer-damming to isolate works areas from open water will involve installation of sheet piles/ cofferdam, pumping out of water, working in the dry and followed by removal of coffering. Locations where there is potential for any in-channel works to have an impact on sensitive species are at sites of at least Medium sensitivity. For benthic macroinvertebrates, the impacts are likely to be very localised and of **Negligible** magnitude because of the restricted area of excavation coupled with the likelihood of rapid recolonization of invertebrates from upstream, a commonly observed trait (Ref. 12.30). However, impacts of **Minor** magnitude could occur at all sites of at least Medium sensitivity where trout and or lamprey/ eels or other fish species are present because effects may be short-term and cause minor alterations to fish population abundance (**Appendix 12.2, Volume 3, Table 1**). At sites of lower sensitivity, effects are likely to be **Negligible** either due to the lack of suitable salmonid habitat or the low suitability even for coarse fish species.

### Temporary obstruction of fish passage

12.6.18 Poor management of works adjacent to watercourses or at crossing points may lead to obstruction of the channel during periods of fish migration and spawning. It is intended to install culverts at three main locations and if these are across the full channel width, may cause obstruction. The proposed culvert locations are:

- Site 5 - Annagh Hill;
- Site 18 – Ashgrove Rd; and
- Sites 20-21 – Derryvore Lane.

12.6.19 However, temporary obstruction of fish passage is highly unlikely in any of these aforementioned sites because of the expected lack of migratory fish species with most of these watercourses characteristic of straightened, sluggishly flowing and heavily silted land drains. However, although the Annagh River at Annagh Hill was of very poor physical habitat and chemical quality, there is the possibility that installation of a structure would cause temporary obstruction of the movement of roach if present. Given the poor habitat quality both upstream and downstream of Annagh Hill, this is unlikely to be of sufficient magnitude to cause alteration to fish population levels and so is assessed at **Negligible (Appendix 12.2, Volume 3, Table 1)**. At no other location is there potential for obstruction of the full channel width and so no impacts are expected.

### Noise and vibration

12.6.20 This potential impact is specific to activities that involve percussive blows associated with the installation of sheet and general piling. Vibration and noise associated with percussive activities such as vibratory or impact hammers has the potential to disrupt migratory behaviour or cause injury to sensitive fish species such as salmon, trout, lamprey, and eels, and may impact on coarse fish species. Flood defence walls are proposed at a number of sites where these fish species are present, with the locations proposed occurring at the river's edge or set just outside of the river corridor but running parallel. All of these fish species are present in the main River Bann, while trout and coarse fish species are also present within the Ballybay/ Corcraun River.

12.6.21 An in-depth study and review by Parvin *et al.* (Ref. 12.34) measured the level of underwater noise and vibration generated during Horizontal Directional Drilling (HDD) for the installation of a gas pipeline beneath the bed of the River Wye. Based on the noise generated during drilling, and on the sound perception of test fish species, the predicted magnitude of impact was from Neutral to Negligible, and was associated with behavioural avoidance in a few individuals of a population of a sensitive species with specialist hearing

abilities, such as Shad (*Alosa spp.*, potentially present in the Foyle estuary) to a low likelihood of disturbance for a hearing generalist such as Atlantic salmon (Ref. 12.34). It is noteworthy that lamprey have a similar noise perception threshold as for salmon (see Ref. 12.35), and so the same low likelihood of disturbance is expected. Migrating silver eels have been shown to avoid localised, very low frequency sounds in a river (Ref. 12.36).

- 12.6.22 The transport and handling of fish eggs during culture, and pile driving and controlled explosions during mining and quarrying, are examples of mechanical shock that has caused mortality in salmonid eggs (Ref. 12.37; Ref. 12.38). The magnitude of impact of pile driving could therefore be similar but would be of greater magnitude than the risks of noise to free-swimming fish considered above. Piling involving percussive blows therefore has the potential to cause mechanical shock and vibration and while no localised salmon, trout, or lamprey spawning would occur in the main section of the River Bann adjacent proposed hard defences, marginal spawning by roach, bream and possibly perch will occur. In addition, in the main Ballybay/ Corcrair River, trout spawning also is possible at several scheme locations including Corcullentragh Road and Corcrair Mews. As per DMRB guidance, a high risk of very localized mortality of incubating eggs would equate to a **Minor** magnitude of impact at sites of at least Medium sensitivity; i.e. where habitat is either considered suitable for salmonid spawning (Ballybay River at Corcullentragh Road and Corcrair Mews) and piling takes place during a period when eggs are present in riverbed materials i.e. Oct-Mar, or where marginal spawning of coarse fish species is likely (River Bann) and piling takes place when eggs are developing i.e. May to June.

### Temporary Interruption of access for recreational anglers

- 12.6.23 This potential impact could occur where there is a likelihood that construction activity will disturb or interrupt walking access to recreational angler stands and is likely only to be of concern along the main River Bann where works are scheduled from Castle Street to Bowling Green upstream given the presence of angler stands on the true left bank. All public fishing stands along the Castle Street to Bowling Green section will be preserved as is and no interruption to access is anticipated (Amey, pers. comm.). In the unlikely event that access is interrupted due to construction activities to an angling stand, the stand will be replaced like-for-like.

### Movement/ unintentional spread of AIS

- 12.6.24 The accidental or unintentional spread of AIS can occur during excavations of watercourse channels with subsequent release of propagules via dislodgement to downstream watercourses, movement of aquatic plants in excavated spoil heaps to storage/ disposal sites adjacent or connected to other watercourses, and movement of plant and machinery that vector AIS to uninfected locations. Canadian Pondweed and Nuttall's Pondweed were the only Schedule 9-listed AIS at watercourses where in-channel works are proposed. Though Nuttall's Pondweed appears to be increasing in distribution, Canadian Pondweed is declining and possibly being displaced by the former. While these species were identified on the main River Bann in the vicinity of sites 15-17 (Woodside Green, Foundry St., Castle St., Irwins Mill and Bowling Green), in the Ballybay River (sites 11-14 – Rose Cottages to Parkside), and in the Annagh River (sites 3 & 5 – Olde Golf Links/ Annagh FC and Annagh Hill Industrial Estate), they are already widely established in the River Bann and associated drainage rivers within the scheme area. Therefore, while there is potential to spread both species during any in-channel works to connected or downstream watercourses, both species' establishment means that any further propagule release would be highly unlikely to further affect the integrity of the water environment in potentially interacting watercourses and as such **No Impact** locally is expected.
- 12.6.25 There remains a risk, however, of accidental transfer of both Pondweed species from each site to uninfected locations unless appropriate mitigation is implemented. Both species thrive in nutrient rich waters and can form dense monocultures thus impacting on local diversity and out-competing native species. Both species also act as metal ion pumps, whereby they absorb metals from sediment and release these into the water column. In a broad-scale study of impacts of *E. nuttallii* on native freshwater plant, algae and invertebrate communities, no difference in the biomass of species richness of invertebrates was detected while there was an increase in macrophyte species richness and cover with percentage cover of *E. nuttallii* (Ref. 12.39). Only native charophytes were negatively correlated with *E. nuttallii* cover. In contrast, in a risk assessment of impacts of *E. nuttallii* in Ireland, the effect of the species on displacement of native plants through light shading was considered moderate while the potential for economic loss (due to impacts on angling, boating, drainage and flooding, and power generation) was considered major (Ref. 12.41). The magnitude of impact

of accidentally releasing propagules to uninfected locations of high value (e.g. important recreational fisheries, navigation ways, watercourses with high charaphyte component or biodiversity value) is therefore likely to be at worst **Moderate** because it could result in an effect on the integrity of an attribute or loss of part of the attribute (as per Table 12.6).

### Operation

- 12.6.26 Post-construction (operational) impacts include loss and decline in quality of fish and invertebrate habitat at installed hard defence locations, culverts, or where bank-side tree cover and vegetation is lost, obstruction of angler access/ use of resource, and permanent obstruction of fish passage (where new culverts are installed).

### Loss or decline in habitat area or quality

- 12.6.27 Installation of culverts, or temporary erection of piling platforms, has the potential to cause compaction of the riverbed habitat (even though any piling platforms will be removed subsequent to any works). Although new culverts, or extensions to existing culverts, are planned at Annagh Hill, Ashgrove Road and Derrymore Lane, given the already poor baseline habitat quality and limited area, any loss in habitat will be of **Negligible** magnitude (**Appendix 12.2, Volume 3, Table 2**).
- 12.6.28 Where flood walls are installed as embedded concrete structures or steel sheet piling and placed directly adjacent to the edge of a watercourse, there is potential for a minimal loss of marginal habitat for fish and invertebrates when compared to the wide margins present (e.g. main River Bann). However, clearance of riparian vegetation and trees to facilitate works and placement of hard defences, may permit increased light penetration and reduce shading that serves to provide a physical refuge and enhance marginal or whole-channel width habitat quality. In addition, the loss of riparian vegetation removes a potential source of invertebrate food for fish, particularly juveniles that tend to occupy marginal areas where there is better cover and refuge from predation, and is of particular importance in the main River Bann where marginal areas are key nurseries for various coarse fish species.
- 12.6.29 In most watercourses where flood defences are proposed, fish habitat is poor, with fish likely to be absent and aquatic ecological quality or potential also very poor. Therefore, the impacts of the scheme on habitat loss at most sites (i.e. Negligible to Low sensitivity) will be of **Negligible** magnitude (**Appendix 12.2, Volume 3, Table 2**). Where hard defences will be closely adjacent to a watercourse edge or encroaching into the edge of the channel, impacts are likely only through loss of riparian bank vegetation and at sites where the riparian zone supplies cover and food for trout and various coarse fish species and juveniles, such as in the Ballybay River at Corcullentragh, Corcraun Mews, Peoples Park, and Woodside Green (Ulster Carpets), and the main River Bann from Castle Street to Bowling Green (incl. Irwins Mill and Foundry St.). Close proximity of the hard defences to the channel edge of these watercourses, coupled with expected removal/ clearance of vegetation, could have an impact of **Moderate** magnitude. For example, as per guidance adapted from the DMRB (see Table 12.6), these channel lengths are extensive and if habitat loss or change in quality affects juvenile nursery and survival/ recruitment to the local population, changes in fish abundance or food availability could impact productivity over the medium term (1-5 years).

### Permanent obstruction of fish passage

- 12.6.30 Installation of new, or extension of existing, culverts is planned at three locations:

- Site 5 - Annagh Hill;
- Site 18 – Ashgrove Rd; and
- Sites 20-21 – Derrymore Lane.

- 12.6.31 However, there is no potential for permanent obstruction of fish passage at Ashgrove Road or Derrymore Lane because of the very poor fisheries habitat quality. Although there is some potential for roach presence in the Annagh River at Annagh Hill, this potential is low given the limited open water habitat and obvious pollution; at worst, obstruction of roach movements within the channel could cause a partial loss in productivity of the population because the close downstream proximity of the River Bann, which may act as a key local population source “pool” of colonists linking roach upstream and downstream within the Annagh



River, could be cut-off. Therefore, the magnitude of impact could be at worst **Moderate (Appendix 12.2, Volume 3, Table 2)**.

### **Obstruction/ interruption of angler access**

12.6.32 A number of fishing stands occur along the main River Bann in the following locations:

- Castle Street – between Shillington’s Bridge and Bridge Street on the true left bank;
- Foundry Street – single private stand on the true right bank; and
- Bowling Green – upstream of Bridge Street on the true left bank.

12.6.33 At Castle Street, hard defences are proposed on the town side of the pedestrian towpath and so no impacts on angler access are expected. At Bowling Green, ca. 330m of embedded wall is proposed but this will be installed on the town side of the river channel with the main pedestrian path nearer the river. All public fishing stands along the Castle Street to Bowling Green section will be preserved as is and no interruption to access is anticipated (Amey, pers. comm.). Again, in the unlikely event that any fishing stand requires replacement, this will be undertaken on a like-for-like basis so that no long-term obstruction to angler access will occur.

12.6.34 At Foundry Street, approximately 160m of steel sheet piling is proposed at the channel edge while an additional ca. 100m of embedded wall will run towards Shillington’s Bridge parallel to the main river channel but gradually moving further away from the channel edge. It is intended to preserve the private fishing stand at Foundry Street and, as part of embedded mitigation, access steps are proposed to facilitate angler access over the steel sheet pile wall. As such, there will be **no impact** on angler access to this section of the river.

## **12.7. Mitigation**

### **Construction**

12.7.1 Mitigation for fisheries and the aquatic environment are also included within the CEMP, in **Appendix 6.2, Volume 3**.

### **Sediment release and entrainment**

#### **Timing of works**

12.7.2 For sites where sensitive fish are present (i.e. at least Medium sensitivity), the proposed scheme will avoid any in-channel construction or works within the channel edge (e.g. that may cause riverbed disturbance) between 1<sup>st</sup> October to 30<sup>th</sup> April. This is the period for key fish migrations (e.g. adult salmonids/ lamprey, elvers; downstream migrations of silver eels, salmonid smolts) and when sensitive life-stages may be present within riverbed substrate (incubating eggs/ fry). Overlap across life-stage and species migration periods precludes a period when there is a zero risk. DAERA IFD require that any in-channel works should be conducted between 1<sup>st</sup> May and 30<sup>th</sup> September. This mitigation will apply to scheme locations on the Ballybay/ Corcrair River where hard defences may be installed in or within close proximity to the river channel as follows:

- Corcullentragh Road;
- Corcrair Mews;
- People’s Park; and
- Woodside Green/ Ulster Carpets.

12.7.3 For the main channel River Bann (Very High sensitivity), which is a key river corridor for the migration of Atlantic salmon, dollaghan, brown trout, eel and lamprey, installation of hard defences in close proximity or within the channel edge, will be avoided between July and September, the main period for upstream

migration of adult salmonids. In-channel works also will be avoided during the critical period for downstream migration of salmonid smolts, between April and May. This timing mitigation will be extended to account for potential spawning in marginal areas by coarse fish species such as roach, which would occur between May and June. Therefore, marginal channel works will be avoided in the River Bann between April and September at the following locations:

- Foundry Street; and
- Irwins Mill.

### **Construction phase drainage design**

12.7.4 A temporary drainage scheme, for example, based on the principal of Sustainable Drainage (SuDs) will be developed by the contractor to manage surface water run-off from construction areas, including those distant from main river channels. For example, run-off may be conveyed by small drains with low sensitivity that are linked to more sensitive rivers such as the Ballybay and main River Bann. Any treated discharges will be consented through DAERA NIEA and so a design that includes measures such as ground infiltration, settlement ponds, and silt fencing will be important. Additionally, the contractor will prepare an emergency response plan based on the guidance outlined in GPP21 Pollution Incident Response Plan (<https://www.netregs.org.uk/media/1436/gpp-21-final.pdf>). The emergency response plan will outline how instances of the spillage/ discharge of sediment and other pollutants will be managed. The emergency response plan will be included as part of the Construction Environmental Management Plan (CEMP) (**Appendix 6.2, Volume 3**).

### **Release of other pollutants**

#### **Industry Best Practice**

12.7.5 All precautions will be taken to avoid spillages of diesel, oil or other polluting substances during the construction phase. This will be achieved through implementation of good site practices as described in the Good Practice Guidance (GPP) notes (<https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list/>), including but not limited to the following;

- GPP1: Understanding your environmental responsibilities – good environmental practices;
- GPP2: Above ground oil storage tanks;
- GPP5: Works and maintenance in or near waters;
- PPG6: Working at construction and demolition sites;
- GPP8: Safe storage and disposal of used oils;
- GPP21: Pollution incident response planning;
- GPP22: Dealing with spills; and
- GPP26: Safe storage – drums and intermediate bulk containers.

12.7.6 To prevent pollution of watercourses by oils, fuels, grease and concrete, the following mitigations will be included in the CEMP;

- as per GPP5 Works and Maintenance in or Near Water, a minimum 10m distance from any watercourse will be maintained for all activities
- drip trays for standing plant;
- storage of fuels / oils in designated bunded areas (110% capacity of stored volume) with impervious base;

- refuelling points distant from watercourses;
- oil absorbers and grab packs available on all plant; and
- washout of concrete plant to occur in designated areas and into lined skips/ pits to prevent egress to watercourses.

## **Removal / loss of sensitive species**

### **Timing of works**

12.7.7 Based on the requirements of DAERA IFD, in-stream works at sites where trout or other sensitive fish species may be present (e.g. lamprey and eels), will be conducted between 1<sup>st</sup> May and 30<sup>th</sup> September to avoid the more critical salmonid spawning migration and egg incubation phases (DCAL, undated).

### **Species rescue and translocation**

12.7.8 At all sites where fish are present and in-channel works are possible (e.g. Ballybay River and marginal areas of the main River Bann), fish recovery and translocation will be conducted prior to construction activity. The timing of translocations should occur as closely as possible to that of the specific construction activity to avoid fish returning to the area of in-channel works. This mitigation will be implemented if cofferdams or other in-channel works are required at any site of at least Medium sensitivity as follows;

Ballybay River at the following locations:

- Corcullentragh Road;
- Corcraun Mews; and
- People's Park.

12.7.9 And at the following locations on the main River Bann:

- Foundry Street; and
- Irwins Mill.

12.7.10 In the Ballybay River, sensitive fish species will be surveyed via electrofishing immediately upstream, within, and downstream of the proposed works area, and translocated much further downstream. Species removal will also be conducted upstream of any damming and fluming areas if water over-pumping is required so that the surveyed area encompasses the proposed flume / open-cut excavation and any upstream pump intake areas. In the main channel River Bann, if marginal areas are to be isolated prior to installation of sheet piling or embedded walls, the areas should first be surveyed for fish species using a combination of electrofishing (shallower areas) and seine netting (deeper areas). After installation of piles to isolate riverbed areas, further electrofishing of the area for water pumping would be required, followed by translocation of any fish species recovered.

12.7.11 A Section 14 Permit will be required from DAERA IFD to conduct fish surveys and translocations and should be applied for well in advance of any proposed works (up to 6 weeks prior). Where multiple locations require fish removal and translocation, all sites will be listed on the Section 14 Permit application. Generally, granting of Section 14 Permits will only allow fish removal works between July 1<sup>st</sup> and September 30<sup>th</sup>. Where there is the possibility of lamprey spp., including ammocoete larvae (e.g. Ballybay River and River Bann margins), a wildlife licence issued by DAERA NIEA will be required for survey and translocation and again would need to be applied for up to 6 weeks in advance of works commencement.

## **Temporary obstruction of fish passage**

### **Culvert design**

12.7.12 While the three locations where new culverts or culvert extensions are proposed have very low fisheries value, temporary structures will be designed in accordance with UK's CIRIA Guidelines for maintaining

passage at culverts (see Ref. 12.40) so that in the event of future potential improvement in habitat quality for fish, longitudinal connectivity is maintained. The following key points are relevant to maintaining fish passage;

- the avoidance of a significant drop in water level at the inlet or outlet;
- provision of adequate flow and depth for fish passage;
- provision of a natural bed; and
- the avoidance of a local increase in flow velocities.

12.7.13 Temporary culverts/flumes/structures will be installed so that gradient, water depth and flow velocities are as similar as possible to the original channel. The contractor will be required to agree the design of any temporary in-channel structures with DAERA Inland Fisheries Division via a Section 46 permit application.

## **Noise and vibration**

### **Timing of works**

12.7.14 For any piling works adjacent to or within the channel margins of the main River Bann (e.g. Castle Street, Bowling Green, Foundry St and Irwins Mill), works will be avoided during the following period;

- April to September (adult salmon migration, bream roach spawning, smolt downstream migration).

12.7.15 For any piling works required at other sites of at least medium sensitivity (Ballybay River at Corcullentragh Rd, Corcraun Mews, Parkside), works will be avoided during the following period;

- October-April (trout spawning and egg incubation period).

12.7.16 Outside of these sensitive periods, the use of vibrohammers, as opposed to percussive type impact drivers that are likely to cause greater shock, is recommended for any piling works adjacent to water.

## **Movement/ unintentional spread of AIS**

12.7.17 In Northern Ireland, the main legislation relating to the control of non-native species is the Wildlife (Northern Ireland) Order, 1985 (as amended). Both Canadian Pondweed and Nuttall's Pondweed are included on Schedule 9 Part II of the Order. Under this legislation it is illegal to knowingly cause the spread of any non-native plant. Therefore, at sites identified as having Canadian Pondweed and Nuttall's Pondweed (where in-channel works are proposed), it is important to consider potential pathways of spread of both plants to other uninfected locations and for on-site biosecurity measures to be put in place in order to ensure that plant propagules do not leave the site via machinery or personnel. All contractors will be fully briefed on the location of sites containing non-native aquatic plant species and they will be made aware of what each species looks like. This will be achieved through 'toolbox' talks prepared by the Ecological Clerk of Works (ECoW) appointed to oversee the construction activities at sites with non-native plant species present.

12.7.18 At sites where non-native species are known to be present, on-site biosecurity measures will include:

- the use of designated machinery / equipment to prevent movement from one site or waterbody to another;
- the inspection of vehicles before moving them from site to site or off site;
- wash facilities suitable for both machinery (pressure-washing/ Virkon) and personnel (footbaths);
- spoil / soil generated at target sites and / or water left after vehicles have been pressure-washed must be contained, collected and disposed of appropriately. This would involve disposal at a landfill site that is licenced to accept non-native plant species; and
- all chemicals used for the control of non-native species should be stored and used in a responsible manner.

## Operation

### Loss or decline in habitat area or quality

- 12.7.19 The main locations where habitat loss is likely to impact on fisheries and aquatic ecology is the Ballybay/ Corcraun and main River Bann owing to removal of riparian vegetation for hard defence installation.

### Riparian zone reinstatement and enhancement

- 12.7.20 Reinstatement of riparian vegetation using a grass-seeded membrane will be implemented to facilitate rapid growth and stability of the bank. Replanting of bank areas to provide shading/ cover (and a potential food source) will be undertaken where possible to offset any trees removed. For example, along the bank adjacent to Irwin's Mill, clearance of any trees for hard defence construction will be followed by replanting of trees; preferred tree species are birch, alder and willow given their native status, suitability as riparian zone trees, and their potential for rapid reestablishment and growth.

### Permanent obstruction of fish passage

#### Culvert design

- 12.7.21 As indicated earlier, the three locations where new culverts or culvert extensions are proposed have very low fisheries value. The only potential impact of a poorly designed and installed culvert would be to prevent connectivity of sub-populations of roach in the Annagh River at Annagh Hill. Permanent culverts or extensions will be designed and installed according to CIRIA Guidelines for maintaining passage at culverts (see temporary obstruction of fish passage above).

### Permanent obstruction of angler access

#### Angler access

- 12.7.22 Subsequent to the erection of hard defences and completion of all site works, an embedded mitigation is the installation of steps over flood walls at Foundry Street; as such, there will be no impact on permanent obstruction to angler access here.

## 12.8. Residual Effects

### Construction

#### Sediment release and entrainment

- 12.8.1 Without mitigation, the effects during the construction phase for watercourses draining or potentially interacting with the scheme locations, are predicted to be, at worst, of **Moderate Magnitude** and of **Moderate Significance**, depending on specific effects and the sensitivity of individual watercourses e.g. the release of sediment to the main River Bann, as a watercourse with Annex II Atlantic salmon and lamprey spp., trout presence, and a diverse coarse fish community. Implementation of the full range of recommended mitigations is expected to reduce the risks associated with sediment input for the construction phase. Overall, the **residual effects** in this regard are predicted to be of **Negligible magnitude** and of **Neutral significance (Appendix 12.2, Volume 3, Table 1)**.

#### Release of other pollutants

- 12.8.2 Without mitigation, the effects during the construction phase for watercourses draining or potentially interacting with the scheme locations, are predicted to be, at worst, of **Major Magnitude** and of **Very Large Significance**, depending on specific effects and the sensitivity of individual watercourses e.g. the release of hydrocarbons to the main River Bann. Implementation of the full range of recommended mitigations is expected to reduce the risks associated with the release of other pollutants during the construction phase. Overall, the **residual effects** in this regard are predicted to be of **Negligible magnitude** and of **Neutral significance (Appendix 12.2, Volume 3, Table 1)**.

### Removal/ loss of sensitive species

- 12.8.3 Without mitigation, the effects during the construction phase for watercourses draining or potentially interacting with the scheme locations, are predicted to be, at worst, of **Minor Magnitude** and of **Slight Significance**, depending on specific effects and the sensitivity of individual watercourses e.g. the removal of sensitive life-stages of trout in the Ballybay River at Corcrain Mews. Implementation of the full range of recommended mitigations is expected to reduce the risks associated with the removal/ loss of sensitive species during the construction phase. Overall, the **residual** effects in this regard are predicted to be of **Negligible magnitude** and of **Neutral significance (Appendix 12.2, Volume 3, Table 1)**.

### Temporary obstruction of fish passage

- 12.8.4 Without mitigation, the effects during the construction phase for watercourses draining or potentially interacting with the scheme locations, are predicted to be, at worst, of **Negligible Magnitude** and **Neutral Significance**, e.g. Annagh River at Annagh Hill. Installation of culverts as per CIRIA guidelines will secure further potential passage for fish, however, overall the **residual** effects in this regard will remain of **Neutral significance (Appendix 12.2, Volume 3)**.

### Noise and vibration

- 12.8.5 Without mitigation, the effects during the construction phase for watercourses draining or potentially interacting with the scheme locations, are predicted to be, at worst, of **Minor Magnitude** and **Moderate/ Large Significance**, e.g. main River Bann at Foundry St. and Irwins Mills. Implementation of the full range of mitigations is expected to reduce the risks associated with noise and vibration during the construction phase. Overall, the **residual** effects in this regard are predicted to be of **Negligible magnitude** and of **Neutral significance (Appendix 12.2, Volume 3, Table 1)**.

### Movement/ unintentional spread of AIS

- 12.8.6 Without mitigation, the effects during the construction phase for watercourses draining or potentially interacting with the scheme locations, are predicted to be, at worst, of **Moderate Magnitude** and **Moderate/ Large Significance**, e.g. accidental translocation of Nuttall's or Canadian Pondweed to uninfected watercourses at most sites where in-channel works are proposed. Implementation of the full range of mitigations is expected to reduce the risks associated with movement/ unintentional spread of AIS during the construction phase. Overall, the **residual** effects in this regard are predicted to be of **Negligible magnitude** and of **Neutral significance (Appendix 12.2, Volume 3, Table 1)**.

### Operation

#### Loss or decline in habitat area or quality

- 12.8.7 Without mitigation, the effects during the operational phase for watercourses draining or potentially interacting with the scheme locations, are predicted to be, at worst, of **Moderate Magnitude** and **Large Significance**, e.g. removal or compaction/ disturbance of a large length of riparian vegetation along the banks of the main River Bann to facilitate hard defence installation. Implementation of the full range of mitigations is expected to reduce the risks associated with loss or decline in habitat quality or area during the operational phase. Overall, the **residual** effects in this regard are predicted to be of **Negligible magnitude** and of **Neutral significance (Appendix 12.2, Volume 3, Table 2)**.

#### Permanent obstruction of fish passage

- 12.8.8 Without mitigation, the effects during the operational phase for watercourses draining or potentially interacting with the scheme locations, are predicted to be, at worst, of **Moderate Magnitude** and **Slight Significance**, e.g. obstruction of fish passage in the Annagh River at Annagh Hill impacting on roach population connectivity. Implementation of the full range of mitigations is expected to reduce the risks associated with obstruction of fish passage during the operational phase. Overall, the **residual** effects in this regard are predicted to be of **Negligible magnitude** and of **Neutral significance (Appendix 12.2, Volume 3, Table 2)**.

### **Obstruction/ interruption of angler access**

- 12.8.9 Due to the inclusion of design embedded mitigations that will permit angler access (e.g. steps over flood walls at Foundry Street; replacement of stands on a like for like basis if removed during construction), there will be **no impact** on obstruction of angler access during the operational phase (**Appendix 12.2, Volume 3, Table 2**).

## **12.9. Monitoring**

- 12.9.1 Mitigation measures will be monitored as set out in the CEMP. No additional monitoring for the construction or operational stages is required as no significant effects are anticipated with mitigation.

## **12.10. Summary**

- 12.10.1 This chapter uses a combination of desk and field-based surveys to assess the fisheries and aquatic ecological sensitivity of watercourses draining and potentially interacting physically with a number of proposed hard defences for the Portadown FAS.
- 12.10.2 Based on desk and field studies, it was shown that most watercourses have Negligible/ Low fisheries and aquatic ecological sensitivity. Watercourses with greatest sensitivity are the Ballybay/ Corcraigh River (trout, coarse fish species, Moderate WFD-based ecological quality) and the main River Bann (Annex II Atlantic Salmon present (migration corridor); possible presence of Annex II river/ Brook lamprey; trout present; diverse coarse fish community; Internationally renowned coarse fishery; WFD-based status Poor Ecological Potential).
- 12.10.3 The main potential impacts of the scheme during the construction phase are sediment release, the release of other pollutants, removal/ loss of sensitive species, temporary obstruction of fish passage, noise and vibration, and unintentional spread/ release of AIS. Together, the design of the scheme and implementation of the full range of recommended mitigations will ensure that the scheme's effects during the construction phase are reduced from, at worst, Major magnitude and Very Large significance to residual effects of Neutral significance.
- 12.10.4 The main potential impacts of the scheme during the operational phase are loss/ decline in habitat quality/ area, permanent obstruction of fish passage, and permanent obstruction of angler access. Together, the design of the scheme and implementation of the full range of recommended mitigations will ensure that the scheme's effects during the operational phase are reduced from at worst Moderate magnitude and Large significance to residual effects of Neutral significance.

## 13. Soil and Land Contamination

### 13.1. Introduction

13.1.1 The purpose of this chapter is to assess the risks to receptors from existing land contamination in the vicinity of the proposed flood defences.

13.1.2 The aims of this assessment are to:

- Outline the baseline conditions, identify contamination sources and receptors and assess the risk to identified receptors.
- Where appropriate, propose mitigation measures to address any potential risks upon receptors associated with areas of contaminated land.
- Assess the residual risk to receptors with the proposed mitigation in place.

13.1.3 This assessment includes only those eight sites identified at scoping stage which had moderate or high risk of potential land contamination as set out in the preliminary desk studies by Amey. These were then expanded by Tetra Tech to provide a Preliminary Risk Assessment (PRA) for each of these eight sites and the reports are included as **Appendix 13.1 in Volume 3**.

13.1.4 The assessment of land contamination is based on the development of a conceptual site model and the potential risk to receptors based on a comparison of contamination levels against relevant screening criteria. This assessment is based on the information contained within the Tetra Tech Generic Quantitative Risk Assessment reports (Ref 13.1), which are included as **Appendix 13.2 in Volume 3**.

#### Scoping of soils, geology, hydrogeology and land contamination

13.1.5 A scoping report was produced by Amey in 2020 which identified the baseline conditions and potential impacts on soils, geology and hydrogeology as well as land contamination. As the majority of the flood defences are located within the town centre of Portadown, impacts on urban soils were scoped out as being not significant. For the rural sites on the outskirts of the town, it was considered that given the small footprint of the flood defences and that geo-technical design would ensure adverse impacts on drift and agricultural soils would be minimised, no significant effects on soils were identified and therefore scoped out of further assessment in the ES. Also, although some of the defences will be sheet piled walls, effects on underlying bedrock were also scoped out as being not significant. It is likely that piles will not encounter bedrock in some locations due to the depth of the underlying bedrock. In addition, as the footprint of each individual defence is small, significant effects on bedrock were not considered likely and so scoped out.

13.1.6 Significant effects on groundwater in areas of glacial till and peat deposits were considered unlikely and therefore scoped out of further assessment. Only those sites which had potential to be affected by land contamination from existing land uses were scoped in for potential impacts on groundwater.

13.1.7 Desk study geo-environmental conditions were carried out as a precursor to the ground investigation at detailed design stage and reviewed as part of this assessment. These identified eight sites where potential land contamination (such as from heavy metals or fuels/oils, hydrocarbons) may affect receptors such as human health and water and where significant effects were possible. These eight sites were subject to contamination testing as part of the ground investigation works and scoped into this ES. The sites are:

- Corcrair Mews
- Woodside Green/Ulster Carpets
- Parkside
- Castle Street
- Foundry Street



- Bowling Green
- Irwins Mill
- Annagh Hill

13.1.8 These sites are shown in **Figure 13.1, Volume 4**.

13.1.9 The desk studies also identified two sites, Derrylvore Lane and Ripley Mews, as being of low to moderate risk with no requirement to undertake land contamination investigations. These sites were therefore scoped out of any further assessment.

13.1.10 A Generic Quantitative Risk Assessment (GQRA) was undertaken for each of the above sites using the information gained during the GI works and forms the basis for this chapter.

## 13.2. Statutory and Policy Context

13.2.1 In Northern Ireland various pieces of legislation are in place to provide protection for soils, mostly concerned with groundwater protection and land contamination. Legislation includes the following:

- The Groundwater Regulations (Northern Ireland) 2009 which makes it an offence to discharge listed substances without authorisation. It also provides for threshold values to be set by the Department of Agriculture, Environment and Rural Affairs for the protection of water quality.
- The Waste and Contaminated Land (Northern Ireland) 1997 which sets out the waste management regime covering waste carrier registration as well as guidelines for identifying and undertaking remediation of contaminated land.
- The Waste and Contaminated Land (Amendment) Act (Northern Ireland) 2011 which changes the legislative framework for management of land that has been contaminated by pollution and provides guidance on the definition of land contamination.
- The Environmental Liability (Prevention and Remediation) Regulations (Northern Ireland) 2009 (and amendments) which brings into force rules to force polluters to prevent and repair damage to water systems, land quality, species and their habitats and protected sites.

13.2.2 Guidance and policy relating to soils and land contamination are provided by:

- The European Commission Soil Strategy for 2030 (Ref 13.2) sets out a framework and measures to protect and restore soils and ensure they are used sustainably.
- DAERA Environmental Advice for Planning. Practice Guide, Redeveloping Land affected by Contamination (Ref 13.3). This guide sets out the steps required for consent for new development on land affected by contamination.
- Environment Agency Land Contamination Risk Management (Ref 13.4) (replaces the Model Procedures for the Management of Land Contamination CLR 11). Sets out guidelines for assessment and managing risk from land contamination for development schemes.
- Contaminated Land: Applications in Real Environments (CL:AIRE) (Ref 13.5). Provides guidance on remediation techniques as well as providing guidance on site characterisation and monitoring of land affected by contamination.

13.2.3 In addition, NIEA has published Guidance on the Regulation of Greenfield Excavated Materials in Construction and Development (Ref 13.6) to promote the sustainable re-use of greenfield soil. In terms of infrastructure construction, if the soil is deemed suitable it can be reused within a site for landscaping, in SuDS and on roadside verges without being treated as a waste.

13.2.4 The Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (Ref 13.7) was published by Department for Environment, Food and Rural Affairs (Defra) to protect soils and ensure adequate soil function during and after construction.

### 13.3. Methodology

13.3.1 A desktop review was undertaken of the preliminary and quantitative risk assessments, as well as the ground investigation reports to ascertain baseline conditions in the vicinity of the eight sites scoped in from the scoping report. These reports are included as **Appendix 13.1 and 13.2, Volume 3**. The study area was taken to be the footprint of the proposed flood defences, with a 100m buffer to identify historical or current sources of land contamination. This was considered sufficient given the nature of the proposed flood defences and the extent of construction works.

13.3.2 Baseline data has been collected from the following sources to inform this report:

- Amey Desk studies undertaken in 2020 to identify potential contaminated sites (Ref 13.8)
- Preliminary Risk Assessments carried out by Tetra Tech (Ref 13.9)
- Ground investigation reports by Causeway Geotech to inform detailed design (Ref 13.10)
- Generic Quantitative Risk Assessment reports by Tetra Tech (Ref 13.11)

#### Ground Investigation

13.3.3 A review of the ground investigation reports for the eight sites was carried out to ascertain soil type and groundwater levels recorded at each location.

#### Geo-Environmental Testing

13.3.4 Preliminary desk studies were undertaken by Amey prior to the ground investigation (GI) to determine which sites may contain land contamination and would require geo-environmental testing during the GI. A series of Preliminary Risk Assessment (PRA) reports was undertaken by Tetra Tech and these are included in **Volume 3 Appendix 13.1**. As part of the ground investigation, soil and water samples were taken for contamination testing. Results are presented in the Generic Quantitative Risk Assessment (GQRA) reports within **Volume 3 Appendix 13.2** and summarised in this chapter.

13.3.5 Soil and groundwater samples taken from the boreholes were tested for a range of determinants including metals, speciated Total Petroleum Hydrocarbons (TPHs), speciated Polycyclic Aromatic Hydrocarbons (PAH), Volatile Organic Compounds (VOCs), asbestos and other inorganic contaminants.

#### Consultations

13.3.6 Consultation was undertaken with Armagh City, Banbridge and Craigavon Borough Council and NIEA Development Management. The response from NIEA stated that pollution prevention control measures should be adopted during the scheme to prevent pollution to water. At time of writing, no response had been received from ABC Borough Council. Pollution prevention measures are included within Chapter 16 Hydrology and Drainage and the CEMP in **Appendix 6.2, Volume 3**.

#### Assessment of land contamination impacts

13.3.7 In order for impacts to arise from a contaminated land source, there must be an effect pathway and end receptor. If these three elements are present, then the magnitude of the risk is a function of the magnitude and mobility of the source, the sensitivity of the receptor and the nature of the pathway.

13.3.8 The assessment of geo-environmental risks from contaminated land follows the recommendations given in CIRIA's 'Contaminated Land Risk Assessment – A Guide to Good Practice' (CIRIA 552) (Ref 13.14) which recommends the development of a Conceptual Site Model (CSM).

13.3.9 The CSM represents a network of relationships between potential hazards from within and adjacent to the flood alleviation scheme and the receptors that may be exposed to the hazards through linking pathways. Fundamental to the identification and management of land contamination risk is the concept of a pollutant linkage, comprising:

- A contaminant source – a substance that is in, on or under the land and has the potential to cause harm or to cause pollution;
- A receptor – in general terms, something that could be adversely affected by a contaminant, such as people, an ecological system, property or a water body; and
- A pathway – a route or means by which a receptor can be exposed to, or affected by a contaminant.

13.3.10 Each of these elements can exist independently but only create a risk when they are linked together, so that a particular contaminant affects a particular receptor through a particular pathway. A key element of a CSM is that not only does it examine the range of potential exposure pathways that are present; it also eliminates those pathways that are incomplete and therefore cannot pose a risk.

### **Contaminant Source**

13.3.11 All potential contamination sources within a study area of 100m from the footprint of the defences at each of the 8 sites were identified through a desk study. This included historical sources from former land use at each site as well as current sources as identified through a site walkover by Tetra Tech.

13.3.12 For the purposes of this assessment, on site sources of contamination were those located within the scheme extents of each flood defence, while off site sources were those beyond the footprint of the scheme but that may still exert an influence over ground conditions.

### **Receptors**

13.3.13 The flood defences are generally flood walls with a small footprint, and as such the receptors were identified based on the potential for effect pathways to exist. For this scheme, the main receptors are construction workers, surface waters and groundwater.

### **Conceptual Site Model**

13.3.14 Once the source and receptors have been defined, the last components to be assessed are the potential pathways and the pollutant linkages. This then allows a qualitative Preliminary Risk Assessment to be derived. This considers the consequence (magnitude) of the risk and probability that a consequence may occur.

13.3.15 Risks can be either short-term (acute) which relate to adverse effects resulting from short term exposure or contact with hazardous substances; or long term (chronic) risks which relate to adverse effects occurring as a result of long term exposure or contact with hazardous substances.

13.3.16 The classification of consequence can be defined as follows (from CIRIA 552):

- Severe: short-term (acute) risk to human health or risk of pollution to water resource, e.g. high concentrations of a contaminant in an area where exposure is likely, or major spillage of contaminants into a water source.
- Medium: chronic damage to human health or pollution of sensitive water resource, e.g. concentrations of a contaminant from site exceed generic or site specific assessment criteria, or leaching of contaminants from a site to a major or minor aquifer.
- Mild: pollution of non-sensitive water resource, e.g. pollution of non-classified groundwater.

- Minor: non-permanent health effects to human health (which can be prevented by use of PPE), e.g. the presence of contaminations at such concentrations that protective equipment is required during site works.

13.3.17 The classification of probability can be defined as:

- High likelihood: there is a pollution linkage and an event that appears very likely in the short term and almost inevitable over the long term, or there is evidence of harm or pollution at the receptors.
- Likely: there is a pollution linkage and all the elements are present and in the right place, which means it is probable an event will occur. Circumstances are such that an event is not inevitable but possible in the short term and likely over the long term.
- Low likelihood: there is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place, and is less likely in the short term.
- Unlikely: There is a pollution linkage but circumstances are such that it is improbable than an event would occur even in the long term.

13.3.18 The risk to the receptors is a combination of the probability or frequency of occurrence of a defined hazard and the magnitude of the consequences of the occurrence. It is classified as low, moderate or high as detailed in Table 13.1 (derived from CIRIA 552). Risks of moderate or high are likely to require some form of mitigation to avoid significant effects.

Table 13.1. Qualitative Risk Rating from Contaminated Land.

		Consequence			
		Severe	Medium	Mild	Minor
Probability	High likelihood	Very high risk	High risk	Moderate risk	Moderate/low risk
	Likely	High risk	Moderate risk	Moderate/low risk	Low risk
	Low likelihood	Moderate risk	Moderate/low risk	Low risk	Very low risk
	Unlikely	Moderate/low risk	Low risk	Very low risk	Very low risk

### Generic Quantitative Risk Assessment

13.3.19 The PRAs were then refined following the geo-environmental testing undertaken as part of the GI and a detailed CSM derived.

13.3.20 The purpose of the GQRA is to refine the PRA based on the geo-environmental test results from the sampling undertaken as part of the GI. If the GQRA identifies unacceptable risks (moderate or high risk), then mitigation and/or further sampling and testing will be recommended to mitigate risk or identify if remedial works are required.

13.3.21 Both groundwater and soils samples were tested from the 8 sites. The testing required was based on the historical and current land use at the sites. Groundwater samples were tested for;

- Heavy metals
- Total phenol
- Speciated Polycyclic Aromatic Hydrocarbons (PAHs)
- Volatile Organic Compounds (VOCs)

- Total Petroleum Hydrocarbons (some samples were speciated to TPH-CWG (Criteria Working Group) including BTEX (Benzene, Toluene, Ethylbenzene, Xylene)
- Inorganics including cyanide thiocyanate and
- Asbestos.

13.3.22 Soils were tested for:

- Heavy metals
- Total phenol
- Speciated Polycyclic Aromatic Hydrocarbons (PAHs)
- Volatile Organic Compounds (VOCs)
- Total Petroleum Hydrocarbons (some samples were speciated to TPH-CWG (Criteria Working Group) including BTEX (Benzene, Toluene, Ethylbenzene, Xylene)
- Inorganics including cyanide thiocyanate and
- Asbestos.

13.3.23 The contamination test results were then compared to Generic Assessment Criteria (GAC), to identify if contaminant levels exceed these screening thresholds and therefore represent a risk to receptors. The methodology is included in the GQRA reports as included in **Appendix 13.2, Volume 3**, and summarised below.

13.3.24 Generic Assessment Criteria are contaminant concentration values used to compare levels of contaminants found on site and are derived using non site-specific information.

13.3.25 Water sample results were assessed against the Freshwater criteria provided in the Water Framework Directive, or by direct comparison with the Freshwater Environmental Quality Standards (EQS) or UK Drinking Water Standards (DWS), World Health Organisation (WHO) standards for Drinking Water or other appropriate guidance values.

13.3.26 Soil samples were assessed following UK Contaminated Land Exposure Assessment (CLEA) methodology, using GACs from Land Quality Management/Chartered Institute of Environmental Health Suitable 4 Use Levels (CIEH S4ULs) and Tetra Tech Threshold Screening Values (TSVs) to assess risk to human health. For each contaminant a TSV has been derived for various land uses which are:

- Residential with plant uptake (RwP)
- Residential without plant uptake (RwoP)
- Commercial and industrial
- Public open space near residential
- Public open space (park) and
- Allotments.

13.3.27 The threshold values for each of these land uses vary, based on the likely end use of the site or current conditions.

13.3.28 The risk was then determined for each of the identified receptors using the source-pathway-receptor model and the likelihood of an impact occurring. Risks of moderate or high would require mitigation.

## 13.4. Baseline Conditions

13.4.1 The following sites were scoped in for further assessment and the following sections will summarise the baseline conditions at each site based on the GI and geo-environmental testing. The locations are shown in **Figure 13.1, Volume 4**:

- Corcrain Mews
- Ulster Carpets
- Parkside
- Castle Street
- Foundry Street
- Bowling Green
- Irwins Mill
- Annagh Hill

### Corcrain Mews

13.4.2 The ground investigation at Corcrain Mews comprised twelve boreholes (BH) with standpipes installed in two of them for monitoring groundwater. The location of the boreholes are shown in the GI factual reports included as part of the GQRAs in **Appendix 13.2, Volume 3**. The ground conditions encountered were:

- Paved surface – FC2BH02 encountered 200mm of bitmac surfacing
- Made ground (sub-base) – 400mm of aggregate fill below the paved surface in FC2BH02
- Made ground (fill) – reworked sandy, gravelly, clay fill and sandy gravel aggregate with fragments of concrete, brick and tile to a depth of 0.6m – 5.5m in FC2BH01 – FC2BH03 and FC2BH05 – FC2BH07.
- Alluvium – very soft to firm sandy gravelly clay, with layers of loose to medium dense clayey sand.
- Peat – spongy to firm peat in FC2BH01, FC2BH02, FC2BH06 and FC2BH07.
- Glacial till – sandy gravelly clay, with cobbles, typically stiff in upper horizons becoming very stiff with depth and occasional pockets of dense gravel.
- Bedrock (Lough Neagh clay) – stiff to very stiff sandy gravelly clay, with layers of very clayey sand at 16.4m -16.8m in FC2BH01, FC2BH03 and FC2BH05.

13.4.3 Groundwater strikes were encountered at:

- FC2BH05, FC2BH07: 0.6mbgl – 1mbgl
- FC2BH01-FC2BH03: 3mbgl – 3.9mbgl
- FC2BH03-FC2BH04, FC2BH06: 5.9mbgl – 7.5mbgl
- FC2BH10, FC2BH11 and FC2BH12: 2.7mbgl – 7.5mbgl

### Sources of contamination

13.4.4 Historical sources of contamination for this site include an old railway line (S1), a refuse tip approximately 20m north, a garage approximately 25m northeast and factory 270m east. Current potential sources of contamination include a transformer box at the entrance to Corcrain Mews, 2 transformer boxes and electrical substation approximately 35m east (S4). There is a filling station just north east of the site at

Corcrain Road (S2), commercial properties north east (S3) and the remnants of the railway line to the south. Contamination sources are shown on **Figure 13.2, Volume 4**.

13.4.5 The preliminary CSM for this site based on the desk study is summarised in Table 13.2.

Table 13.2: Preliminary CSM for Corcrain Mews

Source	Pathway	Receptor	Risk
<b>On site</b>			
Made ground and natural deposits (potentially containing a range of metals, TPHs, PAHs, VOCs, SVOCs, asbestos) associated with current and former developments, realignment of the river banks, former railway land, refuse tip	Dermal contact Inhalation of fugitive dust Inhalation of vapour Ingestion	Construction workers	Low to moderate
Made ground, surface water and shallow groundwater (potentially containing a range of metals, TPHs, PAHs, VOCs, SVOCs) associated with current and former developments, realignment of the river banks, former railway land, refuse tip	Leachate and/or migration	Surface water Groundwater	Low to moderate
<b>Off site</b>			
Made ground, natural deposits, surface water and shallow groundwater containing metals, TPHs, PAHs, VOCs, SVOCs, PCBs and pesticides associated with surrounding current and historical commercial/industrial lands uses (garden centre, filling station, railway land), refuse tip, brick pit, transformers and substation	Leachate and/or migration	Construction workers Surface water Groundwater	Low to moderate

13.4.6 Geo-environmental testing was carried out on two water samples taken at 1.3m in FC2BH01 and at 2.65m in FC2BH03. The water samples were tested for metals and TPHs. Full results are presented in **Appendix 13.2, Volume 3** as part of the GQRA reports.

13.4.7 The water samples were compared against the freshwater criteria for WFD. The levels of contaminants in the water samples fell below the threshold levels for all the contaminants tested.

13.4.8 Testing was also undertaken on two soil samples from FC2BH12 at 0.5m and 2m and on a sample from FC2BH10 at 0.5m. The samples were tested for asbestos, metals, speciated TPHs, PCBs and VOCs.

13.4.9 The soil samples were compared to Tetra Tech Threshold Screening Values (TSVs) to assess the risk to human health. Given the location and land use at Corcrain Mews, the TSVs for residential without plant uptake (RwP) were used.

13.4.10 The levels of contaminants in all the soil samples fell below the relevant threshold levels with TPHs, PAHs, VOCs and BTEX/Phenols all below the level of laboratory detection. No asbestos was detected in any of the samples.

13.4.11 No exceedances of the screening thresholds were recorded at Corcrain Mews.

## Woodside Green/Ulster Carpets

13.4.12 The ground investigation at this site initially comprised nine cable percussion boreholes and one rotary drilled borehole, with standpipes installed in four boreholes. Ground conditions encountered were:

- Paved surface: CBH03, CBH05, CBH07 overlain by 200-300mm concrete surfacing, boreholes CBH04, CBH06-CBH10 had 5-100mm bitmac surfacing.
- Made ground (sub-base): 200-800mm aggregate and clay fill with brick fragments beneath paved surface in boreholes CBH03-CBH10.
- Made ground (fill): reworked sandy clayey gravel fill or sandy gravelly clay fill with fragments of concrete, brick, glass extending to depths of 0.8m to 2m in boreholes CBH01, CBH02, CBH07-CBH10.
- Peat: spongy brown peat in CBH02-CBH03, CBH05 and CBH07-10.
- Alluvium: medium dense becoming very dense at depth, sand or gravel alternating with beds of soft to firm sandy clay, becoming stiff at depth.
- Glacial till: sandy gravelly clay, with cobbles, typically firm or stiff in upper horizons, becoming very stiff at depth.
- Bedrock (clay and mudstone): Lough Neagh clay encountered at 16.8m in CBH03 and 19.7-24.3m in CBH02, CBH08, CBH09. Mudstone bedrock encountered in CBH03 at 22.3m depth.

13.4.13 During drilling, groundwater was encountered at:

- CBH10: 0.5m
- CBH01, CBH03, CBH05-CBH10: 2.5m - 7.5m
- CBH02, CBH03, CBH10: 12m - 17m.

13.4.14 Additional boreholes were drilled in late 2019 and consisted of five boreholes using a cable percussion rig, three using a window sampling rig and hand dug trenches. Groundwater and gas monitoring standpipes were installed in five of the boreholes. Further boreholes were drilled in 2021 and consisted of eight boreholes, using a window sample rig.

13.4.15 Groundwater depths in the additional boreholes were recorded as:

- DBH01-DBH05 and DWS01-DWS03 – between 1.6m bgl and 4.4m bgl
- DBH01 at 19.6mbgl

13.4.16 Groundwater was also recorded as seepage at 1.5mbgl in the trenches DST03 and DST04.

13.4.17 Subsequent groundwater monitoring indicates that the level of water is generally between 0.94m to 2.47mbgl.

### Sources of contamination

13.4.18 Historical sources of contamination include a brick hole, rail line (S2), former weaving factory and linen factories. The main source of current contamination is the Ulster Carpet factory (S1 and S3) on the site, with associated tanks and services. Vehicle movements are frequent on the site. Contamination sources and receptors are shown on **Figure 13.3, Volume 4**.

13.4.19 The preliminary CSM for this site is summarised in Table 13.3.



Table 13.3: Preliminary CSM for Woodside Green

Source	Pathway	Receptor	Risk
Made ground and natural deposits (potentially containing a range of metals, TPHs, PAHs, asbestos) associated with spoil heap, existing carpet premises, former factories and mills, former brick hole, filling station, railway land	Dermal contact Inhalation of fugitive dust Inhalation of vapour Ingestion	Construction workers	Moderate
Made ground, natural deposits, surface water, shallow groundwater associated with leaks/spills of unknown contaminants from former tank at northern end of site	Migration	Construction workers Surface water Groundwater	Moderate

- 13.4.20 Geo-environmental testing was carried out on 10 water samples and were tested for heavy metals, phenols, PAHs, VOCs, spceiated TPH and inorganics. The results were compared to the Freshwater criteria thresholds in the WFD.
- 13.4.21 The testing indicates levels of copper in CBH03 was 14µg/l, which slightly exceeds the WFD freshwater standard of 10µg/l. Mercury was detected in CBH02 (1.2µg/l), CBH03 (2.0µg/l), CBH09 (0.76µg/l) and CBH04 (0.64µg/l) at levels which exceed the WFD freshwater standard of 0.05µg/l.
- 13.4.22 Levels of PAHs, TPHs, VOCs and BTEX and phenols in the water samples were generally below laboratory limits of detection or the threshold values. However, exceedances were recorded in DBH04 and DBH05 of total TPHs.
- 13.4.23 A total of 17 soil samples were tested for a range of contaminants, including heavy metals, phenols, PAHs, VOCs, PCBs, spceiated TPHs and asbestos.
- 13.4.24 Given the location and land use of the site, the threshold values for Residential with plant uptake (RwP) and commercial and industrial were used.
- 13.4.25 The levels of heavy metals in all 17 soil samples were below the commercial and industrial GAC, but 7 were above the RwP GACs. Levels of PAHs were generally below threshold levels, with the exception of the exceedances shown in Table 13.4. Levels of PCBs, VOCs, BTEX and phenols were below threshold levels.
- 13.4.26 The exceedances for the soil samples are summarised in Table 13.4.

Table 13.4: Exceedances in soil samples for Woodside Green

Contaminant	C-WS05 0.8m	C-WS05 1.2m	C-WS01 0.3m	C-WS02 0.5m	C-WS03 0.5m	C-WS03 0.3m	C-WS07 1.0m	C-WS07 0.5m	Screening thresholds
Arsenic	45mg/kg	42mg/kg	-	-	-	-	-	-	RwP GAC – 37mg/kg
Beryllium	2.5mg/kg	-	-	-	-	-	-	-	RwP GAC – 1.7mg/kg
Nickel	-	-	350mg/kg	160mg/kg	240mg/kg	-	-	-	RwP GAC – 130mg/kg
Benzo(a)pyrene	-	-	-	-	-	-	-	2.7mg/kg	RwP GAC – 2.2mg/kg
Benzo(b)fluoranthene	-	-	-	-	-	-	-	3.4mg/kg	RwP GAC – 2.6mg/kg
Dibenz(ah)anthracene	-	-	-	-	-	-	0.48mg/kg	0.58mg/kg	RwP GAC – 0.24mg/kg
Asbestos	-	-	-	-	-	-	Asbestos present	-	-

13.4.27 Asbestos was present in one sample, from CWS07 at 1m (chrysotile fibres).

13.4.28 In summary, levels of mercury, copper and TPH slightly exceeded the thresholds in the groundwater samples. Exceedances of heavy metals and PAHs were recorded in some soil samples, with asbestos recorded in one soil sample.

### Parkside

13.4.29 The initial ground investigation comprised a total of five boreholes, of which two had standpipes installed, and four trial trenches.

13.4.30 Ground conditions at the site were:

- Topsoil: ground overlain by topsoil to 100-400mm thick across the majority of the site.
- Made ground (fill): reworked sandy gravelly clay fill with concrete and brick fragments extending to a depth of 0.3m – 1.2m.
- Peat: spongy pseudo-fibrous peat in EBH01.
- Alluvium: soft to firm sandy gravelly clay or loose sand deposits to depths of 2.6 – 4.7m.
- Glacial till: sandy gravelly clay, with cobbles, typically stiff in upper horizons, becoming very stiff at depth.

13.4.31 Groundwater was encountered at:

- EBH01, EBH02, EWS01-EWS03: 2.1m – 5.9m
- EBH01: 11.3m.

13.4.32 Three additional boreholes were drilled at the site using a window sampler rig in 2021 for the purposes of gaining samples for contamination testing.

### Sources of contamination

13.4.33 Historical sources of contamination include a textile factory (located on the site of People's Park) and housing. The main current source of contamination is the metal recycling scrapyards adjacent to Parkside (S1). Contamination sources and receptors are shown on **Figure 13.4, Volume 4**.

13.4.34 The preliminary CSM for Parkside is summarised in Table 13.5.

Table 13.5: Preliminary CSM for Parkside

Source	Pathway	Receptor	Risk
Made ground (potentially containing a range of organic/inorganic contaminants including TPHs, PAHs, asbestos) associated with on site scrapyards, former factory and development	<ul style="list-style-type: none"> <li>• Dermal contact</li> <li>• Inhalation of fugitive dust</li> <li>• Inhalation of vapour</li> <li>• Ingestion</li> </ul>	Construction workers	Moderate
Made ground, surface water and shallow groundwater (potentially containing a range of inorganic/organic contaminants, TPHs, PAHs,) associated with scrapyards, former factory and existing development	Leachate and/or migration	Surface water Groundwater	Moderate

13.4.35 Two water samples were tested for heavy metals, phenols, PAHs, TPGs and inorganics, from 0.5m in EBH01 and 1.4m in EBH02. The test results were compared to the freshwater criteria in the WFD.

13.4.36 No asbestos was detected in either of the two water samples. Levels of heavy metals, TPHs, PAHs, phenols were all below laboratory limits of detection.

13.4.37 Ten soil samples were taken from the trial pits and boreholes and tested for heavy metals, phenols, PAHs, VOCs, PCBs, speciated TPH and asbestos.

13.4.38 The soils samples were compared to the TSVs for Residential without plant uptake (RwOP) and Public open space near residential (POS res), as these were considered the most appropriate given the existing land use and proposed defences.

13.4.39 The levels of heavy metals in the soil samples were below the threshold levels with the exception of lead in four samples, as shown in Table 13.6.

Table 13.6: Exceedances for lead in soils samples at Parkside

Contaminant	E-WS05 2m	E-WS04 0.4m	E-WS04 0.8m	E-WS04 1.4m	Screening thresholds
Lead	360mg/kg	880mg/kg	500mg/kg	500mg/kg	RwP GAC – 200mg/kg

13.4.40 The levels of TPHs were below the RwoP and POS res thresholds.

13.4.41 For PAHs, exceedances were recorded in 4 of the borehole soil samples as summarised in Table 13.7.

Table 13.7: PAH exceedances at Parkside.

Contaminant	E-ST03 0.5m	E-WS04 0.4m	E-WS04 1.4m	E-ST02 0.8m	E-WS04 0.8m	Screening thresholds
Benzo(a)pyrene	10mg/kg	-	-	--	-	RwoP GAC – 3.2mg/kg POS res GAC – 5.7mg/kg
	11mg/kg	5.9mg/kg	4mg/kg	-	-	RwoP GAC – 3.9mg/kg POS res GAC – 7.1mg/kg
Dibenz(a,h)anthracene	0.92mg/kg	1.4mg/kg	1.1mg/kg	0.34mg/kg	0.78mg/kg	RwoP GAC – 0.31mg/kg POS res GAC – 0.57mg/kg

13.4.42 Levels of PCBs in E-WS04 were marginally above laboratory detection limits, with the remaining samples all below the limits of detection.

13.4.43 All samples had levels of VOCs, BTEX and phenols below the RwoP and POS res GAC thresholds. Asbestos was detected in the sample from E-WS04 at 0.4mbgl.

13.4.44 In summary, no exceedances were recorded in the groundwater samples. Some of the soil samples had exceedances of lead and PAHs, while asbestos was recorded on one soil sample.

### Castle Street

13.4.45 The ground investigation at Castle Street comprised a total of seven boreholes, of which two had standpipes (combined groundwater and gas monitoring), and two trial trenches. Ground conditions were:

- Paved surface: borehole HWS01 encountered 100mm bitmac surfacing with 600mm aggregate sub-base. Borehole HBH03 encountered 250mm concrete with 1150mm aggregate sub-base.
- Topsoil: encountered typically in 100-400mm thickness across most of the site.
- Made ground (fill): reworked sandy gravelly clay or sandy gravelly fill with fragments of concrete and brick, extending to 1.1m – 4.9m depth.
- Peat: spongy brown pseudo-fibrous and fibrous peat.
- Alluvium: typically very soft to soft, becoming firm with increasing depth, sandy gravelly silty clay, with organic content.
- Glacial till: sandy gravelly clay, with cobbles, typically firm or stiff in upper horizons, becoming very stiff with increasing depth.

13.4.46 Groundwater was encountered at:

- HBH04, HWS01 and HWS02; 1.1m – 4.4m.

## Sources of contamination

13.4.47 Historical sources of contamination include a distillery, flour mill, railway line, flax mill, gasworks, saw mill and weaving factory. Existing sources of contamination include railway line (S1), builder's merchants (S4) and car parking (S2). Contamination sources and receptors are shown on **Figure 13.5, Volume 4**.

13.4.48 The preliminary CSM is summarised in Table 13.8.

Table 13.8: Preliminary CSM for Castle Street

Source	Pathway	Receptor	Risk
Made ground and natural deposits, shallow groundwater (potentially containing a range of organic/inorganic contaminants, asbestos) associated with channelling of the River Bann, potentially infilled tributaries and previous development.	<ul style="list-style-type: none"> <li>· Dermal contact</li> <li>· Inhalation of fugitive dust</li> <li>· Inhalation of vapour</li> <li>· Ingestion</li> </ul>	Construction workers	Low
Off site potentially impacted made ground, natural deposits, surface water and shallow groundwater from metals, TPHs, PAHs associated with surrounding current and historical land use	<ul style="list-style-type: none"> <li>· Leachate and/or migration</li> </ul>	<ul style="list-style-type: none"> <li>· Construction workers</li> <li>· Surface water</li> <li>· groundwater</li> </ul>	Moderate

13.4.49 One water sample from HBH01 at 2.3m depth was tested for a range of contaminants including heavy metals, phenols, PAHs, VOCs, speciated TPH. The contaminant results were then compared against the Freshwater criteria in the WFD and Freshwater EQS.

13.4.50 The sample had an exceedence of mercury levels, with a level of 1.1µg/l, above the WFD Freshwater Standard of 0.05µg/l and the Freshwater EQS of 1µg/l. Levels of all other contaminants were below laboratory limits of detection or within threshold values.

13.4.51 Nine soil samples from HBH02A at 1m, HBH03 at 2m, HBH04 at 2m, HWS01 at 0.5m, HWS01 at 1m, HWS01 at 1.6m, HWS02 at 0.5m, HWS02 at 1m and HWS02 at 2m were tested for heavy metals, phenols, PAHs, VOCs, PCBs, speciated TPHs and asbestos.

13.4.52 The soil contaminant results were compared against TSVs for commercial and industrial and Public open space (park) (POS) as the site is located adjacent to commercial properties, towpath and a bowling green. The levels of heavy metals, TPHs, PCBs, VOCs were all below the relevant screening thresholds or below laboratory limits of detection. All bar one of the samples had levels of PAHs below the thresholds with the exception of the sample from HWS01 at 0.5mbgl. The exceedances are summarised in Table 13.9. It is considered however, that as this sample was taken from below bitmac, it is likely that these results arise from a fragment of bitmac in the sample as an isolated exceedence.

Table 13.9: Exceedances for soil samples at Castle Street

Contaminant	HWS01 0.5m	Screening thresholds
Benzo(a)pyrene	26mg/kg	POS GAC – 11mg/kg
Benzo(b)fluoranthene	33mg/kg	Commercial GAC – 13mg/kg
Dibenz(a,h)anthracene	23mg/kg	Commercial GAC – 3.5mg/kg POS GAC – 1.1mg/kg

13.4.53 No asbestos was recorded in any of the samples.

13.4.54 In summary, exceedances of mercury was recorded in the groundwater sample, while exceedances of PAHs were recorded in one soil sample.

### Foundry Street

13.4.55 The ground investigation at Foundry Street consisted of a total of four boreholes with one trial trench. Standpipes were installed in two of the boreholes. Ground conditions encountered were:

- Paved surface: boreholes IBH03 and IBH04 encountered 100mm of bitmac surfacing with 200mm of concrete underneath.
- Made Ground (fill): reworked sandy gravelly silty clay or sand and gravel fill with fragments of wood and brick extending to a depth of 0.90-1.80m.
- Peat: spongy pseudo-fibrous peat.
- Alluvium deposits: typically soft sandy silty clay with beds of loose to medium dense sandy gravel.
- Glaciofluvial deposits: typically medium dense sands and gravels with occasional bands of sandy clay.
- Glaciolacustrine deposits: soft sandy clays occasionally with gravel becoming stiff with increasing depth.
- Glacial Till: sandy gravelly clay, frequently with low cobble and boulder content, typically stiff in upper horizons, becoming very stiff with increasing depth.

13.4.56 Groundwater was encountered at:

- IBH01: 0.3m
- IBH01 – IBH04: 5.5m – 12.4m

### Sources of contamination

13.4.57 Historical sources of contamination include a quay, foundry, filling station, railway land (S3), mills, factories and a gas works. Current sources of contamination include an industrial storage yard with tank and pump house (S2), industrial units (S1) and car parking area (S4). Contamination sources and receptors are shown on **Figure 13.6, Volume 4**.

13.4.58 The preliminary CSM is shown in Table 13.10.

Table 13.10: Preliminary CSM for Foundry Street

Source	Pathway	Receptor	Risk
<b>On site</b>			
Made ground and natural deposits (potentially containing a range of metals, TPHs, PAHs, PCBs, asbestos) associated with current and historical land use	Dermal contact Inhalation of fugitive dust Inhalation of vapour Ingestion	Construction workers	Moderate
Made ground, surface water and shallow groundwater (potentially containing a range of metals, TPHs, PAHs, PCBs)	Leachate and/or migration	Surface water Groundwater	Moderate
<b>Off site</b>			
Made ground, natural deposits, surface water and shallow groundwater containing metals, TPHs, PAHs, VOCs, SVOCs and phenolics associated with surrounding historical industrial land uses	Leachate and/or migration	Construction workers Surface water Groundwater	Moderate

13.4.59 A water sample from IBH04 at 1.6mbgl was tested for heavy metals, phenols, PAHs, VOCs, TPH-CWG inc BTEX and inorganics.

13.4.60 The water sample results were compared to the Freshwater criteria in WFD and WHO drinking water criteria and identified exceedances of lead and mercury. The sample also had exceedances of speciated TPHs.

13.4.61 Seven soil samples were tested for heavy metals, phenols, PAHs, VOCs, TPH-CWG inc BTEX and asbestos.

13.4.62 The contaminant levels in the soil samples were compared to TSVs for commercial and industrial land use, as the site is along the River Bann adjacent to a number of industrial and commercial properties. The contaminant levels for all parameters generally fell below the relevant TSVs or were below the laboratory limits of detection. However, the sample at IBH01 at 1.5mbgl contained asbestos.

13.4.63 The exceedances are summarised in Table 13.11.

Table 13.11: Exceedances for samples at Foundry Street

Contaminant	IBH01 1.5m (s)	IBH04 1.6m (w)	Screening thresholds
Asbestos	Chrysotile 0.016%	-	presence
Lead	-	12µg/l	WFD Freshwater criteria – 7.2µg/l
Mercury	-	0.67µg/l	WFD Freshwater criteria – 0.05µg/l

Contaminant	IBH01 1.5m (s)	IBH04 1.6m (w)	Screening thresholds
TPH – aliphatic EC>C8-C10	-	330µg/l	WHO criteria – 300µg/l
TPH – aromatic EC>C10-C12	-	160µg/l	WHO criteria – 90µg/l
TPH – aromatic EC>C12-C16	-	380µg/l	WHO criteria – 90µg/l
TPH – aromatic EC>C16-C21	-	170µg/l	WHO criteria – 90µg/l
TPH – aromatic EC>C21-C35	-	1600µg/l	WHO criteria – 90µg/l

13.4.64 In summary, there were exceedances of lead, mercury and TPHs in the groundwater sample, while asbestos was recorded in one soil sample.

### Bowling Green

13.4.65 The ground investigation at this site comprised a total of seven boreholes with standpipes installed in two of these. The soil types encountered were:

- Paved surface: boreholes JBH04, JBH04A and JBH05 overlain by 100-150mm bitmac.
- Topsoil: encountered typically in 200-1400mm thickness across the site and occasionally reworked.
- Made ground (fill): reworked sandy gravelly silty clay or sand and gravel fill with fragments of concrete, timber, and brick extending to depths of 2.30 – 4.9m.
- Peat: spongy pseudo-fibrous peat encountered in boreholes JBH02, JBH03, JBH04, JBH05 and JWS01.
- Alluvium: typically very soft to soft sandy gravelly clay and very loose to loose sand and gravel beds becoming firm or medium dense with increasing depth across the site, frequent organic content.
- Fluvioglacial deposits: medium dense to dense sands and gravels encountered in JBH02, JBH03 below alluvial deposits.
- Glacial till: stiff to very stiff sandy gravelly clay in JB01 at a depth of 15.2m.

13.4.66 Groundwater strikes were recorded at:

- JBH03, JBH05, JWS01: 0.3m – 2.5m
- JBH01, JBH02 and JBH05: 4.8m – 7m
- JBH05: 11.6m.

### Sources of contamination

13.4.67 Historical sources of contamination identified include a stitching factory, weaving factory and boot factory. Current sources of contamination include a tank located in the boathouse (S1), and the Tesco car park (S2). Contamination sources and receptors are shown on **Figure 13.7, Volume 4**.

13.4.68 The preliminary CSM is shown in Table 13.12.



Table 13.12: Preliminary CSM for Bowling Green

Source	Pathway	Receptor	Risk
<b>On site</b>			
Made ground and natural deposits (potentially containing a range of metals, TPHs, PAHs, asbestos) associated with previous development	Dermal contact Inhalation of fugitive dust Ingestion	Construction workers	Low
Made ground, surface water and shallow groundwater (potentially containing a range of metals, TPHs, PAHs)	Leachate and/or migration	Surface water Groundwater	Low to Moderate
<b>Off site</b>			
Made ground, natural deposits, surface water and shallow groundwater containing metals, TPHs and PAHs, associated with surrounding historical industrial land uses	Leachate and/or migration	Construction workers Surface water Groundwater	Low

- 13.4.69 A water sample from JBH01 at 1.78m was tested for heavy metals, phenols, PAHs, VOCs, TPH-CWG inc BTEX and inorganics.
- 13.4.70 There were no exceedances of the GACs from the water sample, with the exception of levels of the TPH aromatic fraction C21-C35 of 450µg/l, which exceeds the WHO guideline values of 90µg/l.
- 13.4.71 Seven soil samples from JBH01 at 1m and 2m, JBH02 at 1m and 2m, JBH03 at 1m and 2m, and JBH04 at 1m were tested for heavy metals, phenols, PAHs, VOCs, PCBs, TPH-CWG inc BTEX and asbestos.
- 13.4.72 The soil samples were compared to TSVs for Commercial and industrial and Public open space (park) thresholds, given the proximity of the site to commercial properties and recreational facilities.
- 13.4.73 The samples indicated that contaminant levels of TPHs, heavy metals, PCBs, VOCs, BTEX and phenols all fell below the TSV thresholds for both Commercial and industrial and Public open space (park). Exceedances of some PAHs were recorded in JBH01 at 1.5m and 2m and are summarised in Table 13.13.

Table 13.13: Exceedances for Bowling Green

Contaminant	JBH01 2m (s)	JBH01 1.5m (s)	Screening thresholds
Benzo(a)anthracene	260mg/kg	-	Commercial GAC – 170mg/kg POS (park) – 49mg/kg
Benzo(a)pyrene	250mg/kg	-	Commercial GAC – 35mg/kg POS (park) – 11mg/kg
Benzo(b)fluoranthene	310mg/kg	-	Commercial GAC – 44mg/kg POS (park) – 13mg/kg

Contaminant	JBH01 2m (s)	JBH01 1.5m (s)	Screening thresholds
Chrysene	260mg/kg	-	POS (park) – 93mg/kg
Dibenz(ah)anthracene	19mg/kg	1mg/kg	Commercial GAC – 3.5mg/kg POS (park) – 1.1mg/kg

13.4.74 No asbestos was detected in any of the soil samples.

13.4.75 In summary, there was exceedances of TPH in the groundwater sample, while exceedances of some PAHs were recorded in 2 of the soil samples.

### Irwins Mill

13.4.76 The initial ground investigation comprised a total of eight boreholes with standpipes installed in 2 of them. Ground conditions encountered were:

- Paved surface: boreholes LBH02, LBH03 and LBH02A overlain by 200-350mm concrete surfacing.
- Topsoil: LBH01 at 300mm thickness.
- Made ground (fill): reworked sandy gravelly clay or sandy gravel fill with fragments of concrete and brick extending to a depth of 1.9m to 3.2m.
- Peat: spongy pseudo-fibrous peat in LBH03-LBH05.
- Fluvioglacial deposits: medium dense becoming very dense sands and gravels encountered in LBH01-LBH03.
- Glacial till: sandy gravelly clay, frequent cobbles, typically firm or stiff in upper horizons, becoming very stiff with depth.

13.4.77 Groundwater strikes were recorded at:

- LBH02, LBH04 and LBH05: 0.7m – 7.9m and at 13.5m to 16m.

13.4.78 Additional boreholes were drilled in December 2020 and consisted of 2 boreholes LBH06 and LBH07.

### Sources of contamination

13.4.79 Historical sources of contamination at the site include a textile factory, brick works and bleach house. The main current source of contamination is the existing factory (S1), which makes aerospace components, and which has fuel and storage tanks as well as an electrical substation located to the north east. Contamination sources and receptors are shown on **Figure 13.8, Volume 4**.

13.4.80 The preliminary CSM for this location is shown in Table 13.14.

Table 13.14: Preliminary CSM for Irwins Mill

Source	Pathway	Receptor	Risk
Made ground and natural deposits, (potentially containing a range of metals, TPHs, PAHs, VOCs, SVOCs, PCBs, dyes, pesticides, asbestos) associated with on-	Dermal contact Inhalation of fugitive dust Inhalation of vapour Ingestion	Construction workers	Moderate

Source	Pathway	Receptor	Risk
site factory, electrical substation, above ground tanks, former bleach house and brick works.			
Reduced quality made ground, surface water and shallow groundwater (potentially containing a range of metals, TPHs, PAHs, VOCs, SVOCs, PCBs, dyes, pesticides, asbestos) associated with on-site factory, electrical substation, above ground tanks, former bleach house and brick works.	Leachate and/or migration	Construction workers Surface water Groundwater	Moderate

13.4.81 Water samples from LBH02 at 2.15m, LBH06 at 1.6m and LBH07 at 1.9m were tested for heavy metals, phenols, PAHs, VOCs, TPH-CWG inc BTEX and inorganics.

13.4.82 Levels in the water samples were generally within the relevant screening thresholds, with the exception of elevated levels of selenium in LBH02 and of zinc in LBH07. These are summarised in Table 13.15.

13.4.83 Soil samples were taken from LBH02 at 1m and 2m, LBH04 at 0.5m and 1.5m, and tested for heavy metals, phenols, PAHs, VOCs, PCBs, TPH-CWG inc BTEX and asbestos. The levels were compared to TSVs for Commercial and industrial land use, given the existing land use as a factory.

13.4.84 Levels of heavy metals, TPHs, PCBs, VOCs, BTEX and phenols were all below the TSVs for commercial and industrial use. One sample, LBH04 at 1.5m had exceedances of some PAHs, as summarised in Table 13.15.

Table 13.15: Exceedances for Irwins Mill

Contaminant	LBH04 1.5m (s)	LBH07 1.0m (s)	LBH02 2.15m (w)	LBH07 1.9m (w)	Screening thresholds
Benzo(a)pyrene	180mg/kg	-	-	-	Commercial GAC - 35mg/kg
Benzo(b)fluorant hene	180mg/kg	-	-	-	Commercial GAC - 44mg/kg
Dibenz(ah)anthra cene	23mg/kg	-	-	-	Commercial GAC - 3.5mg/kg
Asbestos	-	0.008%	-	-	Presence
Selenium	-	-	12µg/l	-	UK Drinking water standard - 10µg/l
Zinc	-	-	-	2700µg/l	WFD Freshwater standard - 75µg/l

13.4.85 Asbestos was detected in the sample from LBH07 at 1mbgl (0.008% chrysotile).

13.4.86 In summary, the groundwater samples had exceedances of selenium and zinc, while one soil sample showed exceedances of PAHs. Asbestos was recorded on one soil sample.

### Annagh Hill

13.4.87 A total of eight boreholes were undertaken at Annagh Hill, with standpipes installed in three of them for groundwater monitoring. Ground conditions encountered were:

- Topsoil: encountered in MBH01, MBH06 and MBH08 at 100 – 300mm thickness.
- Made ground (fill): reworked sandy gravelly clay fill and sandy gravel fill extending to a depth of 0.5m to 1.7m.
- Peat: spongy fibrous peat in MBH02-MBH06 at 0.3m to 1.3m.
- Alluvium: soft to firm sandy clay or sandy gravelly clay.
- Glacial till: sandy gravelly clay, frequent cobbles, occasional beds of dense sand or gravel, typically stiff in upper horizons, becoming very stiff with increasing depth.

13.4.88 Groundwater strikes were encountered at:

- MBH02-MBH08: 0.6m – 5.8m
- MBH01, MBH02, MBH04, MBH05: 8m – 15m.

### Sources of contamination

13.4.89 This site has largely been in agricultural use since the earliest maps in the 1800s. Historical sources of contamination are from development to the north and west of the site, and includes railway (S2), textile factories and housing. Current sources of contamination are the businesses located in the industrial units to the west (S1) which include a car repair garage and agricultural sources. Contamination sources and receptors are shown on **Figure 13.9, Volume 4**.

13.4.90 The preliminary CSM for the site is shown in Table 13.16.

Table 13.16: Preliminary CSM for Annagh Hill

Source	Pathway	Receptor	Risk
<b>On site</b>			
Made ground and natural deposits (potentially containing a range of organic/inorganic contaminants including asbestos) associated with existing and previous development	Dermal contact Inhalation of fugitive dust Inhalation of vapours Ingestion	Construction workers	Low
Made ground, surface water and shallow groundwater (potentially containing a range of inorganic/organic contaminants)	Leachate and/or migration	Surface water groundwater	Moderate
<b>Off site</b>			
Shallow groundwater containing metals, TPHs and PAHs, associated	Leachate and/or migration	Construction workers Surface water Groundwater	Moderate

Source	Pathway	Receptor	Risk
with surrounding historical industrial land uses			

- 13.4.91 Two groundwater samples, MBH04 at 0.7m and MBH05 at 0.03m, were tested for heavy metals, phenols, PAHs, VOCs, TPH-CWG inc BTEX, inorganics. The test results were compared to the relevant freshwater GACs.
- 13.4.92 Both samples showed elevated levels of boron compared to the relevant screening thresholds as shown in Table 13.17, while the sample from MBH05 had very high TPH levels recorded. The sample from MBH05 was not tested for speciated TPHs so it is possible that values exceed the speciated TPH banding thresholds. The sample from MBH05 showed slightly elevated levels of naphthalene compared to the freshwater threshold value.

Table 13.17: Exceedances for Annagh Hill

Contaminant	MBH04 0.7m (w)	MBH05 0.03m (w)	Screening thresholds
Boron	770µg/l	1300µg/l	Groundwater threshold value 750µg/l under WFD Groundwater drinking water protected areas thresholds Freshwater EQS threshold – 1000µg/l
Total TPH (>C6-C40)	490µg/l	21,000µg/l	No screening threshold given for total TPH
Naphthalene	-	2.9µg/l	WFD freshwater EQS – 2.4µg/l

- 13.4.93 Levels of all other contaminants in the groundwater samples fell below screening threshold values.
- 13.4.94 No soil samples were tested for contamination from this site.
- 13.4.95 In summary, groundwater samples had exceedances of boron, TPH and naphthalene.

### Assumptions and Limitations

- 13.4.96 The GQRAs assume that the samples taken and tested are generally representative of the ground conditions at each of the 8 sites. No difficulties were encountered during the sampling for the duration of the GI or the testing.

## 13.5. Evaluation (Value of Resource or Sensitivity of Receptors)

- 13.5.1 Operationally, as the scheme is for flood walls around properties, the only potential receptors would be DfI Rivers maintenance staff who maintain the defences post construction. Given that the maintenance will be most likely on the above ground structures, no contaminant pathways are anticipated to have an effect on receptors. Any excavations for maintenance would be minimal and of short duration and not considered to be significant. Operational effects are therefore scoped out of this assessment.
- 13.5.2 Based on the nature of the scheme, only construction impacts are considered in this assessment.
- 13.5.3 The preliminary CSMs were refined following the GI and geo-environmental testing and updated CSMs produced.
- 13.5.4 Based on the updated CSM Table 13.18 lists the identified sensitive receptors at each of the 8 locations.

Table 13.18: Construction sensitive receptors for 8 land contamination sites

Site	Receptor
Corcrain Mews	Construction workers
	Groundwater
	Surface water – Corcrain River
	Groundwater
Castle Street	Construction workers
	Groundwater
	Surface water – River Bann
Bowling Green	Construction workers
	Groundwater
	Surface water – River Bann
Annagh Hill	Construction workers
	Surface water – River Bann

## 13.6. Impact Assessment

### Corcrain Mews

- 13.6.1 Impacts on construction worker health could arise from exposure to made ground during excavations for the flood walls. The results of the geo-environmental testing showed that the samples taken at this location all

fell within the relevant contaminant threshold levels, and the magnitude of consequence would be **minor** (as described within 13.3.15). The risk is assessed to be **low to moderate** within the updated CSM.

13.6.2 Groundwater levels in the boreholes varied between less than a metre below ground level to around 7.5mbgl. The proposed wall along the side of Corcrain Mews will be sheet piled to a maximum depth of around 13mbgl. There is therefore potential that piling could create a preferential pathway for contaminants in the soils to be leached or migrate into groundwater or surface water. However as the contaminant levels were below relevant screening thresholds for groundwater and surface water, the magnitude of consequence would be **mild** and the risk is deemed to be **low to moderate**.

13.6.3 Excavations have potential to expose contaminants at surface level, and runoff could cause contaminated sediments to enter the Ballybay River. However, as the contaminant levels were below the screening thresholds for surface waters, the magnitude of consequence would be **medium**, the risk is assessed to be **low to moderate**.

13.6.4 The updated CSM following the geo-environmental testing is presented in Table 13.19.

Table 13.19 Updated CSM for Corcrain Mews

Source	Pathway	Receptor	Risk
<b>On site</b>			
Made ground and natural deposits (potentially containing a range of metals, TPHs, PAHs, VOCs, SVOCs, asbestos) associated with current and former developments, realignment of the river banks, and possible overlap of refuse tip	Dermal contact Inhalation of fugitive dust Inhalation of vapour Ingestion	Construction workers	Low to moderate
Made ground, surface water and shallow groundwater (potentially containing a range of metals, TPHs, PAHs, VOCs, SVOCs) associated with current and former developments, realignment of the river banks, and possible overlap of the refuse tip	Leachate and/or migration	Surface water Groundwater	Low to moderate
<b>Off site</b>			
Made ground, natural deposits, surface water and shallow groundwater containing metals, TPHs, PAHs, VOCs, SVOCs, PCBs associated with surrounding current and historical brick pit, transformers and substation	Leachate and/or migration	Construction workers Surface water Groundwater	Low to moderate

### Ulster Carpets

13.6.5 There is potential that health of the construction workers may be adversely impacted due to elevated levels of heavy metals and PAHs in the soils, during any excavation works. Levels of arsenic and beryllium and the PAHs however were only marginally higher than the screening threshold levels. This site also had asbestos in one of the samples. The magnitude of consequence is **medium**.

13.6.6 As shown in the CSM, the risk to human health is **low to moderate**.

13.6.7 Excavations may also expose contaminated sediments in the soils resulting in runoff of heavy metals, TPHs and PAHs into the Corcraigh and Bann rivers. The magnitude of consequence would be **medium**. However, the risk is deemed to be **low** for metals as the levels were only slightly in excess of the threshold values, and **moderate** for TPHs.

13.6.8 The flood defences at this site are a mixture of embedded walls and sheet piling. Groundwater levels were recorded at the site between 0.5mbgl and 19.6mbgl. At time of writing the pile depth had not been confirmed, but it is likely that piling could cause a preferential pathway for contaminants to enter groundwater. The groundwater samples taken at the site showed exceedances of mercury, copper and TPHs, indicating that groundwater has already been affected by the historical and current land use. The magnitude of consequence for additional contamination to impact groundwater quality would be **mild**. The risk of additional contamination entering groundwater is **low** for metals and **moderate** for hydrocarbons as shown in the CSM.

13.6.9 The updated CSM for Ulster Carpets/Woodside Green site is in Table 13.20.

Table 13.20: Updated CSM for Ulster Carpets/Woodside Green

Source	Pathway	Receptor	Risk
Reduced quality made ground containing elevated PAHs and asbestos, potentially associated with reported spoil heap, existing carpet factory, former factories and mills, former brick hole and existing railway land.	<ul style="list-style-type: none"> <li>- Dermal contact</li> <li>- Inhalation of fugitive dust</li> <li>- Inhalation of vapour</li> <li>- Ingestion</li> </ul>	Construction workers	Low to moderate
Reduced quality made ground, surface water and shallow groundwater resulting in slightly elevated heavy metal concentration in groundwater, being associated with current and historical land use	Leachate and/or migration	Surface water Groundwater	Low
Potentially impacted made ground, natural desposits, surface water and shallow groundwater associated with leaks/spills of unknown contaminants (possibly hydrocarbons) from the former possible tank at northern end of site	Migration	<ul style="list-style-type: none"> <li>- Construction workers</li> <li>- Surface water</li> <li>- Groundwater</li> </ul>	Moderate

### Parkside

13.6.10 There is potential for adverse impacts on health of the construction workers due to the elevated levels of PAHs and lead recorded on site as well as the presence of asbestos. Excavations have potential to expose workers to contaminants and the magnitude of consequence would be **medium**. The CSM deems the risk to be **low to moderate**.

13.6.11 Excavations have the potential to expose or release contaminated sediments, resulting in runoff into the Ballybay River. However given the distance between the proposed defence at Parkside and the Ballybay River, the likelihood is deemed to be low. The magnitude of consequence would be **medium**. The risk is deemed to be **low**.



13.6.12 Groundwater levels at this site were recorded between 2.1mbgl and 11.3mbgl, with pile depth expected to be between 4.5-7.0mbgl. There is potential for piling to create a preferential pathway for contaminants to enter groundwater. The groundwater samples tested showed no exceedances of tested contaminants, however the soil samples did have elevated levels of PAHs, lead and asbestos. The magnitude of consequence would be **mild**. The CSM deemed the risk to groundwater to be **low**.

13.6.13 The updated CSM for Parkside is in Table 13.21.

Table 13.21: Updated CSM for Parkside

Source	Pathway	Receptor	Risk
On site			
Reduced quality made ground containing elevated metals (lead) and PAHs associated with made ground on site.	Dermal contact Inhalation of fugitive dust Inhalation of vapour Ingestion	Construction workers	Low to moderate
Asbestos in made ground	Inhalation of fibres	Construction workers	Low to moderate
Potentially reduced quality made ground, surface water and shallow groundwater (potentially containing a range of metals, TPHs, PAHs, VOCs and PCBs) associated with existing on site scrapyards, former damask factory and existing on-off site development	Leachate and/or migration	Surface water Groundwater	Low
Off site			
Reduced quality made ground, containing elevated metals (lead), PCBs, PAHs and asbestos associated with scrapyards	Dermal contact Inhalation of fugitive dust Inhalation of vapour Ingestion	Construction workers	Low to Moderate

### Castle Street

13.6.14 The majority of samples at this site returned no exceedances, with the exception of one sample in made ground with elevated levels of some PAHs. There is potential for the health of the construction workers to be adversely affected by exposure to contaminants during excavations, however the magnitude of consequence would be **minor**, and risk is deemed to be **low**. The CSM also identified site users as a potential receptor as the site has picnic tables and is alongside a recreational path. However the GQRA postulated that the exceedances were likely as a result of an isolated fragment of bitmac present in the sample tested, and that as this is an isolated occurrence and that during construction, users will be prevented from entering the construction area, the risk is **low**.

13.6.15 Given the proximity of the site to the River Bann, there is potential for contaminated soils to be exposed during excavations and for sediments to be washed off or blown into the river. The magnitude of consequence would be **medium**, but risk is however deemed to be **low**, given the isolated exceedance.

13.6.16 At time of writing the depth of piles below ground level had not been confirmed. During the GI, groundwater was encountered between 1.1mbgl and 4.4mbgl. The groundwater tested showed slightly elevated levels of mercury. It is likely that groundwater would be affected by piling, through creation of preferential pathways by piles through the ground, with a risk of contaminants leaching or migrating into

groundwater. However, given that the exceedances at the site are small and isolated, the magnitude of consequence would be **mild**, the risk to groundwater was deemed to be **low**.

13.6.17 The updated CSM for Castle Street is in Table 13.22.

Table 13.22: Updated CSM for Castle Street

Source	Pathway	Receptor	Risk
On site			
Reduced quality made ground, natural deposits and shallow groundwater associated with channelling of the River Bann, potentially infilled tributaries and previous development.	Dermal contact Inhalation of fugitive dust Inhalation of vapour Ingestion	Construction workers Site users	Low
Potentially reduced quality made ground, surface water and shallow groundwater (including mercury) associated with channelling of the River Bann, potentially infilled tributaries and previous development	Leachate and/or migration	Surface water Groundwater	Low
Off site			
Potentially impacted made ground, natural deposits, surface water and shallow groundwater from metals, TPHs and PAHs, associated with surrounding land use	Leachate and/or migration	Construction workers Surface water Groundwater	Low

### Foundry Street

13.6.18 Asbestos was identified in one of the samples from Foundry Street, with potential to adversely affect health of construction workers, should they be exposed to made ground containing asbestos. Although the CSM identifies the risk as **low**, there is potential that asbestos may be present elsewhere in the made ground on the site, the magnitude of consequence would be **medium**. No other exceedances of contaminants were recorded from the soil samples.

13.6.19 Given the proximity of the site to the River Bann, there is potential that contamination from soils could be leached or migrate into the river during excavations and piling. The magnitude of consequence would be **medium**, the CSM identifies the risk to be **low to moderate**.

13.6.20 One of the groundwater samples tested from the site had exceedances of lead, mercury and PAHs. Groundwater monitoring recorded groundwater levels at the site between 0.9m and 2.3mbgl. The flood defences will be piled in this location and the maximum depth of the piles is anticipated to be around 14mbgl. There is potential for contaminants to enter groundwater through creation of preferential pathways from the piles, the magnitude of consequence would be **mild**, the CSM identifies the risk as being **low to moderate**.

13.6.21 The updated CSM for Foundry Street is in Table 13.23.

Table 13.23: Updated CSM for Foundry Street

Source	Pathway	Receptor	Risk
Reported reduced quality made ground/natural desposits (including asbestos containing materials and/or fibres) associated with current and historical land use	Inhalation of fugitive dust	Construction workers	Low
Reported reduced quality made ground, shallow groundwater containing a range of metals and TPHs associated with current and historical land use on and off site	Leachate and/or migration	Surface water Groundwater	Low to moderate

### Bowling Green

- 13.6.22 Elevated levels of some PAHs were recorded in a soil sample at this site, with potential to have adverse impacts on the health of the construction workers, should the contaminants be exposed during excavations. The PAH levels, although only identified in one sample, were high relative to the GAC (see table 13.13 in section 13.4) and the magnitude of consequence would be **medium**. The CSM identifies the risk as being **low to moderate**.
- 13.6.23 There is potential that contaminants may be exposed during excavations, and contaminated soils could be washed into the River Bann or leached out in runoff. The magnitude of consequence would be **medium**, the CSM identifies the risk as **low to moderate**.
- 13.6.24 The groundwater sample tested from the Bowling Green site had elevated levels of TPHs, indicating that the groundwater is already affected by the historical and current land use. Groundwater levels during the GI and subsequent monitoring were recorded between 0.3m and 11.6mbgl. At time of writing, the depth of any piles at this location were not confirmed, however it is anticipated that there is potential for the piles to encounter groundwater. There is potential for preferential pathways to be created by piling for contaminants to leach into groundwater, the magnitude of consequence would be **medium** with the CSM identifying the risk as **low to moderate**.
- 13.6.25 The updated CSM for the Bowling Green site is in Table 13.24.

Table 13.24: Updated CSM for Bowling Green

Source	Pathway	Receptor	Risk
Reduced quality made ground containing elevated PAHs	Dermal contact Inhalation of fugitive dust Inhalation of vapour Ingestion	Construction workers	Low to moderate
Reduced quality made ground, surface water and shallow groundwater resulting in locally elevated TPH concentrations in groundwater, being associated with on site/adjacent historical land use	Leachate and/or migration	Surface water Groundwater	Low to moderate
Slight hydrocarbon odours emanating from groundwater	Dermal contact	Construction workers	Low

Source	Pathway	Receptor	Risk
(reported during GI and groundwater monitoring)	Inhalation of fugitive dust Inhalation of vapour Ingestion	Surface water Groundwater	

### Irwins Mill

- 13.6.26 Elevated levels of some PAHs were recorded at this site along with the presence of asbestos in one of the soil samples. There is potential that the health of the construction workers could be adversely impacted through contact with the contamination or inhaling asbestos fibres. Although exceedances were only recorded in one sample, and the asbestos in another sample, there is potential for contamination to be present throughout the site where excavations would occur. The magnitude of consequence would be **medium**, the CSM identifies the risk as **low to moderate**.
- 13.6.27 The site is located on the banks of the River Bann, and there is potential for contaminated soils to be washed into the river or for contaminants to be leached out of the soils from runoff. The magnitude of consequence would be **medium** and the risk to surface water in the CSM is **low to moderate**.
- 13.6.28 Groundwater levels during the GI and subsequent monitoring were recorded between 0.7mbgl and 16.0mbgl and the groundwater sample tested had elevated levels of zinc. The anticipated maximum pile depth is around 7mbgl and there is potential for piling to create preferential pathways for additional contamination of groundwater. The magnitude of consequence would be **mild**, the CSM identifies the risk as **low to moderate**.
- 13.6.29 The updated CSM for Irwins Mill is in Table 13.25.

Table 13.25: Updated CSM for Irwins Mill

Source	Pathway	Receptor	Risk
Reduced quality made ground containing elevated PAHs and asbestos, being associated with on site/adjacent factory, above ground tanks, and former bleach house and brick works.	Dermal contact Inhalation of fugitive dust Inhalation of vapour Ingestion	Construction workers	Low to moderate
Reduced quality made ground, surface water and shallow groundwater resulting in locally elevated zinc concentrations, being associated with on site/adjacent factory, above ground tanks, and the former bleach house and brick works.	Leachate and/or migration	Surface water Groundwater	Low to moderate

### Annagh Hill

- 13.6.30 No soil samples were tested from Annagh Hill, but the groundwater samples had elevated levels of boron, TPHs and a PAH (naphthalene). There is potential that the soils would contain some perceptible levels of contaminants that would pose a risk to the health of the construction workers. The magnitude of consequence would be **minor**. The CSM identifies the risk as **low**.
- 13.6.31 There is potential that the existing levels of boron, TPH and naphthalene present in the groundwater could be leached out into the Annagh River and/or River Bann during works. Excavations may expose shallow

groundwater that may runoff into the surface waters. The magnitude of consequence would be **medium** and the CSM identifies the risk as **low to moderate**.

13.6.32 During the GI and subsequent groundwater monitoring, the groundwater was recorded at depths of between 0.03mbgl and 15mbgl. At time of writing the maximum pile depth had not been determined but it is likely that piles would encounter groundwater at this site. There is potential for the piles to create preferential pathways for contaminants to leach or migrate into the groundwater. The magnitude of consequence would be **mild** and the risk from the CSM is deemed to be **low to moderate**.

13.6.33 The updated CSM for Annagh Hill is in Table 13.26.

Table 13.26: Updated CSM for Annagh Hill

Source	Pathway	Receptor	Risk
On site			
Potentially reduced quality made ground (containing a range of inorganic contaminants and hydrocarbons (TPHs/PAHs) including potential asbestos containing materials and/or fibres) associated with existing and previous development (Annagh Hill industrial estate, historic channelling of the river banks and developed areas on site boundary)	Dermal contact Inhalation of fugitive dust Inhalation of vapour Ingestion	Construction workers	Low
Potentially reduced quality made ground. Reported reduced quality shallow groundwater	Leachate and/or migration	Surface water Groundwater	Low to moderate
Off site			
Potentially impacted shallow groundwater from inorganic contaminants and hydrocarbons (TPH and PAH) associated with surrounding historical industrial land use (Annagh Hill industrial estate, possible scrapyards, railway land, unspecified works, garage, burial ground, brickfield and textile factories)	Leachate and/or migration	Construction workers Surface waters Groundwater	Moderate

## 13.7. Mitigation

13.7.1 The GQRAs are based on the samples available that were taken during the GI. Where possible, these were taken from representative locations to inform the assessment. However, there are areas where additional sampling would have allowed a more detailed risk assessment. The GQRAs therefore recommend additional boreholes and sampling in some of the locations, particularly where the existing samples include exceedances or asbestos. Additional investigation and sampling is recommended in the GQRAs as set out below:

- Corcrair Mews – further investigation at the centre and northern section of the site, with 4 additional boreholes to a depth of 5m with samples tested for metals, inorganics, hydrocarbons, PCBs and asbestos.
- Woodside Green/Ulster Carpets – 2 boreholes to a depth of 5m in the northern section of the Ulster Carpets site where a former tank was located and samples tested for metals, inorganics, hydrocarbons and asbestos.
- Parkside – further investigation at the north, east and west of the site with 3 boreholes up to 5m and samples tested for metals, inorganics, hydrocarbons and asbestos.
- Foundry Street – further investigation with 4 boreholes to a depth of 5m and monitoring wells installed in the boreholes. Samples tested for metals and speciated TPHs.
- Annagh Hill – further investigation across the site with an additional 7 boreholes to 5m with samples tested for metals, inorganics, hydrocarbons and asbestos.

13.7.2 No further investigation was deemed necessary for Castle Street, Bowling Green and Irwins Mill.

13.7.3 The recommended further investigations were not deemed necessary to allow this assessment to be completed. The existing information will be made available to the contractor at construction stage, and it will be a contractor decision to undertake any further boreholes if he deems it necessary to inform the final CEMP. The information provided by the GQRA informs the mitigation measures detailed in this section.

13.7.4 The GQRAs have been reviewed by the geo-technical team and the type of piles to be used have been considered based on the contamination risk at these 8 sites. At the sites where the GQRA has indicated a low to moderate risk of pollutant linkages being present, consideration has been given to the piling method proposed to reduce the risk of creating preferential pathways for near surface contaminants recorded within the made ground to reach ground or surface water present within or adjacent to the site.

13.7.5 Where appropriate a Continuous Flight Auger (CFA) piling method has been proposed instead of driven sheet piling to mitigate the risk of creating preferential pathways for pollutants. Due to the nature of how a CFA piled wall is constructed, the risk of introducing a new pollutant pathway is considered negligible as the pathway is closed during construction – the piles are bored with the sides of the hole continuously supported by the soil filled auger and following completion of boring, concrete is pumped from the base of the auger as it is extracted.

13.7.6 A preliminary piling risk assessment has been carried out by Amey and will be made available to the contractor prior to construction.

13.7.7 Although the risk to receptors was low or moderate, as best practice the GQRAs provide a series of mitigation measures to ensure adverse impacts on construction worker health and water receptors are minimised. For all sites the mitigation is similar and summarised in this section. Please refer to the full GQRAs in **Appendix 13.2, Volume 3** for more detail.

13.7.8 Best practice measures will be implemented with regards to preventing pollution, with the contractor implementing and adhering to Guidance for Pollution Prevention. These include but are not limited to:

- GPP 1: Understanding your environmental responsibilities – good environmental practices
- GPP 2: Above ground oil storage tanks
- GPP 5: Works and maintenance in or near water
- PPG 6: Working at construction and demolition sites
- PPG 7: Safe storage – the safe operation of refuelling facilities
- PPG 18: Managing fire water and major spillages
- GPP 21: Dealing with spills

- CIRIA Environmental good practice on site guide (C741)
- 13.7.9 Construction worker safety and the risks posed to health through potential exposure to contaminants will be minimised through adherence to the following health and safety guidance:
- Management of Health and Safety at Work Regulations (NI) 1999
  - Construction (Health, Safety and Welfare) Regulations (NI) 1999
  - Protection of workers and the General Public during the Development of Contaminated Land (HSE 1991)
  - A Guide to Safe Working on Contaminated Sites (R132) (CIRIA 1996).
- 13.7.10 The contractor will implement a Health and Safety Plan which would include measures such as: provision of welfare facilities including collection of dirty PPE; and provision of appropriate PPE for working in potentially contaminated sites.
- 13.7.11 As asbestos was identified on a number of sites, the contractor will be made aware of the risk of encountering asbestos. A watching brief will be maintained during site works and protocols adhered to with reference to the CAR-SOIL Guidance (Control of Asbestos Regulations 2012: Interpretation for Managing and Working with asbestos in Soil and Construction and Demolition materials: Industry Guidance).
- 13.7.12 Should any unexpected materials be encountered during the works, site operation will stop until the materials have been identified. A risk assessment will be carried out and appropriate remedial measures implemented prior to recommencement of works.
- 13.7.13 Other standard control measures to minimise risk of pollution to soils and water are included within the outline CEMP, **Appendix 6.2 in Volume 3**, as well as in Chapter 16 Hydrology and Drainage.

## 13.8. Residual Effects

- 13.8.1 With the mitigation measures implemented, the risks to the identified receptors at all the sites are minimised. All construction impacts on human health are temporary, and short term in duration. With the implementation of additional testing and/or a watching brief, and provision of appropriate PPE for site workers, the risks will be reduced. In addition, the duration of the works at each of the 8 sites is limited and likely to be:
- Corcrain Mews – 3 months
  - Woodside Green/Ulster Carpets – 9 months
  - Parkside – 9 months
  - Castle Street – 9 months
  - Foundry Street – 6 months
  - Bowling Green – 9 months
  - Irwins Mill – 6 months
  - Annagh Hill – 6 months
- 13.8.2 Pollution prevention measures will minimise the risk of significant pollution affecting the Ballybay, Corcrain, Annagh and Bann rivers. Construction effects will be temporary and short term in duration.
- 13.8.3 With consideration given to alternative piling solutions in the areas with elevated contamination levels, the risk of pollution to groundwater will be minimised. The residual effects on all receptors with mitigation are **not significant**.

## 13.9. Monitoring

- 13.9.1 Although no significant effects on receptors were identified, monitoring as set out in the mitigation section will be undertaken during construction to ensure exposure to any uncovered additional contamination is minimised. Monitoring will also be undertaken for additional signs of asbestos as set out in the mitigation section.

## 13.10. Summary

- 13.10.1 The scoping report identified 8 sites with potential to have moderate to high risk of land contamination. Geo-environmental samples were taken from these sites during the ground investigation and tested for a range of contaminants such as heavy metals, TPHs, PAHs and asbestos.
- 13.10.2 The laboratory testing indicated exceedances of some contaminants at 7 of the 8 sites, with only Corcrair Mews having no exceedances. The contaminant levels were compared to GACs to assess the impact on construction workers, groundwater and surface waters. The CSM for the sites indicated that the risk to human health, groundwater and surface waters ranged from low to moderate.
- 13.10.3 With mitigation measures being implemented during construction, there are **no significant effects** on construction workers, groundwater or surface waters.



## 14. Noise and Vibration

### 14.1. Introduction

- 14.1.1 This chapter of the Environmental Statement (ES) addresses the impact of the proposed scheme on the local environment in terms of Noise & Vibration. The assessment focuses on the construction phase at nearby sensitive receptors as operational impacts were scoped out since flood defences would not result in a permanent source of noise and vibration.

### 14.2. Statutory and Policy Context

#### The Land Acquisition and Compensation (Northern Ireland) Order 1973

- 14.2.1 Part III of the Land Acquisition and Compensation (Northern Ireland) Order 1973 (Ref. 14.1) provides a means by which noise insulation can be provided to insulate buildings against noise caused or expected to be caused by construction. The responsible authority also is required to provide expenses to persons that are required to be moved temporarily during construction works.

#### The Regional Development Strategy 2035 'Building a Better Future'

- 14.2.2 The Regional Development Strategy (Ref. 14.2) provides a strategic planning framework which facilitates and guides the public and private sectors. Under strategic guidance RG7: Support Urban and Rural Renaissance, it is stated that noise levels which are above comfort levels can be caused by construction activities. It states that when new developments or plans are being prepared it will be important to take into consideration the European Noise Directive which aims to avoid, prevent or reduce, on a prioritised basis, the harmful effects of noise.
- 14.2.3 Construction and demolition noise can be managed through best practicable means and a noise management plan that is drawn up in agreement with the local authority.

#### Noise Policy Statement for Northern Ireland

- 14.2.4 The Noise Policy Statement for Northern Ireland (Ref. 14.3), published in September 2014, defines the responsibility of Department of Agriculture, Environment and Rural Affairs' (DAERA) policy to manage environmental noise.
- 14.2.5 The Noise Policy aims, through effective management and control of noise, to:
- "Avoid or mitigate significant adverse impacts on health and quality of life;
  - Mitigate and minimise adverse impacts on health and quality of life; and
  - Where possible, contribute to the improvement of health and quality of life."

#### Control of Pollution Act 1974

- 14.2.6 The Control of Pollution Act 1974 (CoPA) (Ref. 14.4) Section 61 sets out the procedures for obtaining 'Prior consent' for construction works, including the agreement of noise limits. Applications for 'Prior consent' should be made to the relevant local authority and should contain a method statement detailing how the works will be carried out as well as a procedure to ensure noise is kept to a minimum.
- 14.2.7 Under Section 60 of the Act, the local authority serves the notice on the developer to limit noise and vibration impacts (usually as a result of complaints being received). These notices cannot be served if a Section 61 consent already exists (in which case, prosecution is for breach of Section 61 rather than for breach of Section 60 notice).
- 14.2.8 Section 71 of the Act details the approved codes of practices used to minimise noise and Section 72 defines Best Practicable Means (BPM).

## British Standards and Guidance

- 14.2.9 BS 5228:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites' Part 1 Noise (BS 5228-1) (Ref. 14.5) and Part 2 Vibration (BS 5228-2) (Ref. 14.6) was used to assess noise and vibration from construction and demolition activities associated with construction sites and Part 2 Vibration.
- 14.2.10 BS 5228-1 provides guidance to predict noise levels from plant and equipment associated with construction sites.
- 14.2.11 BS 5228-1 does not define strict criteria to determine the significance of noise impacts; however, it has three methods for assessing construction noise. In order to determine the potential for significant changes, Method 2 called the 5dB(A) change method from Annex E has been applied for this assessment. It states that:
- "Noise levels generated by site activities are deemed to be potentially significant if the total noise (pre-construction ambient plus site noise) exceeds the pre-construction ambient noise by 5dB or more, subject to lower cut-off values of 65dB, 55dB and 45dB  $L_{Aeq,T}$  from site noise alone, for the daytime, evening and night-time periods, respectively; and a duration of one month or more, unless works of a shorter duration are likely to result in significant effect".*
- 14.2.12 BS 5228-2 provides a database of measured ground vibration levels for different piling methods and a range of ground conditions. Based on the formula within Table E.1 for driven piling, the predicted PPV was estimated for the closest sensitive receptor.
- 14.2.13 In addition to the above, vibration from construction and demolition activities may impact on adjacent buildings. The criteria used in this assessment relate to the potential for cosmetic damage, not structural damage.

## 14.3. Methodology

### Baseline conditions

- 14.3.1 The baseline conditions were determined using google maps and reviewing available noise data from Noise Maps (Ref 14.7).

### Study area

- 14.3.2 For construction noise, a study area of 300m from the closest construction activity was deemed sufficient using the guidance of the Design Manual for Roads and Bridges LA 111 Noise and Vibration (DMRB LA 111) (Ref. 14.8) and professional judgement. BS 5228-1 states that noise predictions over 300m should be treated with caution as they are unreliable.
- 14.3.3 For construction vibration, a study area of 100m from the closest construction activity was deemed sufficient using guidance of DMRB LA 111 and professional judgement.

### Noise Survey

- 14.3.4 A noise survey was undertaken in accordance with the guidance in BS 5228-1 Annex G. During the baseline noise survey,  $L_{Aeq,T}$  which is the A-weighted equivalent continuous sound pressure level over a period of time T, was recorded.
- 14.3.5 Fourteen daytime and eight night-time noise surveys location were chosen. These locations were selected on the basis that they are representative for residential receptors within the study area.

### Sensitivity of receptors

- 14.3.6 Noise sensitive receptors (NSR) are receptors potentially sensitive to noise or vibration. They typically include dwellings, hospitals, community facilities and designated areas.

14.3.7 The identification of sensitive receptors was undertaken using Ordnance Survey AddressBase data from 2018.

## Significance Criteria

### Noise assessment

14.3.8 Assessment of the noise effects during the construction phase is based on guidance set out in BS 5228-1. Noise predictions have been carried out at selected receptors to the proposed schemes using the calculation procedures in F.2.2.2. The calculations represent the typical worst-case facade noise level at selected receptors.

14.3.9 The noise levels generated at selected receptors is dependent on a number of variables:

- Noise generated by plant or equipment used on each site
- Periods of operation of plant used on each site
- Distance between noise source and receptors
- Attenuation provided from ground absorption and barriers.

14.3.10 When assessing the temporary effects of construction noise, the sensitivity depends on the existing noise levels in the study area. Noise from construction works are expected to be more intrusive in a quiet area with low background noise levels compared to a noisy area with existing high background noise levels, where construction noise would not be easily heard. There are two methods set out in BS 5228-1 to predict significant; the "ABC method" and the "5dB(A) change".

14.3.11 Table E.1 provides an example assessment method to determine the sensitivity of dwellings in relation to construction noise using the "ABC method": Table E.1 is represented here as Table 14-1. Although given in the Standard as an example, the method and the levels given in Table 14-1 are conventionally applied to assessments as presented. These levels only indicate where there could be a potentially significant effect as a result of the level of noise. A number of other factors including the duration of the impact, the character of the construction and the number of receptors affected must also be considered to determine if there is a significant effect.

Table 14-1: Threshold of potential significant effects at dwellings

Assessment category and threshold value period	Threshold value, in decibels (dB $L_{Aeq,T}$ )		
	Category A	Category B	Category C
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75
Evenings weekday (19:00-23:00); Saturdays (13:00-23:00); and Sundays (07:00-23:00)	55	60	65
Night-time (23:00 – 07:00)	45	50	55
NOTE 1: A potential significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level.			
NOTE 2: If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3 dB due to site noise.			
NOTE 3: Applied to residential receptors only.			
Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values (i.e. below 65).			
Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values (i.e. 65).			

Assessment category and threshold value period	Threshold value, in decibels (dB $L_{Aeq,T}$ )		
	Category A	Category B	Category C
Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values (i.e. above 65).			

- 14.3.12 Using the "5dB(A) change" method, construction activities are deemed to be potentially significant if the total noise (pre-construction ambient plus construction noise) exceeds the pre-construction ambient noise by 5dB or more, subject to lower cut-off values of 65dB (daytime), 55dB (evening) and 45dB (night)  $L_{Aeq,T}$  from construction noise alone.
- 14.3.13 BS 5228-1 contains a database of the noise emissions from individual items of equipment which can be used to predict noise from construction activities at selected receptors.

### Construction Vibration

- 14.3.14 Assessment of the vibration effects during the construction phase is based on guidance set out in BS 5228-2. There is no formula within BS 5228-2 for the prediction of the vibration through the ground due to different ground conditions. BS 5228-2 provides a range of measured historical data for a variety of different piling methods.
- 14.3.15 BS 5228-2 provides a database of measured ground vibration levels for different piling methods and a range of ground conditions. Based on the formula within Table E.1 for driven piling, the predicted peak particle velocity (PPV) was estimated for the closest receptor.
- 14.3.16 Table 14-2 is taken from BS 5228-2 and modified to include magnitude of impacts associated with each vibration level which have been derived from DMRB LA 111. It details PPV levels and their potential effect on humans and provides a semantic scale for description of vibration impacts on human receptors.

Table 14-2: Guidance of vibration levels (modified version of Table B.1, BS 5228-2 and DMRB LA 111)

Vibration level (mm/s)	Effect	Magnitude of impact
0.14	Vibration might be just perceptible in the most sensitive situation for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.	Negligible
0.3	Vibration might be just perceptible in residential environments.	Minor
1.0	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.	Moderate
10	Vibration is likely to be intolerable for any more than a very brief exposure to this level.	Major

- 14.3.17 The lowest observable adverse effect level (LOAEL) and significant observable adverse effect level (SOAEL) for construction vibration in terms of PPV are determined in accordance with the threshold summaries in Table 14-3 and taken from DMRB LA 111.

Table 14-3: Construction vibration LOAEL and SOAEL

Time periods	LOAEL	SOAEL
All time periods	0.3mm <sup>-1</sup> PPV	1.0mm/1 PPV

14.3.18 Construction vibration shall constitute a likely significant effect where it is determined that a major or moderate magnitude of impact will occur for a duration exceeding:

- 10 or more days or nights in any consecutive days or nights; or
- a total number of days exceeding 40 in any 6 consecutive months.

14.3.19 For vibration during the construction phase, activities may impact on nearby buildings. The criteria used in this assessment related to potential for cosmetic damage, not structural damage. The recommended PPV vibration limits in BS 7385 (referenced in BS 5228-1) (Ref. 14.8) for transient excitation for different types of buildings are detailed in Table 14-4.

Table 14-4: Transient vibration guide values for cosmetic damage

Type of structure	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
	4Hz to 15 Hz	15 Hz and above
Reinforced or framed structures	50 mm/s at 4 Hz and above	30 mm/s at 15 Hz increasing to 50 mm/s to 40 Hz and above
Industrial and heavy commercial buildings		
1 – Values referred to are at the base of the buildings 2 – For line 2, at frequencies below 4 Hz, a maximum displacement of 0.6mm (zero to peak) should not be exceeded.		

### Assumptions and limitations

#### Construction programme

14.3.20 In order to quantify the likely noise from construction works, it is necessary to define the various activities based on the anticipated programme of work.

14.3.21 Construction works are proposed to commence in 2023 for a duration of 36 months.

#### Equipment and plant

14.3.22 The list of plant expected to be used during each construction phase is detailed in Table 14-5 including sound pressure level, percentage on-time and number of items. The programme and construction details are limited at this stage; therefore, this information has been assumed based on preliminary information received from designers and professional judgement of typical construction activities.

14.3.23 The screening and ground attenuation between the construction site and receptors will be based on a scheme by scheme basis and detailed in the assessment section.

Table 14-5: List of plant and equipment included in the noise assessment

Phase or works	Item	Data source	Noise level at 10m (dB (A))*	On time (%)	Number of items
Raised flood embankments	Excavators	C.2 14	79	50	2
	Earth movers	C.2 8	68	50	2

Phase or works	Item	Data source	Noise level at 10m (dB (A))*	On time (%)	Number of items
Reinforced concrete walls	Delivery trucks	C.2 30	79	20	3
	Excavators	C.2 14	79	50	2
	Earth movers	C.2 8	68	50	2
	Concrete pump	C.4 29	80	50	1
	Delivery trucks	C.2 30	79	20	3
	Mobile cranes	C.3 43	70	50	3
	Barges	Ref. 14.9	72 dB (A) at 15m	50	3
Landscaping	Earth movers	C.2 8	68	50	2
	Delivery trucks	C.2 30	79	20	3
Sheet pile walling	Piling rigs (steel sheet piles)	C.3 1	89	50	2
	Barges	Ref. 14.9	72 dB (A) at 15m	50	3
	Delivery trucks	C.2 30	79	50	3
Raised footpath/walkways	Excavators	C.2 14	79	50	2
	Earth movers	C.2 8	68	50	2
	Concrete pump	C.4 29	80	50	1
Embedded cantilever wall	Excavators	C.2 14	79	50	2
	Earth movers	C.2 8	68	50	2
	Delivery trucks	C.2 30	79	50	3
	Mobile cranes	C.3 43	70	50	3
Secant piling	Piling rigs (steel sheet piles)	C.3 1	89	50	2
	Barges	Ref. 14.9	72 dB (A) at 15m	50	3
	Delivery trucks	C.2 30	79	50	3

\*unless otherwise stated

## 14.4. Baseline Conditions

### Desk based

14.4.1 The baseline conditions for each of the sites is detailed in Table 14.6. There are no candidate noise management areas (CNMA) in Portadown.

Table 14-6: Baseline conditions at sites

Site	Setting	Predominant noise source	Description
A: Ashgrove Road	Urban	Road	This site is located on the boundary between urban and rural Portadown. To the west and south, the study area is mainly residential while to the north and the east the main land use is agricultural. There are no A class roads in the immediate vicinity of the site therefore there are no noise levels available on the Noise maps.
A1: Corcraan Mews	Urban	Road	This site is located along the A4. Residential receptors located along this road experience high levels of noise (up to 74 dB L <sub>day</sub> )
B: Derryanvil Road	Rural	Agricultural	This site is located in a rural environment at a distance from any major roads. Therefore, it is expected that noise from agricultural activities would be the main noise source in the study area.
C: Woodside Green	Urban	Road/Rail	This site is located adjacent to the A3 Northway and the railway, with Portadown Train Station located approximately 400m to the south, therefore will experience high level of noise (up to 64 dB L <sub>day</sub> )
D: People's Park	Urban	Road/Rail	This site is located around the southern and eastern extents of Portadown People's Park. Portadown Train Station and the A3 Northway are located less than 100m from the site. Noise levels at this site are predicted to be between 50 dB and 55 dB L <sub>day</sub> . The site is lower than the train station by approximately 2m.
E: Parkside Obins Street	Urban	Road	This site is located within a residential area. It is located near the A3 and A4; therefore, noise levels are up to 74 dB L <sub>den</sub> . The maximum noise level at most residential properties is 64 dB L <sub>den</sub> .
F: Rose Cottages	Urban	Road	This site is to the south west of a residential area. It is not located near a major road and there is no noise level data available on the Noise maps.
H: Castle Street	Urban	Road/Rail	This site is located along the riverside walk adjacent to the River Bann. The site is located to the south of the A3 Northway and east of the Castle Road; therefore, it is likely to experience high levels of noise (up to 74 dB L <sub>day</sub> )
I: Foundry Street	Urban	Road/Rail	This site is mainly in a commercial area with a few residential and community receptors located near the scheme. This site is located between the A3 Northway and Bridge Street; therefore, it is likely to experience high levels of noise (up to 74 dB L <sub>day</sub> )
J: Bowling Green	Urban	Road/Commercial	This site is located along the west of the River Bann. The closest receptors are commercial, with some residential receptors located further from the site. Bridge Street is located within the study area and all receptors located along this road have higher noise levels (up to 74 dB L <sub>day</sub> ) while receptors closer to the site have lower noise levels (less than 55 dB L <sub>day</sub> ).
K: Health Centre	Urban	Road	This site is located on the boundary between urban and rural Portadown. To the north and west, the study area is mainly commercial and residential while to the south and the east the main land use is agricultural. The site is adjacent to Meadow Lane, but there are no noise level data available on the Noise maps.
L: Irwins Mill	Urban	Road/commercial	This site is located between the Upper Bann and Irwin's Mill. Bridge Street is located less than 100m from the site, causing high

Site	Setting	Predominant noise source	Description
			noise levels (up to 74 dB $L_{day}$ ) within the study area, particularly at receptors located along this road. Receptors located further from Bridge Street have lower noise levels (less than 55 dB $L_{day}$ ).
M: Annagh Hill Industrial Estate	Urban	Road	This site is located on the boundary between urban and rural Portadown. To the west, the study area is mainly residential while to the east the main land use is agricultural. There are no major roads in the immediate vicinity of the site and there is no noise level data available on the Noise maps.
N: Olde Golf Links & N2: Fairways	Urban	Road	This site is located around a community facility and residential receptors in Olde Golf Links. There are no major roads in the immediate vicinity of the site and there is no noise level data available on the Noise maps.
O: 313 Tandragee Road	Rural	Road/agricultural	This site is located to the rear of farm buildings. There are no major roads in the immediate vicinity of the site and there is no noise level data available on the Noise maps.
P: Derryvore Lane	Urban	Road/commercial	This site is located near the Seagoe Road and approximately 400m from the M12. The study area comprises predominantly of commercial buildings with some scattered residential receptors, to the north of the study area. The noise level in the study is predominantly between 50 and 54 dB $L_{day}$ .
Q: Ripley Mews	Urban	Road	The site is located adjacent to the A27 Armagh Road behind residential receptors. Armagh Street is located within the study area and receptors located along this road have higher noise levels (up to 74 dB $L_{day}$ ) while receptors which are located further from the road have lower noise levels (less than 55 dB $L_{day}$ ).
R: Corcullentragh Road	Rural	Agricultural	This site is located in a rural environment at nearly 400m from any major roads. Therefore, it is expected that noise from agricultural activities would be the main noise source in the study area.
S: Corcrain Drive	Rural	Road	This site is located on the boundary between urban and rural Portadown. To the south, the study area is mainly residential while to the north the main land use is agricultural. There are no major roads in the immediate vicinity of the site and there is no noise level data available on the Noise maps.

## Noise Survey

14.4.2 Noise surveys were undertaken in accordance with the guidance in BS 5228-1 Annex G. During the baseline noise survey,  $L_{Aeq,T}$  which is the A-weighted equivalent continuous sound pressure level over a period of time T, was recorded.

14.4.3 The noise surveys were undertaken on:

- 22<sup>nd</sup>, 23<sup>rd</sup> & 25<sup>th</sup> November 2021 – daytime surveys
- 29<sup>th</sup> November 2021, 17<sup>th</sup> January & 25<sup>th</sup> January 2022 – evening surveys.

14.4.4 The weather for each of the surveys is detailed in **Appendix 14.1, Volume 3**. There was no precipitation or wind for each of the surveys. Temperature and cloud cover varied over the days and is detailed below:

- 22<sup>nd</sup> November – 1.0°C to 7.5°C
- 23<sup>rd</sup> November – 7.0°C to 8.0°C



- 25<sup>th</sup> November – 4.0°C to 5.5°C
- 29<sup>th</sup> November – 9.5°C to 10.0°C
- 17<sup>th</sup> January – 5.5°C to 6.0°C
- 24<sup>th</sup> January – 5.0°C to 6.0°C

14.4.5 The noise surveys were completed using LXT meter which was calibrated before and after each survey. The equipment used during the noise survey is detailed in Table 14-7. Calibration values are detailed in **Appendix 14.1, Volume 3**.

Table 14-7: Noise survey equipment

Equipment	Manufacturer	Serial Number
Sound level meter	LXT1	0002589
Acoustic calibrator	CAL200	7903

14.4.6 **Figures 14.1 – 14.20, Volume 4** show the location of the noise surveys. The coordinates of the survey are detailed below in Table 14-8. The results for the day and night survey are also detailed in Table 14-8. All 14 locations were surveyed during the day and a representative number of locations were surveyed during the evening. The locations with the lowest day time noise levels were surveys. Full results are detailed in **Appendix 14.1, Volume 3**.

Table 14-8: Noise survey results

Noise survey location	Address	Coordinates	Figure reference	Day	Evening
				Noise level (L <sub>Aeq</sub> dB)	Noise level (L <sub>Aeq</sub> dB)
1	11 Ashgrove Lodge	54.43608 -6.44857	Figure 14.1	55.2	54.8
2	8 Corcraín Mews	54.42883 -6.45988	Figure 14.2	48.9	48.1
3	People's Park	54.42731 -6.44437	Figure 14.5	53.2	51.6
4	People's Park	54.42554 -6.44904	Figure 14.5	51.2	-
5	Foundry Street Car Park	54.41921 -6.43901	Figure 14.14	56.7	56.6
					-
7	3 Annagh Hill	54.41519 -6.44200	Figure 14.13	52.0	48.4
8	24 The Olde Golf Links	54.40942 -6.44343	Figure 14.8	58.8	-

Noise survey location	Address	Coordinates	Figure reference	Day	Evening
				Noise level (L <sub>Aeq</sub> dB)	Noise level (L <sub>Aeq</sub> dB)
9	319 Tandragee Road	54.39026 -6.44523	Figure 14.16	62.8	-
11	7 Ripley Mews	54.41329 -6.45259	Figure 14.18	50.6	50.8
13	33 Drumcree Grove	54.41104 -6.46082	Figure 14.18	49.1	46.3
14	34/36 Derryvore Lane	54.44918 -6.43668	Figure 14.17	43.4	43.1

## 14.5. Evaluation (Value of Resource or Sensitivity of Receptors)

14.5.1 The number of residential receptors and non-residential receptors which have been included in each study area as part of this assessment are detailed in Table 14-9 and shown in **Figures 14.1 – 14.20, Volume 4.**

14.5.2 The non-residential sensitive properties within the study area consisting of:

- Churches
- Schools
- Community spaces
- Health assets.

14.5.3 All residential and non-residential receptors included within the assessment have been assigned a high sensitivity.

Table 14-9: Noise Sensitive Receptors

Site	Distance bands (m)													
	Residential Receptor							Non-residential Receptor						
	10	20	50	100	150	200	300	10	20	50	100	150	200	300
A	1	3	27	80	110	115	237	0	0	0	0	0	0	0
A1	1	6	16	32	83	131	234	0	1	0	0	0	0	1
B	0	0	1	0	1	0	1	0	0	0	0	0	0	0

Site	Distance bands (m)													
	Residential Receptor							Non-residential Receptor						
	10	20	50	100	150	200	300	10	20	50	100	150	200	300
C	0	2	31	76	77	60	135	0	0	0	0	0	1	1
D	1	12	56	86	68	106	208	0	0	0	3	0	1	0
E	3	12	24	52	102	83	170	0	0	1	0	1	0	3
F	0	13	17	54	126	148	218	0	0	0	0	0	0	3
H	0	0	0	8	58	49	123	0	0	0	0	2	1	5
I	0	0	1	9	18	69	160	0	0	0	1	1	2	4
J	0	0	0	0	0	27	124	0	2	0	0	1	0	6
K	0	0	0	1	42	42	139	0	0	0	1	0	1	14
L	0	0	0	1	49	68	163	0	0	0	2	0	3	7
M	0	1	14	57	126	93	316	0	0	0	0	2	4	3
N	0	14	27	52	62	98	137	0	0	1	0	0	0	0
N2	0	18	19	35	31	36	88	0	0	0	0	1	0	0
O	0	0	0	0	3	3	7	0	0	0	0	0	0	2
P	0	0	1	2	2	0	4	0	0	2	2	1	1	2
Q	0	8	25	38	91	138	213	0	0	0	0	0	0	0
R	0	1	0	0	0	0	3	0	1	0	0	0	0	3
S	1	25	51	100	167	160	278	0	0	0	0	0		1
<b>Total</b>	<b>7</b>	<b>115</b>	<b>311</b>	<b>682</b>	<b>1215</b>	<b>1427</b>	<b>2956</b>	<b>0</b>	<b>3</b>	<b>2</b>	<b>7</b>	<b>8</b>	<b>13</b>	<b>50</b>

## 14.6. Impact Assessment

### Do-Nothing

14.6.1 In the Do-Nothing scenario, it is envisaged that there would not be any perceptible change in noise and vibration condition, particularly as the risk of flooding and inundation in the area would remain, therefore restrictions on future development on land potentially affected by flooding would negate the potential to introduce new sources of noise and vibration associated with the scheme.

### Construction Noise

14.6.2 During the construction phase, the majority of works would comprise site preparation, involving the use of earth moving, excavation and piling. In addition, there would also be additional noise generated by construction site traffic which would include HGV movements associated with the delivery of earthwork material, which would have potential for a noise impact along the haul routes to the site.

14.6.3 Table 14-10 to Table 14-24 shows the estimated noise levels at various distance bands for each construction stage at each site and the number of dwellings within each distance band. Construction stages shown in red are those that are predicted to exceed the relevant threshold.

14.6.4 The relevant threshold is not predicted to be exceeded beyond 200m in the daytime. The relevant threshold is predicted to be exceeded up to 300m if construction works are completed during the evening/weekend. Highest noise levels are predicted during piling works.

14.6.5 It should be noted that these predicted results are worst-case, and the actual impact anticipated on receptors is anticipated to be less than presented here. Not all plant will be in use at the same time and plant will move within the construction site resulting in noise levels to be lower than predicted. Also, although it has been assumed as a conservative measure, not all construction works within these phases will be taking place during the night.

### Site A Ashgrove Road

14.6.6 In terms of sensitivity to construction noise, baseline noise level at this location was taken as 55.2dB (A) (Noise Location: 1) during the daytime and 54.8 dB(A) (Noise Location: 1), (**Figure 14.1, Volume 4**) during the evening/weekend time, which corresponds to Category A during the day (65 dB) and Category B during the evening/weekend (60 dB).

Table 14-10: Indicative construction noise levels at different distance bands from the scheme – Site A

Phase	Time period	Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised flood embankments	Day	81	75	68	62	58	57
	Evening/weekend	81	75	68	62	58	57
Reinforced concrete walls	Day	84	78	70	65	60	58
	Evening/weekend	84	78	70	65	60	58
Landscaping	Day	77	71	64	59	57	56
	Evening/weekend	77	71	64	59	57	56
Sheet pile walling	Day	86	80	72	67	61	59
	Evening/weekend	86	80	72	67	61	59
Raised footpath /walkways	Day	81	75	68	62	58	57
	Evening/weekend	81	75	68	62	58	57
Embedded cantilever wall	Day	82	76	68	63	58	57
	Evening/weekend	82	76	68	63	58	57
Secant piling	Day	86	80	72	67	61	59
	Evening/weekend	86	80	72	67	61	59

14.6.7 All activities will result in exceedance of the day and evening/weekend thresholds at receptors within the distance shown above.

### Site A1 Corcraín Mews

14.6.8 In terms of sensitivity to construction noise, baseline noise level at this location was taken as 48.9dB (A) (Noise Location: 2) during the daytime and 48.1 dB(A) (Noise Location: 2), **Figure 14.2, Volume 4**, during the evening/weekend time, which corresponds to Category A (65 dB during the day and 55 dB during evening/weekends).

Table 14-11: Indicative construction noise levels at different distance bands from the scheme – Site A1

Phase	Time period	Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised flood embankments	Day	81	75	67	61	56	54
	Evening/weekend	81	75	67	61	55	52
Reinforced concrete walls	Day	84	78	70	64	58	56
	Evening/weekend	84	78	70	64	58	54
Landscaping	Day	77	71	63	58	53	51
	Evening/weekend	77	71	63	57	51	48
Sheet pile walling	Day	86	80	72	66	61	57
	Evening/weekend	86	80	72	66	60	57
Raised footpath/walkways	Day	81	75	67	62	56	54
	Evening/weekend	81	75	67	61	55	52
Embedded cantilever wall	Day	82	76	68	62	57	54
	Evening/weekend	82	76	68	62	56	52
Secant piling	Day	86	80	72	66	61	57
	Evening/weekend	86	80	72	66	60	57

14.6.9 All activities will result in exceedance of the day and evening/weekend thresholds at receptors within the distance shown above.

### Site B Derryanvil Road

14.6.10 In terms of sensitivity to construction noise, baseline noise levels at this location were taken as 60.2dB (A) (Noise Location: 10) during the daytime and 54.8 dB(A) (Noise Location: 10), **Figure 14.3, Volume 4**, during the evening/weekend time, which corresponds to Category A during the day (65 dB) and Category B during the evening/weekend (60 dB).

Table 14-12: Indicative construction noise levels at different distance bands from the scheme – Site B

Phase	Time period	Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised flood embankments	Day	81	75	68	64	61	61
	Evening/weekend	81	75	68	62	58	57
Reinforced concrete walls	Day	84	78	70	66	62	61
	Evening/weekend	84	78	70	65	60	58
Landscaping	Day	77	72	65	62	61	60
	Evening/weekend	77	71	64	59	56	56
Sheet pile walling	Day	86	80	73	67	63	62
	Evening/weekend	86	80	72	67	61	59
Raised footpath /walkways	Day	81	75	68	64	61	61
	Evening/weekend	81	75	68	62	58	57
Embedded cantilever wall	Day	82	76	68	64	62	61
	Evening/weekend	82	76	68	63	58	57
Secant piling	Day	86	80	73	67	63	62
	Evening/weekend	86	80	72	67	61	59

14.6.11 All activities will result in exceedance of the day and evening/weekend thresholds at receptors within the distance shown above.

#### Site C Woodside Green & D People's Park

14.6.12 In terms of sensitivity to construction noise, baseline noise levels at this location was taken as 53.2dB (A) (Noise Location: 3) during the daytime and 52.6 dB(A) (Noise Location: 4) during the evening/weekend time, which corresponds to Category A (65 dB during the day and 55 dB during evening/weekends). Locations are shown on **Figure 14.4 and 14.5, Volume 4**.

Table 14-13: Indicative construction noise levels at different distance bands from the scheme – Site C &amp; D

Phase	Time period	Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
	Day	81	75	67	62	57	56

	period	Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised flood embankments	Evening/ weekend	81	75	67	62	57	55
Reinforced concrete walls	Day	84	78	70	64	59	57
		84	78	70	64	59	56
Landscaping	Day	77	71	64	59	55	54
	Evening/ weekend	77	71	64	58	54	53
Sheet pile walling	Day	86	80	72	66	61	58
	Evening/ weekend	86	80	72	66	61	58
Raised footpath /walkways	Day	81	75	68	62	57	56
	Evening/ weekend	81	75	67	62	57	55
Embedded cantilever wall	Day	82	76	68	62	58	56
	Evening/ weekend	82	76	68	62	57	55
Secant piling	Day	86	80	72	66	61	58
	Evening/ weekend	86	80	72	66	61	58

14.6.13 All activities will result in exceedance of the day and evening/weekend thresholds at receptors within the distance shown above.

### Site E Parkside

14.6.14 In terms of sensitivity to construction noise, baseline noise levels at this location was taken as 51.2dB (A) (Noise Location: 4) during the daytime and 51.6 dB(A) (Noise Location: 4), during the evening/weekend time, **Figure 14.5 and Figure 14.6, Volume 4** which corresponds to Category A (65 dB during the day and 55 dB during evening/weekends).

Table 14-14: Indicative construction noise levels at different distance bands from the scheme – Site E

Phase	Time period	Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised flood embankments	Day	81	75	67	62	57	54
	Evening/ weekend	81	75	67	62	57	55
	Day	84	78	70	64	59	56

		Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Reinforced concrete walls	Evening/ weekend	84	78	70	64	59	56
	Day	77	71	64	58	54	53
Landscaping	Day	86	80	72	66	61	58
	Evening/ weekend	81	75	67	62	57	55
Sheet pile walling	Day	82	76	68	62	57	55
	Evening/ weekend	86	80	72	66	61	58
Raised footpath /walkways	Day	81	75	67	62	57	55
	Evening/ weekend	82	76	68	62	57	55
Embedded cantilever wall	Day	86	80	72	66	61	58
	Evening/ weekend	86	80	72	66	61	58
Secant piling	Day	86	80	72	66	61	58
	Evening/ weekend	86	80	72	66	61	58

14.6.15 All activities will result in exceedance of the day and evening/weekend thresholds at receptors within the distance shown above.

### Site F Rose Cottages

14.6.16 In terms of sensitivity to construction noise, baseline noise levels at this location was taken as 48.9dB (A) (Noise Location: 2) during the daytime and 48.1 dB(A) (Noise Location: 2) during the evening/weekend time, which corresponds to Category A (65 dB during the day and 55 dB during evening/weekends). Location 2 was chosen to be included in Site F Rose Cottages assessment as both locations have a similar setting. The location of Rose Cottages is shown in **Figure 14.7, Volume 4**.

Table 14-15: Indicative construction noise levels at different distance bands from the scheme – Site F

		Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised flood embankments	Day	81	75	67	61	56	54
	Evening/ weekend	84	78	70	64	58	56
Reinforced concrete walls	Day	84	78	70	64	58	56
	Evening/ weekend	84	78	70	64	58	55



Phase	Time	Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Landscaping	Day	77	71	63	58	53	51
	Evening/weekend				58	53	51
Sheet pile walling	Day	86	80	72	66	61	57
	Evening/weekend	86	80	72	66	60	57
Raised footpath /walkways	Day	81	75	67	62	56	54
	Evening/weekend						
Embedded cantilever wall	Day	82	76	68	62	57	54
	Evening/weekend						
Secant piling	Day	86	80	72	66	61	57
	Evening/weekend	86	80	72	66	60	57

14.6.17 All activities will result in exceedance of the day and evening/weekend thresholds at receptors within the distance shown above.

#### Site H Castle Street, I Foundry Street, J Bowling Green & L Irwin's Mill

14.6.18 In terms of sensitivity to construction noise, baseline noise levels at these locations was taken as 56.7dB (A) (Noise Location: 5) during the daytime and 56.6 dB(A) (Noise Location: 5) during the evening/weekend time, which corresponds to Category A (65 dB) in the day and Category B (60 dB) in the evening. The sites are shown on **Figures 14.8 – Figure 14.10 and Figure 14.12, Volume 4.**

Table 14-16: Indicative construction noise levels at different distance bands from the scheme – Site H, I, J & L

		Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised flood embankments	Day	81	75	68	63	59	58
Reinforced concrete walls	Day	84	78	70	65	60	59
			78	70	65	60	59
Landscaping	Day	77	71	64	60	58	57
	Evening/weekend	77	71	64	60	58	57

		Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Sheet pile walling	Day	86	80	72	67	62	60
	Evening/weekend						60
Raised footpath /walkways	Day	81	75	68	63	59	58
	Evening/weekend	81	75	68	63	59	58
Embedded cantilever wall	Day	82	76	68	63	59	58
Secant piling	Day	86	80	72	67	62	60
	Evening/weekend	86	80	72	67	62	60

14.6.19 All activities will result in exceedance of the day and evening/weekend thresholds at receptors within the distance shown above.

#### Site K Health Centre

14.6.20 In terms of sensitivity to construction noise, baseline noise levels at this location was taken as 73.1dB (A) (Noise Location: 6) during the daytime and 54.8dB(A) (Noise Location: 1) during the evening/weekend time, which corresponds to Category C (75 dB during the day and 65 during the evening/weekends). As a night-time noise was not completed at this site, the night-time noise level at Noise Location: 1 was used.

Table 14-17: Indicative construction noise levels at different distance bands from the scheme – Site K

		Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised flood embankments	Day	82	77	74	73	73	73
Reinforced concrete walls	Day	84	79	75	74	73	73
Landscaping	Day	79	75	74	73	73	73
Sheet pile walling	Day	86	81	76	74	73	73
	Evening/weekend	86	80	72	67	61	59

Phase	Time period	Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised footpath /walkways	Day	82	77	74	73	73	73
	Evening/ weekend	81	75	68	62	58	57
Embedded cantilever wall	Day	82	78	74	73	73	73
	Evening/ weekend	82	76	68	63	58	57
Secant piling	Day	86	81	76	74	73	73
	Evening/ weekend	86	80	72	67	61	59

14.6.21 All activities will result in exceedance of the day and evening/weekend thresholds at receptors within the distance shown above.

### Site M Annagh Hill

14.6.22 In terms of sensitivity to construction noise, baseline noise levels at this location was taken as 52.0dB (A) (Noise Location: 7, **Figure 14.13, Volume 4**) during the daytime and 48.4 dB(A) (Noise Location: 7) during the evening/weekend time, which corresponds to Category A (65 dB during the day and 55 dB during evening/weekends).

Table 14-18: Indicative construction noise levels at different distance bands from the scheme – Site M

Phase	Time period	Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised flood embankments	Day	81	75	67	62	57	55
	Evening/ weekend	81	75	67	61	56	53
Reinforced concrete walls	Day	84	78	70	64	59	56
	Evening/ weekend	84	78	70	64	58	55
Landscaping	Day	77	71	64	58	55	53
	Evening/ weekend	77	71	63	58	53	51
Sheet pile walling	Day	86	80	72	66	61	58
	Evening/ weekend	86	80	72	66	60	57
Raised footpath /walkways	Day	81	75	67	62	57	55
	Evening/ weekend	81	75	67	62	56	53

Phase	Time period	Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Embedded cantilever wall	Day	82	76	68	62	57	55
	Evening/weekend	82	76	68	62	56	54
Secant piling	Day	86	80	72	66	61	58
	Evening/weekend	86	80	72	66	60	57

14.6.23 All activities will result in exceedance of the day and evening/weekend thresholds at receptors within the distance shown above.

### Site N Olde Golf Links & N2 Fairways

14.6.24 In terms of sensitivity to construction noise, baseline noise levels at these locations were taken as 58.8 dB (A) (Noise Location: 8, **Figure 14.14, Volume 4**) during the daytime and 54.8 dB(A) (Noise Location: 1) during the evening/weekend time, which corresponds to Category A (65 dB) and Category B (60 dB) during the evening/weekend. As a night-time noise was not completed at this site, the night-time noise level at Noise Location: 1 was used. The location of the Fairways receptors is shown in **Figure 14.15, Volume 4**.

Table 14-19: Indicative construction noise levels at different distance bands from the scheme – Sites N and N2

		Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised flood embankments	Day	81	75	68	63	60	60
	Evening/weekend	81	75	68	62	58	57
Reinforced concrete walls	Day	84	78	70	65	61	60
	Evening/weekend	84	78	70	65	60	58
Landscaping	Day	77	72	65	61	60	59
	Evening/weekend	77	71	64	59	56	56
Sheet pile walling	Day	86	80	72	67	63	61
	Evening/weekend	86	80	72	67	61	59
Raised footpath /walkways	Day	81	75	68	63	60	60
	Evening/weekend	81	75	68	62	58	57
	Day	82	76	68	64	61	60

		Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Embedded cantilever wall	Evening/ weekend	82	76	68	63	58	57
	Day	86	80	72	67	63	61
Secant piling	Evening/ weekend	86	80	72	67	61	59

14.6.25 All activities will result in exceedance of the day and evening/weekend thresholds at receptors within the distance shown above.

### Site O 313 Tandragee Road

14.6.26 In terms of sensitivity to construction noise, baseline noise levels at this location was taken as 62.8dB (A) (Noise Location: 9, **Figure 14.16, Volume 4**) during the daytime and 54.8 dB(A) (Noise Location: 1) during the evening/weekend time, which corresponds to Category A (65 dB) during the day and Category B (60 dB) during the evening/weekend. As a night-time noise was not completed at this site, the night-time noise level at Noise Location: 1 was used.

Table 14-20: Indicative construction noise levels at different distance bands from the scheme – Site O

		Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised flood embankments	Day	81	75	69	65	64	63
Reinforced concrete walls	Day	84	78	71	66	64	63
Landscaping	Day	77	72	66	64	63	63
Sheet pile walling	Day	86	80	73	68	65	64
Raised footpath /walkways	Day	81	76	69	65	64	63
Embedded cantilever wall	Day	82	76	69	65	64	63
	Evening/ weekend	82	76	68	63	58	57

Phase	Time period	Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Secant piling	Day	86	80	73	68	65	64
	Evening/weekend	86	80	72	67	61	59

14.6.27 All activities will result in exceedance of the day and evening/weekend thresholds at receptors within the distance shown above.

### Site P Derryvore Lane

14.6.28 In terms of sensitivity to construction noise, baseline noise levels at this location was taken as 43.4dB (A) (Noise Location: 14, **Figure 14.17, Volume 4**) during the daytime and 43.1 dB(A) (Noise Location: 14) during the evening/weekend time, which corresponds to Category A (65 dB during the day an 60 dB during the evening/weekends).

Table 14-21: Indicative construction noise levels at different distance bands from the scheme – Site P

Phase	Time period	Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised flood embankments	Day	81	75	67	61	56	52
	Evening/weekend	81	75	67	61	55	52
Reinforced concrete walls	Day	84	78	70	64	58	55
	Evening/weekend	84	78	70	64	58	55
Landscaping	Day	77	71	63	57	52	49
	Evening/weekend	77	71	63	57	52	49
Sheet pile walling	Day	86	80	72	66	60	57
	Evening/weekend	86	80	72	66	60	57
Raised footath/walkwys	Day	81	75	67	61	56	52
	Evening/weekend	81	75	67	61	56	52
Embedded cantilever wall	Day	82	76	68	62	56	53
	Evening/weekend	82	76	68	62	56	53
Secant piling	Day	86	80	72	66	60	57
	Evening/weekend	86	80	72	66	60	57

14.6.29 All activities will result in exceedance of the day and evening/weekend thresholds at receptors within the distance shown above.

### Site Q Ripley Mews

14.6.30 In terms of sensitivity to construction noise, baseline noise levels at this location were taken as 50.6dB (A) (Noise Location: 11, **Figure 14.18, Volume 4**) during the daytime and 50.8 dB(A) (Noise Location: 11) during the evening/weekend time, which corresponds to Category A (65 dB during the day and 60 dB during the evenings/weekends).

Table 14-22: Indicative construction noise levels at different distance bands from the scheme – Site Q

Phase	Time period	Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised flood embankments	Day	81	75	67	62	57	54
	Evening/weekend	81	75	67	62	57	54
Reinforced concrete walls	Day	84	78	70	64	59	56
	Evening/weekend	84	78	70	64	59	56
Landscaping	Day	77	71	64	58	54	52
	Evening/weekend	77	71	64	58	54	53
Sheet pile walling	Day	86	80	72	66	61	58
	Evening/weekend	86	80	72	66	61	58
Raised footpath /walkways	Day	81	75	67	62	57	54
	Evening/weekend	81	75	67	62	57	54
Embedded cantilever wall	Day	82	76	68	62	57	54
	Evening/weekend	82	76	68	62	57	55
Secant piling	Day	86	80	72	66	61	58
	Evening/weekend	86	80	72	66	61	58

14.6.31 All activities will result in exceedance of the day and evening/weekend thresholds at receptors within the distance shown above.

### Site R Corcullentragh Road

14.6.32 In terms of sensitivity to construction noise, baseline noise levels at this location were taken as 54.5dB (A) (Noise Location: 12, **Figure 14.19, Volume 4**) during the daytime and 48.4 dB(A) (Noise Location: 7, **Figure 14.13, Volume 4**) during the evening/weekend time, which corresponds to Category A (65 dB) and

Category B (60 dB) during the evening/weekend. Location 7 (Annagh Hill) was chosen to be included in Site R Corcullentragh Road assessment as both locations have a similar daytime noise level.

Table 14-23: Indicative construction noise levels at different distance bands from the scheme – Site R

		Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised flood embankments	Day	81	75	67	62	58	56
	Evening/weekend	81	75	67	62	57	54
Reinforced concrete walls	Day	84	78	70	64	60	57
	Evening/weekend	84	78	70	64	59	56
Landscaping	Day	77	71	64	59	56	55
	Evening/weekend	77	71	64	58	54	53
Sheet pile walling	Day	86	80	72	67	61	59
	Evening/weekend	86	80	72	66	61	58
Raised footpath /walkways	Day	81	75	68	62	58	56
	Evening/weekend	81	75	67	62	57	54
Embedded cantilever wall	Day	82	76	68	62	58	57
	Evening/weekend	82	76	68	62	57	55
Secant piling	Day	86	80	72	67	61	59
	Evening/weekend	86	80	72	66	61	58

14.6.33 All activities will result in exceedance of the day and evening/weekend thresholds at receptors within the distance shown above.

### Site S Corcraín Drive

14.6.34 In terms of sensitivity to construction noise, baseline noise levels at this location was taken as 48.9dB (A) (Noise Location: 2) during the daytime and 48.1 dB(A) (Noise Location: 2) during the evening/weekend time, which corresponds to Category A (65 dB during the day or 60 dB during the evening/weekends). The receptors at Corcraín Drive are shown on **Figure 14.20, Volume 4**.



Table 14-24: Indicative construction noise levels at different distance bands from the scheme – Site S

Phase	Time period	Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised flood embankments	Day	81	75	67	62	56	54
	Evening/weekend	81	75	67	61	55	52
Reinforced concrete walls	Day	84	78	70	64	59	56
	Evening/weekend	84	78	70	64	58	54
Landscaping	Day	77	71	64	58	53	51
	Evening/weekend	77	71	63	57	51	48
Sheet pile walling	Day	86	80	72	66	61	57
	Evening/weekend	86	80	72	66	60	57
Raised footpath /walkways	Day	81	75	67	62	56	54
	Evening/weekend	81	75	67	61	55	52
Embedded cantilever wall	Day	82	76	68	62	57	54
	Evening/weekend	82	76	68	62	56	52
Secant piling	Day	86	80	72	66	61	57
	Evening/weekend	86	80	72	66	60	57

14.6.35 All activities will result in exceedance of the day and evening/weekend thresholds at receptors within the distance shown above.

### Construction Vibration

14.6.36 PPV vibration has been predicted using the methods presented in BS 5228-2. Vibration levels are presented in Table 14-25 for sheet piling which occurs during sheet pile walling and Secant piling construction phases.

Table 14-25: Construction vibration levels

Contributing plant	Vibration level, PPV ( $\text{mms}^{-1}$ )			
	10m	20m	50m	100m
Sheet piling rig	1.497	0.608	0.184	0.075

14.6.37 Vibration levels from construction activities beyond 62m is negligible. This means that in most sensitive situations, construction vibration would be just perceptible for most vibration frequencies beyond this

distance. There is predicted to be a moderate impact on receptors within 20m. The total number of receptors within this distance is 122. The number of receptors within 20m at each site is detailed in Table 14-26.

Table 14-26: Number of receptors within 20m of each flood defence location

Site	No of receptors within 20m
Ashgrove Road	4
Derryanvil Road	0
People's Park	13
Rose Cottages	13
Foundry Street	0
Health Centre	0
Annagh Hill	1
The Fairways	18
Derryvore Lane	0
Corcullentragh Road	1
Total	122

14.6.38 Sheet piling is not anticipated to exceed either 10 days within 15 consecutive days or 40 days within 6 consecutive months.

## 14.7. Mitigation

### Construction

14.7.1 The following paragraphs describe mitigation measures in relation to reducing the adverse impact of noise during construction. These measures are described in detail BS 5228-1 and contained within the outline CEMP (**Appendix 6.2, Volume 3**).

## Community Relations

- 14.7.2 Good relations with people living and working in the vicinity of the site operations are of paramount importance. Early establishment and maintaining good community relations throughout the duration of the contract will help to alleviate people's concerns.
- 14.7.3 The person, company or organisation carrying out work on site will appoint a responsible person to liaise with the public.

## Limitations of Time of Works

- 14.7.4 Noise during construction works has the potential to be significant at the closest receptors, particularly during the different phases. Works will be carried out during the daytime period during weekdays, where it is practicable to do so.

## Potential Mitigation Measures

- 14.7.5 Guidance and recommendations for basic methods of noise and vibration control relating to construction are taken from BS 5228-1. BS 5228-1 Table B.1 provides an estimate of the expected sound reduction in dB(A) as a result of the mitigation proposals reproduced below.
- 14.7.6 Wherever possible, noise will be controlled at source as this limits the spread of noise. Mitigation measures will include, in the following order of preference:
- Control of noise at source;
  - Control of the spread of noise;
  - Provision of additional mitigation at noise-sensitive properties (NSPs).

## Control of noise at source

- 14.7.7 Control of noise at source measures includes:

- Use of best practicable means and best practice methods.
- Reprogramming of concurrent activities.
- Enclosures.

- 14.7.8 The best practical methods for each activity are outlined below and will be adhered to wherever possible during the construction phase.

- Plant and machinery in intermittent use will be shut down in intervening periods of non-use or, where this is impracticable, they will be throttled down to a minimum.
- Unattended plant outside normal working hours will, if possible, be powered by electricity otherwise acoustic enclosures will be necessary to minimise noise levels.
- Where possible, plant with directional noise characteristics will be positioned in such a way as to minimise noise at adjacent properties.
- Static machines will be sited as far away as practicable from inhabited buildings (or other noise sensitive premises) and/or behind temporary screens or enclosures.
- Plant will be well maintained and effectively silenced.

## Control of spread of noise

- 14.7.9 If noise cannot be controlled at source, then alternative methods of reducing the noise impact will be introduced. These will include noise reducing screens.

14.7.10 For maximum benefit, screens will be positioned close to the source of noise or close to the receiver. In order for a barrier to be effective, care is needed in its design, siting and construction. For example, by reflecting sound a barrier can simply transfer a problem from one receiving position to another.

### Site Specific Measures

14.7.11 Should night time working be required, mobile barrier screens will be placed surrounding works at a height which obscures line of sight to NSRs, and of an appropriate length. The barriers will be placed as close to works as practically possible and constructed before works begin. Where practicable, hoarding will be placed around the site to remove the line of site.

14.7.12 Where possible, all noisy works will be completed during day-time hours to avoid significant impacts on sensitive receptors.

14.7.13 Construction noise will be managed by the implementation of a Construction Noise Management Plan (CNMP) or as part of a Construction Environment Management Plan (CEMP). The outline CEMP is included as **Appendix 6.2, Volume 3**.

## 14.8. Residual Effects

### Construction

14.8.1 Assuming mitigation measures detailed in Section 14.7 are implemented the following noise levels are predicted at receptors within each of the distances bands shown in Table 14-27 to Table 14.41.

14.8.2 Mitigation reduced the number of receptors predicted to experience significant effects. During the day, it is predicted that significant effects are likely up to 50m and up to 100m during the evening/weekend period.

### Site A Ashgrove Road

Table 14-27: Indicative construction noise levels at different distance bands from the scheme – Site A

		Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised flood embankments	Day	71	66	59	57	56	55
Reinforced concrete walls	Day	74	68	61	58	56	56
Landscaping	Day	68	62	57	56	55	55
Sheet pile walling	Day	76	70	63	59	56	56
Raised footpath /walkways	Day	71	66	59	57	56	55
	Evening/ weekend	71	66	59	56	55	55

		Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Embedded cantilever wall	Day	72	66	60	57	56	55
	Evening/weekend						55
Secant piling	Day	76	70	63	59	56	56
	Evening/weekend	76	70	63	59	56	55

### Site A1 Corcraín Mews

Table 14-28: Indicative construction noise levels at different distance bands from the scheme – Site A1

		Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised flood embankments	Day	71	65	58	53	50	50
	Evening/weekend	71	65	58	53	50	49
Reinforced concrete walls	Day	74	68	60	55	51	50
	Evening/weekend	74	68	60	55	51	50
Landscaping	Day	67	62	55	51	50	49
	Evening/weekend	67	62	54	51	49	48
Sheet pile walling	Day	76	70	62	57	53	51
	Evening/weekend	76	70	62	57	52	50
Raised footpath/walkways	Day	71	65	58	53	50	50
	Evening/weekend	71	65	58	53	50	49
Embedded cantilever wall	Day	72	66	58	54	51	50
	Evening/weekend	72	66	58	53	50	49
Secant piling	Day	76	70	62	57	53	51
	Evening/weekend	76	70	62	57	52	50

## Site B Derryanvil Road

Table 14-29: Indicative construction noise levels at different distance bands from the scheme – Site B

		Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised flood embankments	Day	72	66	62	61	60	60
Reinforced concrete walls	Day	74	69	63	61	60	60
Landscaping	Day	68	64	61	60	60	60
Sheet pile walling	Day	76	71	64	62	61	60
Raised footpath /walkways	Day	72	66	62	61	60	60
Embedded cantilever wall	Day	72	67	62	61	60	60
Secant piling	Day	76	71	64	62	61	60
	Evening/ weekend	76	70	63	59	56	55

## Site C Woodside Green & D People's Park

Table 14-30: Indicative construction noise levels at different distance bands from the scheme – Site C & D

Phase	Time period	Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised flood embankments	Day	71	65	59	55	54	53
	Day	74	68	61	57	54	54

		Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Reinforced concrete walls	Evening/ weekend	74	68	61	56	53	52
	Day	67	62	56	54	53	53
Landscaping	Day	76	70	63	58	55	54
	Evening/ weekend	76	70	63	58	55	54
Sheet pile walling	Day	71	66	59	55	54	54
	Evening/ weekend	71	66	59	55	54	54
Raised footpath /walkways	Day	72	66	59	56	54	54
	Evening/ weekend	72	66	59	56	54	54
Embedded cantilever wall	Day	76	70	63	58	55	54
	Evening/ weekend	76	70	63	58	55	54
Secant piling	Day	76	70	63	58	55	54
	Evening/ weekend	76	70	63	58	54	53

### Site E Parkside

Table 14-31: Indicative construction noise levels at different distance bands from the scheme – Site E

Phase	Time period	Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised flood embankments	Day	71	65	58	54	52	52
	Evening/ weekend	71	65	58	54	53	52
Reinforced concrete walls	Day	74	68	61	56	53	52
	Evening/ weekend	74	68	61	56	53	52
Landscaping	Day	67	62	55	53	52	51
	Evening/ weekend	67	62	56	53	52	52
Sheet pile walling	Day	76	70	63	57	54	53
	Evening/ weekend	76	70	63	58	54	53

Phase	Time period	Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised footpath /walkways	Day	71	65	58	54	52	52
	Evening/ weekend	71	65	58	54	53	52
Embedded cantilever wall	Day	72	66	59	54	52	52
	Evening/ weekend	72	66	59	55	53	52
Secant piling	Day	76	70	63	57	54	53
	Evening/ weekend	76	70	63	58	54	53

14.8.3 All activities will result in exceedance of the day and evening/weekend thresholds at receptors within the distance shown above.

### Site F Rose Cottages

Table 14-32: Indicative construction noise levels at different distance bands from the scheme – Site F

Phase	Time period	Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised flood embankments	Day	71	65	58	53	50	50
	Evening/ weekend	71	65	58	53	50	49
Reinforced concrete walls	Day	74	68	60	55	51	50
	Evening/ weekend	74	68	60	55	51	50
Landscaping	Day	67	62	55	51	50	49
	Evening/ weekend	67	62	54	51	49	48
Sheet pile walling	Day	76	70	62	57	53	51
	Evening/ weekend	76	70	62	57	52	50
Raised footpath /walkways	Day	71	65	58	53	50	50
	Evening/ weekend	71	65	58	53	50	49
Embedded cantilever wall	Day	72	66	58	54	51	50
	Evening/ weekend	72	66	58	53	50	49



Phase	Time period	Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Secant piling	Day	76	70	62	57	53	51
	Evening/weekend	76	70	62	57	52	50

### Site H Castle Street, I Foundry Street, J Bowling Green & L Irwins Mill

Table 14-33: Indicative construction noise levels at different distance bands from the scheme – Site H, I, J & L

Phase	Time period	Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised flood embankments	Day	71	66	60	58	57	57
	Evening/weekend	71	66	60	58	57	57
Reinforced concrete walls	Day	74	68	62	59	57	57
	Evening/weekend	74	68	62	59	57	57
Landscaping	Day	68	63	58	57	57	57
	Evening/weekend	68	63	58	57	57	57
Sheet pile walling	Day	76	70	63	59	58	57
	Evening/weekend	76	70	63	59	58	57
Raised footpath /walkways	Day	71	66	60	58	57	57
	Evening/weekend	71	66	60	58	57	57
Embedded cantilever wall	Day	72	66	60	58	57	57
	Evening/weekend	72	66	60	58	57	57
Secant piling	Day	76	70	63	59	58	57
	Evening/weekend	76	70	63	59	58	57

## Site K Health Centre

Table 14-34: Indicative construction noise levels at different distance bands from the scheme – Site K

		Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised flood embankments	Day	75	74	73	73	73	73
Reinforced concrete walls	Day	77	74	73	73	73	73
Landscaping	Day	74	73	73	73	73	73
Sheet pile walling	Day	78	75	73	73	73	73
Raised footpath /walkways	Day	75	74	73	73	73	73
Embedded cantilever wall	Day	75	74	73	73	73	73
Secant piling	Day	78	75	73	73	73	73
	Evening/ weekend	76	70	63	59	56	55

## Site M Annagh Hill

Table 14-35: Indicative construction noise levels at different distance bands from the scheme – Site M

Phase	Time period	Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised flood embankments	Day	71	65	58	55	53	52
	Day	74	68	61	56	53	53

		Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Reinforced concrete walls	Evening/ weekend	74	68	60	55	51	50
	Day	67	62	56	53	52	52
Landscaping			62		51		49
	Day	76	70	63	58	54	53
Sheet pile walling			70		57		51
	Day	71	66	58	55	53	52
Raised footpath /walkways							49
	Day	72	66	59	55	53	52
Embedded cantilever wall							49
	Day	76	70	63	58	54	53
Secant piling	Evening/ weekend	76	70	62	57	52	51

14.8.4 All activities will result in exceedance of the day and evening/weekend thresholds at receptors within the distance shown above.

### Site N Olde Golf Links and N2 Fairways

Table 14-36: Indicative construction noise levels at different distance bands from the scheme – Site N and N2

		Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised flood embankments	Day	62	60	59	59	59	59
Reinforced concrete walls	Day	62	60	59	59	59	59
Landscaping	Day	62	60	59	59	59	59
Sheet pile walling	Day	62	60	59	59	59	59

Phase	Time period	Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised footpath /walkways	Evening/ weekend	58	56	55	55	55	55
	Day	62	60	59	59	59	59
Embedded cantilever wall	Evening/ weekend	58	56	55	55	55	55
	Day	62	60	59	59	59	59
Secant piling	Evening/ weekend	58	56	55	55	55	55
	Day	62	60	59	59	59	59

14.8.5 It is predicted that no activities will result in exceedance of the day and evening/weekend thresholds at receptors within the distance shown above.

### Site O Tandragee Road

Table 14-37: Indicative construction noise levels at different distance bands from the scheme – Site O

Phase	Time period	Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised flood embankments	Day	72	67	64	63	63	63
	Evening/ weekend	71	66	59	56	55	55
Reinforced concrete walls	Day	74	69	65	63	63	63
	Evening/ weekend	74	68	61	57	56	55
Landscaping	Day	69	65	63	63	63	63
	Evening/ weekend	68	62	57	56	55	55
Sheet pile walling	Day	76	71	66	64	63	63
	Evening/ weekend	76	70	63	59	56	55
Raised footpath /walkways	Day	72	67	64	63	63	63
	Evening/ weekend	71	66	59	56	55	55
	Day	72	67	64	63	63	63

		Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Embedded cantilever wall	Evening/ weekend	72	66	60	57	55	55
	Day	76	71	66	64	63	63
Secant piling	Evening/ weekend	76	70	63	59	56	55

14.8.6 All activities will result in exceedance of the day and evening/weekend thresholds at receptors within the distance shown above.

### Site P Derryvore Lane

Table 14-38: Indicative construction noise levels at different distance bands from the scheme – Site P

		Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised flood embankments	Day	71	65	57	52	47	46
	Evening/ weekend						
Reinforced concrete walls	Day	74	68	60	54	49	47
	Evening/ weekend						
Landscaping	Day	67	61	54	49	45	44
	Evening/ weekend						
Sheet pile walling	Day	76	70	62	56	51	48
	Evening/ weekend						
Raised footpath/walkways	Day	71	65	58	52	47	46
	Evening/ weekend	71	65	57	51	45	42
Embedded cantilever wall	Day	72	66	58	52	48	46
	Evening/ weekend	72	66	58	52	46	42
Secant piling	Day	76	70	62	56	51	48
	Evening/ weekend	76	70	62	56	50	47

## Site Q Ripley Mews

Table 14-39: Indicative construction noise levels at different distance bands from the scheme – Site Q

		Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised flood embankments	Day	71	65	58	54	52	51
Reinforced concrete walls	Day	74	68	61	56	52	52
Landscaping	Day	67	62	55	52	51	51
Sheet pile walling	Day	76	70	63	57	53	52
Raised footpath /walkways	Day	71	65	58	54	52	51
Embedded cantilever wall	Day	72	66	59	54	52	51
Secant piling	Day	76	70	63	57	53	52
	Evening/ weekend	76	70	63	57	54	52

## Site R Corcullentragh Road

Table 14-40: Indicative construction noise levels at different distance bands from the scheme – Site R

Phase	Time period	Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised flood embankments	Day	71	66	59	56	55	55
	Day	74	68	61	57	55	55

		Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Reinforced concrete walls	Evening/ weekend	74	68	60	55	51	50
	Day	68	62	57	55	55	55
Landscaping	Day	76	70	63	58	56	55
	Evening/ weekend	76	70	62	57	52	51
Sheet pile walling	Day	71	66	59	56	55	55
	Evening/ weekend	71	66	59	56	55	49
Raised footpath /walkways	Day	72	66	59	56	55	55
	Evening/ weekend	72	66	59	56	55	49
Embedded cantilever wall	Day	76	70	63	58	56	55
	Evening/ weekend	76	70	62	57	52	51
Secant piling	Day	76	70	63	58	56	55
	Evening/ weekend	76	70	62	57	52	51

### Site S Corcraín Drive

Table 14-41: Indicative construction noise levels at different distance bands from the scheme – Site S

Phase	Time period	Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised flood embankments	Day	71	65	58	53	51	50
	Evening/ weekend	71	65	58	53	50	49
Reinforced concrete walls	Day	74	68	60	55	52	50
	Evening/ weekend	74	68	60	55	51	50
Landscaping	Day	67	62	55	51	50	49
	Evening/ weekend	67	62	55	51	49	49
Sheet pile walling	Day	76	70	62	57	53	51
	Evening/ weekend	76	70	62	57	52	51

		Indicative total noise level $L_{Aeq}$ (dB) from construction & ambient noise at distance bands					
		10m	20m	50m	100m	200m	300m
Raised footpath /walkways	Day	71	65	58	53	51	50
	Evening/ weekend	71	65	58	53	50	49
Embedded cantilever wall	Day	72	66	58	54	51	50
	Evening/ weekend	72	66	58	53		49
Secant piling	Day	76	70	62	57	53	51
	Evening/ weekend	76	70	62	57	52	51

## 14.9. Monitoring

14.9.1 The requirements of DMRB LA 111 (Section 4) regarding monitoring and evaluation will be followed. Likely significant environmental effects from noise and/or vibration during construction shall be monitored. Monitoring of likely significant effects should include one or more of the following:

- verification that specific noise and vibration mitigation measures are in place for activities where there is potential for likely significant effects to occur in their absence;
- measurement of noise and/or vibration;
- checking that noise and vibration management procedures and practices are sufficient to ensure that adverse effects are no worse than set out in the assessment report.

## 14.10. Summary

14.10.1 Construction noise and vibration has been assessed from the construction information available at the time of preparation of the ES.

14.10.2 Construction activities have the potential to cause significant noise and vibration to the closest receptors, particularly within 50m of construction activities. The number of NSR to be affected by significant noise levels is relatively low. Sheet pile walling and embedded cantilever wall phases are predicted to result in the highest noise levels. These activities will be restricted, where practicable, to daytime.

14.10.3 Should night-time work be required, further noise monitoring and assessment will be required.



## 15. Population and Human Health

### 15.1. Introduction

- 15.1.1 This chapter of the Environmental Statement (ES) addresses the impact of the scheme on people and communities, including human health and socio-economic effects.
- 15.1.2 This section addresses the potential for long-term positive socio-economic and health effects associated with the operation of the proposed scheme, as well as any potential adverse effects associated with its construction and operation within the environment.

### 15.2. Statutory and Policy Context

#### The Drainage (Northern Ireland) Order 1973

- 15.2.1 Article 10 of The Drainage (Northern Ireland) Order 1973 (as amended) subject to approval allows the Department for Infrastructure (DfI) Rivers to:
- acquire (either by agreement or compulsorily in accordance with the following provisions of this Article), or take on lease, any land
  - dispose of any land for the time being vested in it
  - carry out works on any land
  - restrict, terminate or otherwise interfere with easements, fisheries, water rights, inland navigation rights and other rights.

- 15.2.2 Where the Department desires to acquire otherwise than by agreement any land which it considers necessary for the purpose stated above it may make an order vesting such land.

#### The Access to the Countryside (Northern Ireland) Order 1983

- 15.2.3 Armagh City, Banbridge and Craigavon Borough Council has a statutory responsibility for provision of public open space and recreation facilities within Portadown. Their statutory powers to provide for and facilitate recreation are considerable, ranging from leisure and tourism promotion, acquisition of land for recreational use and provision of facilities, to securing public access to the countryside.
- 15.2.4 Under the order, the borough council has a duty to assert, protect and keep open and free from obstruction or encroachment, any public right of way. It is also given discretionary powers to repair and maintain Rights of Way, to create, divert or close public paths, and to make access agreements or Orders to open land.

#### The Water Environment (Flood Directive) Regulations (Northern Ireland) 2009

- 15.2.5 Under the Floods Directive DfI Rivers manage these risks by:
- prevention: avoiding construction of houses and industries in flood-prone areas; by adapting future developments to the risk of flooding; and by promoting appropriate land-use, agricultural and forestry practices
  - protection: taking measures, both structural and non-structural, to reduce the likelihood and impact of floods
  - preparedness: informing the public about flood risk and what to do in the event of a flood
- 15.2.6 To achieve its objectives, the Flood Directive will address flood risk in Northern Ireland on a catchment-wide scale. This is because flooding problems may be affected by the characteristics of the catchment. DfI Rivers also aims to reduce the risk to life and damage to property from flooding from rivers and the sea through, amongst other activities, providing expert flood risk advice to local planning authorities, undertaking sustainable watercourse maintenance, controlling, as far as weather conditions permit, Lough Neagh &

Lough Erne water levels, constructing new and maintaining existing flood defences, fulfilling a key role in the emergency response to flooding incidents and working to enhance Community Resilience in areas subject to flood risk or severe weather.

### **Craigavon Area Plan 2010**

- 15.2.7 The purpose of this plan is to inform the general public, statutory authorities, developers and other interested bodies of the policy framework and land use proposals that will be used to guide development decisions with the borough. Until such time as the Area Plan is superseded by the ABC Local Development Plan, policies within the Area Plan remain valid.
- 15.2.8 The aim of the plan is to provide a planning framework which facilitates the future growth and development of Craigavon Borough whilst protecting and, where appropriate, enhancing the natural and man-made environment and ensuring that development is both sustainable and of a high quality. Key objectives relevant to this ES are:
- the protection of the quality of the countryside and the diversity of its rural character
  - the achievement of a high quality of layout, design and landscaping in new development
  - facilitating the achievement of the Borough's economic potential.

### **Regional Development Strategy 2035 for Northern Ireland Building a Better Future**

- 15.2.9 The Regional Development Strategy sets out a dynamic strategic planning framework for Northern Ireland to guide physical development within the Region until 2035 and it provides an overarching strategic framework for development plans.
- 15.2.10 The overall aim of the RDS for Rural Northern Ireland is to develop an attractive and prosperous rural area, based on a balanced and integrated approach to the development of town, village and countryside, contributing to the overall wellbeing of the Region as a whole. The RDS also aims to promote development which improves the health and well being of communities, such as through access to facilities and services.
- 15.2.11 Policy RG7 'Support urban and rural renaissance' has a sub objective of promoting green and blue infrastructure to improve environmental quality in urban or deprived areas.

## **15.3. Methodology**

- 15.3.1 This chapter uses Institute of Environmental Management and Assessment (IEMA) "Health in Environmental Impact Assessment" (Ref. 15.1) "Assessing the Significance of Impacts – Social, Economic, Environmental" (Ref. 15.2) and Design Manual for Roads and Bridges (DMRB) LA 112 Population and human health as guidance (Ref. 15.3).

### **Study area**

- 15.3.2 The study area to determine impacts is based on the site boundaries at each scheme location plus a 500m area surrounding each site, based on DMRB LA 112 guidance.

### **Desktop assessment**

- 15.3.3 A desktop analysis of the local area and its facilities was undertaken. To establish relevant information about population and employment, official statistics and social research for the study area was sourced from the Northern Ireland Statistics and Research Agency (NISRA). NISRA is the principal source of official statistics and social research on Northern Ireland.
- 15.3.4 Collaboration was undertaken with the design team with respect to the economic assessment of the scheme to inform the socio-economic assessment in the ES.

**Assessment methodology of likely significant effects**

15.3.5 The purpose of this assessment is to predict the potential for impacts on population, human health and well being outcomes, and economic activity in the area and on potential impacts to the community, including the resident and working community.

**Population Assessment**

15.3.6 The significance of the effect is formulated as a function of the receptor or resource’s environmental value and the magnitude of impact of the proposed scheme.

15.3.7 Receptors to be included in the assessment;

- Private properties and housing
- Community land and assets
- Development land and businesses
- Agricultural land holdings
- Public rights of way for walkers, cyclists and horse-riders (WCH).

Table 15-1: Sensitivity of Receptors

Value (sensitivity)	Typical Descriptors
Very High	<p><u>Private property and housing:</u></p> <p>1) existing private property or land allocated for housing located in a local authority area where the number of households are expected to increase by &gt;25% by 2041 (ONS data); and/or</p> <p>2) existing housing and land allocated for housing (e.g. strategic housing sites) covering &gt;5ha and / or &gt;150 houses.</p> <p><u>Community land and assets where there is a combination of the following:</u></p> <p>1) complete severance between communities and their land/assets, with little/no accessibility provision;</p> <p>2) alternatives are only available outside the local planning authority area;</p> <p>3) the level of use is very frequent (daily); and</p> <p>4) the land and assets are used by the majority (&gt;=50%) of the community.</p> <p><u>Development land and businesses:</u></p> <p>1) existing employment sites (excluding agriculture) and land allocated for employment e.g. strategic employment sites) covering &gt;5ha.</p> <p><u>Agricultural land holdings:</u></p> <p>1) areas of land in which the enterprise is wholly reliant on the spatial relationship of land to key agricultural infrastructure; and</p> <p>2) access between land and key agricultural infrastructure is required on a frequent basis (daily).</p> <p><u>WCH:</u></p> <p>1) national trails and routes likely to be used for both commuting and recreation that record frequent (daily) use. Such routes connect communities with employment land uses and other services with a direct and convenient WCH route. Little / no potential for substitution.</p> <p>2) routes regularly used by vulnerable travellers such as the elderly, school children and people with disabilities, who could be disproportionately affected by small changes in the baseline due to potentially different needs.</p> <p>3) rights of way for WCH crossing roads at grade with &gt;16,000 vehicles per day.</p>
High	<p><u>Private property and housing:</u></p>

Value (sensitivity)	Typical Descriptors
	<ul style="list-style-type: none"> <li>1) private property or land allocated for housing located in a local planning authority area where the number of households are expected to increase by 16-25% by 2041 (ONS data); and/or</li> <li>2) existing housing and land allocated for housing (e.g. strategic housing sites) covering &gt;1-5ha and / or &gt;30-150 houses.</li> <li><u>Community land and assets where there is a combination of the following:</u> <ul style="list-style-type: none"> <li>1) there is substantial severance between community and assets, with limited accessibility provision;</li> <li>2) alternative facilities are only available in the wider local planning authority area;</li> <li>3) the level of use is frequent (weekly); and</li> <li>4) the land and assets are used by the majority (&gt;=50%) of the community.</li> </ul> </li> <li><u>Development land and businesses:</u> <ul style="list-style-type: none"> <li>1) existing employment sites (excluding agriculture) and land allocated for employment (e.g. strategic employment sites) covering &gt;1 - 5ha.</li> </ul> </li> <li><u>Agricultural land holdings:</u> <ul style="list-style-type: none"> <li>1) areas of land in which the enterprise is dependant on the spatial relationship of land to key agricultural infrastructure; and</li> <li>2) access between land and key agricultural infrastructure is required on a frequent basis (weekly).</li> </ul> </li> <li><u>WCH:</u> <ul style="list-style-type: none"> <li>1) regional trails and routes (e.g. promoted circular walks) likely to be used for recreation and to a lesser extent commuting, that record frequent (daily) use. Limited potential for substitution; and/or</li> <li>2) rights of way for WCH crossing roads at grade with &gt;8,000 - 16,000 vehicles per day</li> </ul> </li> </ul>
Medium	<ul style="list-style-type: none"> <li><u>Private property and housing:</u> <ul style="list-style-type: none"> <li>1) houses or land allocated for housing located in a local authority area where the number of households are expected to increase by &gt;6-15% by 2041 (ONS data); and/or</li> <li>2) existing housing and land allocated for housing (e.g. strategic housing sites) covering &lt;1ha and / or &lt;30 houses.</li> </ul> </li> <li><u>Community land and assets where there is a combination of the following:</u> <ul style="list-style-type: none"> <li>1) there is severance between communities and their land/assets but with existing accessibility provision;</li> <li>2) limited alternative facilities are available at a local level within adjacent communities;</li> <li>3) the level of use is reasonably frequent (monthly); and</li> <li>4) the land and assets are used by the majority (&gt;=50%) of the community</li> </ul> </li> <li><u>Development land and businesses:</u> <ul style="list-style-type: none"> <li>1) existing employment sites (excluding agriculture) and land allocated for employment (e.g. strategic employment sites) covering &lt;1ha</li> </ul> </li> <li><u>Agricultural land holdings:</u> <ul style="list-style-type: none"> <li>1) areas of land in which the enterprise is partially dependent on the spatial relationship of land to key agricultural infrastructure; and</li> <li>2) access between land and key agricultural infrastructure is required on a reasonably frequent basis (monthly).</li> </ul> </li> <li><u>WCH:</u> <ul style="list-style-type: none"> <li>1) public rights of way and other routes close to communities which are used for recreational purposes (e.g. dog walking), but for which alternative routes can be taken. These routes are likely to link to a wider network of routes to provide options for longer, recreational journeys, and / or</li> <li>2) rights of way for WCH crossing roads at grade with &gt;4000 – 8000 vehicles per day.</li> </ul> </li> </ul>
Low	<ul style="list-style-type: none"> <li><u>Private property and housing:</u> <ul style="list-style-type: none"> <li>1) proposed development on unallocated sites providing housing with planning permission/in the planning process.</li> </ul> </li> <li><u>Community land and assets where there is a combination of the following:</u></li> </ul>

Value (sensitivity)	Typical Descriptors
	<ul style="list-style-type: none"> <li>- 1) limited existing severance between community and assets, with existing full Disability Discrimination Act (DDA) DDA 1995 compliant accessibility provision;</li> <li>- 2) alternative facilities are available at a local level within the wider community;</li> <li>- 3) the level of use is infrequent (monthly or less frequent); and</li> <li>- 4) the land and assets are used by the minority (&gt;=50%) of the community.</li> </ul> <p><u>Development land and businesses:</u></p> <ul style="list-style-type: none"> <li>- 1) proposed development on unallocated sites providing employment with planning permission/in the planning process.</li> </ul> <p><u>Agricultural land holdings:</u></p> <ul style="list-style-type: none"> <li>- 1) areas of land which the enterprise is not dependent on the spatial relationship of land to key agricultural infrastructure; and</li> <li>- 2) access between land and key agricultural infrastructure is required on an infrequent basis (monthly or less frequent).</li> </ul> <p><u>WCH:</u></p> <ul style="list-style-type: none"> <li>- 1) routes which have fallen into disuse through past severance or which are scarcely used because they do not currently offer a meaningful route for either utility or recreational purposes, and/or</li> <li>- 2) rights of way for WCH crossing roads at grade with &lt;4000 vehicles per day</li> </ul>
Negligible	<p><u>Private property and housing:</u></p> <ul style="list-style-type: none"> <li>- N/A</li> </ul> <p><u>Community land and assets where there is a combination of the following:</u></p> <ul style="list-style-type: none"> <li>- 1) no or limited severance or accessibility issues;</li> <li>- 2) alternative facilities are available within the same community;</li> <li>- 3) the level of use is very infrequent (a few occasions yearly); and</li> <li>- 4) the land and assets are used by the minority (&gt;=50%) of the community.</li> </ul> <p><u>Development land and businesses:</u></p> <ul style="list-style-type: none"> <li>- N/A</li> </ul> <p><u>Agricultural land holdings:</u></p> <ul style="list-style-type: none"> <li>- areas of land which are infrequently used on a non-commercial basis.</li> </ul> <p><u>WCH:</u></p> <ul style="list-style-type: none"> <li>- N/A</li> </ul>

### 15.3.8 The magnitude of change is assessed in accordance with the criteria outlined in Table 15-2.

Table 15-2: Magnitude of impact descriptors

Magnitude of impact	Typical description
Major	<p><u>Private property and housing, community land and assets, development land and businesses and agricultural land holdings:</u></p> <ul style="list-style-type: none"> <li>- loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements. e.g. direct acquisition and demolition of property. Landtake from property and/or severance which would preclude or significantly affect current or future use.</li> <li>- introduction (adverse) or removal (beneficial) of complete severance with no/full accessibility provision.</li> </ul> <p><u>WCH:</u></p> <ul style="list-style-type: none"> <li>- &gt;500m increase (adverse) / decrease (beneficial) in WCH journey length.</li> </ul>
Moderate	<p><u>Private property and housing, community land and assets, development land and businesses and agricultural land holdings:</u></p>

Magnitude of impact	Typical description
	<ul style="list-style-type: none"> <li>partial loss of/damage to key characteristics, features or elements, e.g. partial removal or substantial amendment to access or acquisition of land compromising viability of property, businesses, community assets or agricultural holdings; and/or</li> <li>introduction (adverse) or removal (beneficial) of severe severance with limited / moderate accessibility provision.</li> </ul> <p>WCH: &gt;250m - 500m increase (adverse) or decrease (beneficial) in WCH journey length.</p>
Minor	<p><u>Private property and housing, community land and assets, development land and businesses and agricultural land holdings:</u></p> <ul style="list-style-type: none"> <li>a discernible change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements, e.g., amendment to access or acquisition of land resulting in changes to operating conditions that do not compromise overall viability of property, businesses, community assets or agricultural holdings; and/or</li> <li>introduction (adverse) or removal (beneficial) of severance with adequate accessibility provision.</li> </ul> <p>WCH &gt;50m - 250m increase (adverse) or decrease (beneficial) in WCH journey length.</p>
Negligible	<p><u>Private property and housing, community land and assets, development land and businesses and agricultural land holdings:</u></p> <ul style="list-style-type: none"> <li>very minor loss or detrimental alteration to one or more characteristics, features or elements. e.g. acquisition of non-operational land or buildings not directly affecting the viability of property, businesses, community assets or agricultural holdings; and/or</li> <li>very minor introduction (adverse) or removal (beneficial) of severance with ample accessibility provision.</li> </ul> <p>WCH &lt;50m increase (adverse) or decrease (beneficial) in WCH journey length.</p>
No Change	No loss or alteration of characteristics, features, elements or accessibility; no observable impact in either direction.

15.3.9 The significance of effects is assigned based on the magnitude of the impact and the sensitivity or value of the environmental receptor. Effects are generally considered significant if they are moderate or higher. The significance matrix is shown in Table 15-3.

Table 15-3: Significance of effects

Magnitude of impact		No change	Negligible	Minor	Moderate	Major
Environmental Value (Sensitivity)	Very high	Neutral	Slight	Moderate or large	Large or very large	Very large
	High					
	Medium	Neutral	Neutral or slight	Slight	Moderate	Moderate or large
	Low					
	Negligible	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight

## Human Health

- 15.3.10 DMRB LA 112 Population and human health was used to provide guidance for the assessment on human health due to lack of guidance available for Northern Ireland. A qualitative assessment of human health was undertaken.
- 15.3.11 The geographical extent of the impacts considered within the qualitative assessment should be dependent upon the nature and characteristics of a project and sensitivity or receptors. Information should be gathered for other environmental factors, such as air quality, to help identify changes to health determinants. Once health profiles of the communities within the study area have been established, the sensitivity of a community/population to change shall be identified. The sensitivity of a community/population shall be reported as:
- Low
  - Medium; or
  - High
- 15.3.12 Once community/population sensitivity and changes to health determinants likely to occur as a result of a project have been established, the likely health outcomes shall be identified in line with the categories in Table 15-4, with evidence to support conclusions.

Table 15-4: Human health/socio-economic categories

Health/socio-economic outcomes category	Health outcome description
Positive	A beneficial health/socio-economic impact is identified
Neutral	No discernible health/socio-economic impact is identified
Negative	An adverse health/socio-economic impact is identified
Uncertain	

## Assumptions and limitations

- 15.3.13 Where detailed information is not available at this stage, the assessment has been based on reasonable worst case assumptions and these have been explained in the text. A conservative view of reasonable worst case effects has been used. As such, there is a potential for some negative health effects to be reduced. However, new positive or negative outcomes beyond what is reported in this assessment are not anticipated.

## 15.4. Baseline Conditions

### Population

#### Private property and housing

- 15.4.1 The land within the study area is made up of private and public land. The majority of the study area comprises of privately owned residential properties. There are areas of land zoned for Phase 1 housing within the study area, which are detailed below and shown on **Figure 15.1 a-d, Volume 4** (Ref. 15.4):
- P/H 1: land south of Moy Road
  - P/H 2: land north of Moy Road
  - P/H 3: land between Dungannon Road and Derryanvil Road

- P/H 4: land south of Ashgrove Road
- P/H 5: Land east of Charles Street
- P/H 6: Land north of Loughgall Road
- P/H 7: Land south of Loughgall Road
- P/H 9: Land at Tandragee Road
- P/H 10: Land at Tandragee Road
- P/H 11: Land to the rear of Springfields.

15.4.2 All planning applications submitted to the Planning Portal within the last year are detailed in Table 15-5. The planning applications were reviewed on 30<sup>th</sup> November 2021.

Table 15-5: Planning applications submitted in the last year within the study area.

Nearest site	Planning applications
A: Ashgrove Road	<ul style="list-style-type: none"> <li>▪ LA08/2021/1021/O - Lands between No. 80 &amp; 82 Ashgrove Manor, Portadown, BT62 1UB. Site for proposed dwelling and garage. Status: Consultation issued.</li> <li>▪ LA08/2021/0682/F - Ballyoran Primary School, Ballyoran Park, Portadown, Armagh, BT62 1JY. Provision of a 26 no. space car park, 2 no. drop off zones and 2 no. DDA accessible ramps also including 5 x 13m high column mounted LED lantern floodlights and new one way access from Ashgrove Road with one way exit onto Ballyoran Park with associated site works and landscaping. Status: Permission granted on 18<sup>th</sup> October 2021.</li> <li>▪ LA08/2021/0700/F - Ballyoran Primary School, Ballyoran Park, Portadown, Armagh, BT62 1JY. Erection of 2.4m high Security Fencing to secure and prevent incursion, vandalism and anti-social behaviour on school property. Situated along the front boundary of the school facing onto a minor road. Proposed fence to be joined to already existing fencing along school boundary. Status: Permission granted on 2<sup>nd</sup> August 2021.</li> </ul>
A2: Corcrair Mews	<ul style="list-style-type: none"> <li>▪ LA08/2021/0065/F - 1 Selshion Parade, Portadown, Armagh, BT62 4AT. Single storey extension to front of dwelling and level access ramp. Status: Permission granted on 21<sup>st</sup> June 2021.</li> <li>▪ LA08/2021/0054/F - Farm Chemicals Ltd, 80a Charles Street, Portadown, Armagh, BT62 1DQ. Change of use from agricultural chemical/garden supplies retail unit to builders merchant with alterations and extensions to existing building (including part demolition of existing retail unit) and erection of modular builders supplies storage building, retention of existing hardstanding for use as outdoor storage, servicing and parking areas and associated site works. Status: Consultation issued.</li> <li>▪ LA08/2021/1268/DC - Lands between 80 and 90 Charles Street, Portadown and lands to the rear of 90 - 94 Charles Street, Portadown, Armagh, BT62 1DQ. Proposed Discharge of Condition 12 on planning application LA08/2020/1523/F. Condition 12 states - No building, demolition or vegetation clearance shall take place between 1st March and 31st August inclusive, unless a competent ecologist has undertaken a detailed check for active birds nests immediately before clearance and provided written confirmation that no nests are present/birds will be harmed and/or there are appropriate measures in place to protect nesting birds. Any such written confirmation shall be submitted to the Planning Authority within 6 weeks of works commencing. Status: Condition discharged.</li> <li>▪ LA08/2020/1523/F - Lands between 80 and 90 Charles Street, Portadown and lands to the rear of 90 - 94 Charles Street, Portadown, Armagh, BT62 1DQ. Erection of 2 No. units (1 No. retail unit for the existing Garden Aids business and 1 No. unit for a Coffee Shop) to include all associated site works. Status: Permission refused on 12<sup>th</sup> November 2021.</li> <li>▪ LA08/2021/0180/F - From Laverys filling station at 256 Obins Street to car parking and hair salon at 248 Obins Street Portadown, BT62 1BZ. (over Corcrair River). Retention of pedestrian foot-bridge over the Corcrair River. Status: Permission refused on 12<sup>th</sup> November 2021.</li> </ul>



Nearest site	Planning applications
	<ul style="list-style-type: none"> <li>▪ LA08/2021/0461/F - Lands adjacent to No. 6 Moy Road, Portadown, Armagh, BT62 1QL. Proposed 3G playing pitch with floodlights and fencing. New covered sheltered viewing area, new dugouts and associated groundworks. Status: Consultation issued.</li> <li>▪ LA08/2020/1538/F - 35 Ballyoran Heights, Portadown, Armagh, BT62 1DP. Demolition of existing garage and erection of single storey extension to front, side and rear of dwelling. Status: Permission granted on 15<sup>th</sup> March 2021.</li> </ul>
B: Derryanvil Road	None
C: Woodside Green	None
D: People's Park	<ul style="list-style-type: none"> <li>▪ LA08/2021/1388/F - 139 Garvaghy Road, Portadown, Armagh, BT62 1EH. Erection of extension to supermarket to provide storage. Status: under consideration.</li> </ul>
E: Parkside Obins Street	None
F: Rose Cottages	<ul style="list-style-type: none"> <li>▪ LA08/2021/1619/A - Lands immediately adjacent to and north of Epworth Methodist Church, Montague Street, Portadown, Armagh, BT62 3JR. 'Epworth Playgroup'. Individual letters (s/steel) mounted on rendered wall of building. Status: Application received on 15<sup>th</sup> November 2021.</li> <li>▪ LA08/2021/1608/F - Lands immediately adjacent to and north of Epworth Methodist Church, Montague Street, Portadown, Armagh, BT62 3JR. New single storey stand alone playgroup building, comprising main nursery space (26 child spaces), admin office, kitchen, sensory room, storage, wc's and entrance lobby. External works include hard, soft and covered play areas with paths, perimeter fencing and associated works. Status: Application received on 21<sup>st</sup> October 2021.</li> </ul>
H: Castle Street	<ul style="list-style-type: none"> <li>▪ LA08/2021/0714/A - High Street Mall, 39-40 High Street, Portadown, Armagh, BT62 1HX. 1 no. freestanding sign, 5 no. logo signs and 3no. poster display panels on elevations to Mill Avenue, the car park and the permitted plaza area. Status: Permission granted on 13<sup>th</sup> August 2021.</li> </ul>
I: Foundry Street	<ul style="list-style-type: none"> <li>▪ LA08/2021/0597/F - 9 Bachelors Walk, Portadown, Armagh, BT63 5BQ. Erection of detached garage to include ancillary accommodation at first floor level. Status: Permission granted on 20<sup>th</sup> July 2021.</li> <li>▪ LA08/2021/1165/F - 30 Carrickblacker Road, Portadown, BT63 5AX. Change of use of existing retail unit to cafe and hot food outlet. Status: Under consideration.</li> <li>▪ LA08/2021/1495/O – Florencecourt, rear of and North East of 7-21 Watson Street, Portadown, Armagh, BT63 5AQ. Proposed housing development (to provide 9no. town houses and 6no. semi-detached). Status: Under consideration.</li> </ul>
J: Bowling Green	<ul style="list-style-type: none"> <li>▪ LA08/2021/0481/DC - 13-15 High Street, Portadown, BT62 1HZ. Discharge of Conditions 4 5 and 6 on Application LA08/2020/1018/F(LA08/2020/1018/F - Change of use from approved retail sales and restaurant to community hub comprising of church office, worship room, multi-use rooms, coffee lounge, counselling centre, outdoor terrace and new external approach and landscape works – Permission granted on 26<sup>th</sup> March 2021).</li> <li>▪ Condition 4 states - No site works of any nature or development shall take place until a programme of archaeological work (POW) has been prepared by a qualified archaeologist, submitted by the applicant and approved in writing by Armagh City, Banbridge &amp; Craigavon Borough Council in consultation with Historic Environment Division, Department for Communities. The POW shall provide for: <ol style="list-style-type: none"> <li>1) The identification and evaluation of archaeological remains within the site;</li> <li>2) Mitigation of the impacts of development through licensed excavation recording or by preservation of remains in-situ;</li> <li>3) Post-excavation analysis sufficient to prepare an archaeological report, to publication standard if necessary; and</li> <li>4) Preparation of the digital, documentary and material archive for deposition.</li> </ol> </li> </ul>

## Nearest site

## Planning applications

Condition 5 states - No site works of any nature or development shall take place other than in accordance with the programme of archaeological work approved under Condition 4. Condition 6 states - A programme of post-excavation analysis, preparation of an archaeological report, dissemination of results and preparation of the excavation archive shall be undertaken in accordance with the programme of archaeological work approved under condition 4. These measures shall be implemented and a final archaeological report shall be submitted to by Armagh City, Banbridge & Craigavon Borough Council within 12 months of the completion of archaeological site works, or as otherwise agreed in writing with by Armagh City, Banbridge & Craigavon Borough Council. Status: Condition discharged.

- LA08/2021/0806/LBC - Portadown Town Hall, 15 Edward Street, Portadown, BT62 3LZ. Provision of fibre broadband to include excavation of 25m long track from cable box at the entrance to the car park on Edward Street to the base of the existing rear elevation of Portadown Town hall at a depth of 0.4 metres below ground level. Removal of 10mm core through the external mortar to the inside of the building to allow the cable to terminate at the comms cabinet within the building. Status: Permission granted on 8<sup>th</sup> October 2021.
- LA08/2021/1286/A - Lands adjacent to and to the north of Meadows Retail Park, Meadow Lane, Portadown, BT62 3NJ. Proposed installation of 1 no. 9 metre totem, 2 no. height limiters, 1 no. rotating leader board, 2 no. menu boards, 2 no. order points, 2no. double-sided billboards and fascia signage. Status: Permission granted on 2<sup>nd</sup> November 2021.
- LA08/2021/1052/DC - Lands adjacent to and to the north of Meadows Retail Park, Meadow Lane, Portadown, BT62 3NJ. Proposed Discharge of Condition 5 on Planning Application LA08/2019/1635/F (LA08/2019/1635/F - Proposed single storey drive through cafe, outdoor seating, height limiter, order point kiosk, landscaping, access, parking provision, lighting and ancillary site works (Amended layout) – Permission granted on 20<sup>th</sup> April 2021. On 4<sup>th</sup> June 2021 a proposed minor amendment to the planning approval was received which was granted as a nonmaterial change on 22<sup>nd</sup> June 2021).
- Condition 5 states - Prior to the commencement of the development hereby approved, a final drainage assessment, containing a detailed drainage network design and compliant with Annex D of Planning Policy Statement 15 shall be submitted to and approved in writing by the Council. The drainage design shall be carried out as approved. Status: Condition discharged.
- LA08/2021/0868/NMC - Lands adjacent to and to the north of Meadows Retail Park, Meadow Lane, Portadown, BT62 3NJ. Proposed minor amendments to planning approval LA08/2019/1635/F. Status: Non material change granted on 22<sup>nd</sup> June 2021.

K: Health Centre

- LA08/2021/0929/F - Unit 3 Meadows Retail Park, 72 Meadow Lane, Portadown, BT62 3NJ. Proposed change of use from Retail (Class A1) to Storage and Distribution (Class B4) with associated trade counter/sales and minor external alterations. Status: Permission granted on 15<sup>th</sup> October 2021.
- LA08/2021/0930/A - Unit 3, Meadows Retail Park, 72 Meadow Lane, Portadown, BT62 3NJ. 1no. fascia sign to existing signage zone, with associated external lighting, and 1no. vinyl customer collection sign to elevation. Status: Permission granted on 5<sup>th</sup> November 2021.
- LA08/2021/0191/F - 46 Portmore Street, Portadown, Armagh, BT62 3NF. Change of use from dwelling to HMO with alterations. Status: Consultations issued.
- LA08/2021/0462/F - 50 Portmore Street, Portadown, Armagh, BT62 3NF. Proposed demolition of existing store and extension to side and rear of existing office premises. Status: Permission granted on 24<sup>th</sup> May 2021.
- LA08/2021/0192/F - 13 Harford Street, Portadown, Armagh, BT62 3AA. Change of use from dwelling to HMO with alterations. Status: Consultations issued.
- LA08/2021/1065/F - 15 William Street, Portadown, BT62 3NX. Replacement dwelling. Status: under consideration.
- LA08/2021/0524/F - To the rear of 35 Hanover Street and with access unto Carleton Street, Portadown. Erection of building for the storage of classic cars. Status: Permission granted on 1<sup>st</sup> November 2021.
- LA08/2021/0640/F - 99 Thomas Street, Portadown, Armagh, BT62 3AH. Change of use from dwelling to 5 bedroom house of multiple occupancy (HMO). Status: Under consideration.
- LA08/2021/0083/F - 106 Thomas Street, Portadown, Armagh, BT62 3AG. Change of use of existing dwelling to multiple occupancy living. Status: Under consideration.

Nearest site	Planning applications
L: Irwins Mill	<ul style="list-style-type: none"> <li>LA08/2021/0213/F - 115 Thomas Street, Tavanagh, Portadown, Armagh, BT62 3AH. Conversion of dwelling house to 2no. self-contained apartments. Status: Under consideration.</li> </ul>
	<ul style="list-style-type: none"> <li>LA08/2021/0750/DC - Lands immediately to the south of 11-17 Roslyn Avenue, Edenderry, Portadown, BT63 5BG. Approximately 40m North-West of Knock Eden and Edenderry Gardens Fold Housing Association. Approximately 90m West of Nos 12-16 Wildwood Levaghery, Portadown and East of R.A Irwin &amp; Co Ltd Goban Street, Edenderry, Portadown, BT63 5AG. Proposed Discharge of Condition 14 on Planning Application LA08/2018/0734/F (LA08/2018/0734/F - Proposed residential development scheme involving the erection of 21 single storey dwellings, comprising of 8 semi-detached and 13 detached unit, proposed new access via Roslyn Avenue, associated domestic garages, public open space, site works and landscaping. (Amended development description) – Permission granted on 20<sup>th</sup> April 2021).</li> <li>Condition 14 states - There shall be no external lighting on the site until a Lighting Plan has been submitted to and approved in writing by the Council and shall thereafter be implemented. The Plan shall include the following: <ul style="list-style-type: none"> <li>a. Specifications of lighting to be used across the site, including model of luminaires, location and height;</li> <li>b. All measures to mitigate for the impacts of artificial lighting on bats and other wildlife, e.g. timing of lighting, use of low level lighting, screens, hoods, cowls etc.</li> <li>c. A horizontal illuminance contour plan (isolux drawing) showing predicted light spillage across the site. The isolux drawing must clearly show light spill less than 1 lux on the boundary and retained vegetation.</li> </ul> Status: Conditions discharged.</li> </ul>
	<ul style="list-style-type: none"> <li>LA08/2021/0863/DC - Lands immediately to the south of 11-17 Roslyn Avenue, Edenderry, Portadown, BT63 5BG. Approximately 40m North-West of Knock Eden and Edenderry Gardens Fold Housing Association. Approximately 90m West of Nos 12-16 Wildwood, Levaghery, Portadown, BT63 5EE and East of R.A Irwin &amp; Co Ltd, Goban Street, Edenderry, Portadown, BT63 5AG. Proposed Discharge of Condition 10 on Planning Application LA08/2018/0734/F. Condition 10 states - No development activity shall commence on site until an Invasive Species Management Plan has been submitted to and approved in writing by the Council. The approved Plan shall be implemented in accordance with the approved details, unless otherwise agreed in writing by the Council. Status: Condition discharged.</li> </ul>
	<ul style="list-style-type: none"> <li>LA08/2021/1405/DC - Lands immediately to the south of 11-17 Roslyn Avenue, Edenderry, Portadown, BT63 5BG. Approximately 40m North-West of Knock Eden and Edenderry Gardens Fold Housing Association. Approximately 90m West of Nos 12-16 Wildwood, Levaghery, Portadown, BT63 5EE and East of R.A Irwin &amp; Co Ltd. Proposed Discharge of Condition 9 on Planning Application LA08/2018/0734/F. Condition 9 states - A Final Construction Environmental Management Plan (CEMP) shall be submitted to and approved in writing by the Council once a contractor has been appointed, prior to the commencement of any works herein granted, and shall be implemented in accordance with the timescale and details set out therein. This shall include all the mitigation and avoidance measures to be employed to ensure effective avoidance and mitigation methodologies have been planned for the protection of the water environment. The Final CEMP shall be implemented in accordance with the approved details and all works on site shall conform to the approved Final CEMP. Status: Pre-decision resolution of issues.</li> </ul>
	<ul style="list-style-type: none"> <li>LA08/2021/0862/DC - Lands immediately to the south of 11-17 Roslyn Avenue, Edenderry, Portadown, BT63 5BG. Approximately 40m North-West of Knock Eden and Edenderry Gardens Fold Housing Association. Approximately 90m West of Nos 12-16 Wildwood, Levaghery, Portadown, BT63 5EE and East of R.A Irwin &amp; Co Ltd Goban Street, Edenderry, Portadown, BT63 5AG. Proposed Discharge of Condition 11 on Planning Application LA08/2018/0734/F. Condition 11 states - No development activity, (including ground preparation or vegetation clearance), shall commence on site until a final Species Management Plan (SMP) for the butterflies onsite (Holly Blue and Cryptic Wood white) has been submitted to and approved in writing by the Council. The approved SMP shall reflect the Cryptic Wood White Protection Plan (CWW PP) dated 22nd July 2020. The SMP shall include the following: <ul style="list-style-type: none"> <li>a) Details of the appointment of a competent ecologist as an Ecological Clerk of Works (ECoW), with the power to halt works, including their roles, responsibilities and timings of visits with regard to management of Holly Blue and Cryptic Wood white;</li> </ul> </li> </ul>

Nearest site	Planning applications
	<p>b) A minimum of 5 years post construction monitoring and management for Holly Blue and Cryptic Wood White butterflies.</p> <p>c) Details of appropriate mitigation for Holly Blue and Cryptic Wood white to be implemented during the site preparation, construction and operational phases, including timing of works, wildlife corridors, buffer zones and/or fencing;</p> <p>d) Details of appropriate monitoring of impacts to Holly Blue and Cryptic Wood white during construction works;</p> <p>e) Details of appropriate procedures/measures to be followed should monitoring indicate potential impacts to Holly Blue and Cryptic Wood white and/or potential breaches of wildlife legislation.</p> <p>f) Details of the production of regular monitoring reports which shall be submitted to the Planning Authority within 6 months of the end of each monitoring year and which shall include details of contingency measures should monitoring reveal unfavourable results.</p> <p>Status: Conditions discharged.</p> <ul style="list-style-type: none"> <li>▪ LA08/2021/0470/F - 15 Gilford Road, Portadown, Armagh, BT63 5EF. Two storey gable extension to dwelling to allow garage &amp; utility on ground floor with bedroom, dressing and en-suite on first floor. Status: Permission granted on 1<sup>st</sup> July 2021.</li> <li>▪ LA08/2021/0407/F - 46 Gilford Road, Portadown, Armagh, BT63 5EF. Proposed single storey extension to rear of existing dwelling, reconfiguration of existing landing window and erection of new fence and gates to boundary with Gilford Road (amended proposal). Status: Permission granted on 14<sup>th</sup> June 2021.</li> </ul>
M: Annagh Hill Industrial Estate	<ul style="list-style-type: none"> <li>▪ LA08/2021/1610/F - Vacant lands immediately South West of 138 Thomas Street, Portadown, BT62 3AN at the juncture with Coronation Street, Portadown, BT62 3BA formally known as 140 Thomas Street, Portadown, Armagh, BT62 3AN. Erection of three storey apartment block comprising 9No. (1bed) luxury apartments with verandas, gated courtyard accessed from Coronation Street with 9No. car parking spaces, cycle parking spaces, single storey refuse/recycling compound and all associated site works. Status: Application received on 11<sup>th</sup> November 2021.</li> <li>▪ LA08/2021/0158/F - Presentation Primary School, Thomas Street, Portadown, BT62 3AH. Two storey extension to rear of existing Primary School and internal refurbishment of existing building. Status: Consultations issued.</li> <li>▪ LA08/2021/0648/F - 27 Tandragee Road, Portadown, Armagh, BT62 3BQ. Change of use to house of multiple occupancy. Status: Consultations issued.</li> <li>▪ LA08/2021/1096/F - 1 Ridgeway Park South, Portadown, BT62 3DQ. Conversion of existing garage and outbuildings to rear of dwelling to provide additional living and dining space (to include linked single storey extension) (amended description). Status: Permission granted on 11<sup>th</sup> November 2021.</li> <li>▪ LA08/2021/0588/F - 33 Ridgeway Park North, Portadown, BT62 3DG. Erection of single storey side and rear extension to provide additional living and dining space. Status: Permission granted on 2<sup>nd</sup> July 2021.</li> <li>▪ LA08/2021/1431/F - 59 Kingsway Drive, Portadown, Armagh, BT62 3DX. Proposed extensions and patio to existing dwelling. Status: Under consideration.</li> </ul>
N: Olde Golf Links	<ul style="list-style-type: none"> <li>▪ LA08/2021/1130/F - Lands 390 metres East of 36 Mahon Road, Portadown, BT62 3EH. Erection of 3 No. general industrial units Class B3 (in substitution of previous approved industrial units) and proposed amendments to approved warehouse from previously approved permission LA08/2016/1228/F. Amendments to warehouse building to include alterations to window and door positions and wall cladding. Amendments to warehouse curtilage including alterations to car parking and service yard and provision of van storage, and provision of bike stands, security huts, welfare unit, acoustic barrier and all associated site works. Status: Consultations issued.</li> <li>▪ LA08/2021/0215/DC - Lands 390 metres East of 36 Mahon Road within Mahon Industrial Estate, Portadown, BT62 3EH. Proposed Discharge of Condition 9 on planning application LA08/2016/1228/F. Condition 9 states - No piling work shall commence on this site until a piling risk assessment has been submitted in writing and agreed with the Planning Authority. Piling risk assessments shall be undertaken in accordance with the methodology contained within the Environment Agency document on Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention. In the event of unacceptable risks</li> </ul>

Nearest site	Planning applications
	<p>being identified, a remediation strategy shall be agreed with the Planning Authority in writing, and subsequently implemented and verified to its satisfaction. Status: Condition discharged.</p> <ul style="list-style-type: none"> <li>▪ LA08/2021/0058/NMC - James Park, Mahon Road, Portadown, Armagh, BT62 3EH. Removal of internal partition walls between warehouse units 1, 2 &amp; 3. Status: Non-material change granted on 26<sup>th</sup> January 2021.</li> <li>▪ LA08/2021/0350/NMC - Lands 390 metres East of 36 Mahon Road within Mahon Industrial Estate, Portadown, BT62 3EH. Amendments to Warehouse building. Status: Non-material change granted on 13<sup>th</sup> April 2021.</li> <li>▪ LA08/2021/0324/PAN - Lands East of 36 Mahon Road within Mahon Industrial Estate, Portadown, Armagh, BT62 3EH. Amendments to warehouse and industrial development approved under reference LA08/2016/1228/F. Status: Proposal of application notice acceptable.</li> <li>▪ LA08/2021/1449/F - 19 The Olde Golf Links, Portadown, BT62 3BY. Removal of existing roof to existing side gable with new first floor extension (bedroom) over. Status: Under consideration.</li> <li>▪ LA08/2021/1406/F - 36 Huntingdale Lodge, Portadown, Armagh, BT62 3RU. Side extension over existing attached garage to provide bedroom and en-suite on 1st floor. Status: Pre-decision resolution of issues.</li> </ul>
O: 313 Tandragee Road	None
P: Derryvore Lane	<ul style="list-style-type: none"> <li>▪ LA08/2021/1095/F - The Food Park, 39 Seagoe Industrial Area, Portadown, BT63 5QE. Proposed new kitchen extension. Status: Permission granted on 8<sup>th</sup> November 2021.</li> <li>▪ LA08/2021/1337/F - 39 Seagoe Industrial Estate, Portadown, Armagh, BT63 5QE. The proposal is situated within the compound of the existing treatment plant at the rear of the factory. The proposal consists of extension to the existing treatment plant with the addition of a secondary treatment stage to produce a higher quality effluent that is capable of being used for recycling in 'grey' water applications. Works consist of erection of an anaerobic reactor and associated tanks and plant room. The scheme is an environmentally friendly green project utilising the methane gas produced to provide green energy and be carbon neutral. Status: Consultations issued.</li> <li>▪ LA08/2021/0580/F - Almac Building 16, 20 Seagoe Industrial Estate, Portadown, BT63 5QD. Proposed construction of new single storey flat roof extension at Level 1 and construction of new 3 storey extension at Level 1. Status: Permission granted on 25<sup>th</sup> June 2021.</li> <li>▪ LA08/2021/1605/A - Roadside Motors Portadown, Peugeot Dealer, 30 Seagoe Industrial Area, Portadown, Armagh, BT63 5QD. Display of four internally illuminated fascia signs and display of one internally illuminated pylon sign. Status: Consultations issued.</li> <li>▪ LA08/2021/1022/F - NIE Networks Ltd, 4 Annagh Drive, Carn Industrial Estate, Craigavon BT63 5QJ. Application Proposed for variation to Condition 7 on LA08/2020/1455/F, (Erection of a replacement office building)- removing the requirement for hard surface works to be completed prior to the proposed replacement office building becoming operational. Status: Permission granted on 4<sup>th</sup> October 2021.</li> </ul>
Q: Ripley Mews	<ul style="list-style-type: none"> <li>▪ LA08/2021/0845/F - Land immediately to the rear (south) and side (west) of No.29 Armagh Road, Portadown, Armagh, BT62 3DL. Retention of 2no. modular buildings to provide therapeutic classes and sales / display of garden products, retention of polytunnel, covered planting area, lighting and ancillary parking for social enterprise garden centre. Retention of security fencing / gates with access via Armagh Road and off main access into Lidl existing store. Status: Permission granted on 29<sup>th</sup> October 2021.</li> <li>▪ LA08/2021/1542/A - Bus Shelter 18 metres North of 29 Armagh Road, Portadown, Armagh, BT62 3DR. Conversion of existing six sheet display unit incorporated into an existing Adshel Bus Shelter to a six sheet digital display screen. Status: Consultations issued.</li> <li>▪ LA08/2021/0482/F - 5 Ripley Crescent, Portadown, Armagh, BT62 3JW. Proposed garage and garden store. Status: Permission granted on 1<sup>st</sup> July 2021.</li> <li>▪ LA08/2020/1545/F - 7 Ripley Crescent, Portadown, Armagh, BT62 3JW. Proposed single storey extension to side and rear of existing dwelling. Status: Permission granted on 19<sup>th</sup> April 2021.</li> </ul>

Nearest site	Planning applications
	<ul style="list-style-type: none"> <li>▪ LA08/2021/0171/F - 10 Dorchester Drive, Portadown, Armagh, BT62 3DY. Proposed replacement porch together with a ground floor living room extension. Status: Permission granted on 17<sup>th</sup> May 2021.</li> <li>▪ LA08/2021/1434/F - Brownstown Park Sports Ground, Portadown, Armagh, BT62 3QJ. Erection of new club house, separate toilet block with food kiosk, installation of 3no. prefabricated spectator stands and formation of new synthetic training pitch with associated perimeter fence. Status: Under consideration.</li> <li>▪ LA08/2021/1009/F - 17 Fitzgerald Park, Portadown, Armagh, BT62 3QR. Front single storey porch and rear single storey bathroom extension plus rendering to existing concrete brickwork throughout. Status: Permission granted on 11<sup>th</sup> October 2021.</li> </ul>
R: Corcullentragh Road	<ul style="list-style-type: none"> <li>▪ LA08/2021/0539/O - 80m North East of 120 Loughgall Road, Portadown, Armagh, BT62 4EG. Erection of dwelling. Status: Consultation issued.</li> <li>▪ LA08/2021/0978/F - 30m North East of 93a Loughgall Road, Portadown, BT62 4EG. Proposed tea room and associated ancillary space for sale of farm products, including production/store area with customer parking and site works. Status: Under consideration.</li> </ul>
S: Corcrair Drive	<ul style="list-style-type: none"> <li>▪ LA08/2021/0228/F - 30 Hartmore Gardens, Portadown, Armagh, BT62 4DS. Proposed roof space conversion including provision of dormer window to front elevation. Status: Permission granted on 1<sup>st</sup> July 2021.</li> <li>▪ LA08/2021/0065/F - 1 Selshion Parade, Portadown, Armagh, BT62 4AT. Single storey extension to front of dwelling and level access ramp. Status: Permission granted on 21<sup>st</sup> June 2021.</li> <li>▪ LA08/2021/0497/F - Site 78m North West of No. 47 Ballybay Meadows Off Loughgall Road, Portadown, Armagh, BT62 4DY. Housing development consisting of eight 3 bedroom semi-detached dwellings. Status: Consultations issued.</li> <li>▪ LA08/2021/0287/F - Land immediately adjacent to and south of No's 1-9 Ashton Hall, Loughgall Road, Portadown, BT62 4EF and 200m SW of Brownstown Business Centre including lands opposite / North of Tullyroan Drive, Portadown. Proposed housing development of 13no. dwellings (1no. detached and 12no. semi-detached) with associated garages, estate roadway and site works. Status: Under consideration.</li> <li>▪ LA08/2021/0978/F - 30m North East of 93a Loughgall Road, Portadown, BT62 4EG. Proposed tea room and associated ancillary space for sale of farm products, including production/store area with customer parking and site works. Status: Under consideration.</li> </ul>

### Community land and assets

15.4.3 There are existing open spaces within the study area; including People's Park, and land zoned for open spaces in which the Department wishes to encourage the planting of additional trees within the borough. The River Bann is used by anglers. Other community facilities include:

- Corcrair Community Woodland
- Portadown Rugby Football Club
- Portadown Community Hall
- Portadown Library
- ABC Community Network
- Edenvilla Park
- Annagh United FC
- Shamrock Park
- Brownstown Community Centre.

15.4.4 There are healthcare facilities within the study area including private medical practices and nursing homes. There are no hospitals within the study area.

15.4.5 There are a number of religious and education facilities within the study area. These include:

- Ballyoran Primary School
- St John the Baptist Primary School
- St John the Baptist College
- Hart Memorial Primary School
- Portadown Independent Christian School
- Presentation Primary School
- Clounagh Junior High School
- Millington Primary School
- St John the Baptist Christ
- First Portadown Presbyterian Church
- Carrickblacker Road Gospel Hall
- Millington Nursey
- St Mark's Portadown
- Armagh Road Presbyterian
- Epworth Methodist Church
- Portadown Free Presbyterian Church
- Portadown Baptist Church
- Portadown College
- Armagh Road Presbyterian
- Independent Methodist Church.

### **Development land and businesses**

15.4.6 There are a number of businesses located within the study area. The majority of businesses are located in the centre of Portadown.

15.4.7 There is one area zoned for industry located approximately 470m west of Site P. Land west of Charlestown Road (C/I 4) is shown in **Figure 15.1a, Volume 4**.

15.4.8 The Lough Neagh and the River Bann are the Borough's main natural tourism assets and is enhanced by the extensive network of cycleways, the National Cycle Networks and the Ulster Way.

### **Agricultural land holdings**

15.4.9 The sites located on the edge of the town of Portadown will be located in or near privately owned agricultural lands, which is used for a mixture of arable and pastoral farming.

## WCH

- 15.4.10 Newry Canal Way cycle way (National Cycle Route 9) is located within the study area (Ref. 15.5). This route begins in Portadown at The Bann Bridge on Bridge Street and ends at the Town Hall in Newry and follows the towpaths of the Newry Canal. National Cycle Route 94 (connected to National cycle route 9) is also located in the study area and begins near Bridge Street.
- 15.4.11 This route forms part of the network around Lough Neagh. There are three public walks within the study area (Ref. 15.6); Newry Canal Way, Bann Boulevard and Brackagh Bog. There are footpaths and provision for cyclists within the study area. Recreational routes are shown on **Figure 15.1a-d, Volume 4**.
- 15.4.12 A section of the Ulster Way is also located within the study area. This follows the same path as the Newry Canal Way cycle way. The Ulster Way is 1,024km circular walking route taking in the six counties of Northern Ireland. The Local Development Plan has not designated any areas for tourism within the study areas.

## Human Health

- 15.4.13 The Northern Ireland Multiple Deprivation Measure (NIMBM) (Ref. 15.7) provides a mechanism for ranking areas within Northern Ireland in the order of the most deprived to the least deprived. The spatial deprivation measures rank the Super Output Areas (SOA) in Northern Ireland from 1 (most deprived) to 890 (least deprived). Each SOA has an average population of around 2,100 people and the ranking is based on 38 deprivation indicators. The NIMBM for the SOA in 2017 within the study area are listed in Table 15-6 and shown on **Figure 15.1a-d, Volume 4**.

Table 15-6: Northern Ireland Multiple Deprivation Measure 2017

Super Output Area	Northern Ireland Multiple Deprivation Measure 2017
Ballybay	200
Corcrain 1	129
Corcrain 2	108
Annagh 1	583
Annagh 2	73
Tavanagh	164
Ballyoran	412
Bleary 1	825
Brownstown 1	423
Brownstown 2	447
Edenderry 1	427
Edenderry 2	682
Kernan 1	780
Kernan 2	
The Birches 1	534

- 15.4.14 Portadown is within the Craigavon Urban Area and as of the most recent census data (2011), this area has 64,323 people which accounts for 3.55% of NI population.



15.4.15 The following health profiles were established using data available on Northern Ireland Statistics and Research Agency (NISRA) (Ref. 15.8). The study area is located within the Upper Bann area.

- Percentage of community with increased susceptibility to health issues (vulnerable members, e.g. <16 & >65 years of age): In 2015, the percentage of vulnerable members within the study area was recorded as less than 35.8%.
- Percentage of community with pre-existing health issues (e.g. respiratory disease/chronic obstructive pulmonary disease): In 2019, the percentage of people on the Coronary Heart Disease Register in Armagh City, Banbridge and Craigavon Borough Council area was 10.4%.
- Death from respiratory disease: In Craigavon, in 2018, the percentage of death due to respiratory disease was 11.0%.
- Percentage of community with long term illness or disability: The Health Survey Northern Ireland (2017/18), found that 43% of respondents have a physical or mental health condition or illness expected to last 12 months or more. In 2019, the total number of adults in Northern Ireland with a disability was 21% (6% of children). In the west and south of Northern Ireland, the total number of adults was 22% (7% of children).
- General health: The Health Survey Northern Ireland (2017/18), found that over 2/3 of respondents rated their general health as good.
- Life expectancy: In Northern Ireland (in 2011-2013), life expectancy is 78.1 for males and 82.4 for females at birth.

15.4.16 A summary of the key conditions relating to human health are detailed below; however, full details on environmental conditions can be found in the following chapters:

- Chapter 8: Air Quality
- Chapter 10: Landscape and Visual Effects
- Chapter 13: Soil and Land Contamination
- Chapter 14: Noise and Vibration.
- Chapter 16: Hydrology and Drainage

15.4.17 There is no Candidate Noise Management Area (CNMA) within the study area. Ambient noise surveys have been carried out near each of the sites and the results are detailed in Chapter 14.4. During the day, noise levels ranged from 73.1dB outside the Portadown Health Centre to 43.4dB at Derryvore Lane. Highest noise levels were recorded within the town limits and lowest levels were recorded at rural properties.

15.4.18 Vehicle emissions and domestic combustion emissions are the main influencers on air quality within the study area. In 2018 the council declared the entire Borough an Air Quality Management Area (AQMA). Ambient air quality levels are discussed in Chapter 8: Air Quality.

15.4.19 The scheme is located in Portadown, with sites located in urban and rural areas, therefore there are a large number of visual receptors located within the study area which may be potentially impacted by the proposed scheme. Landscape amenity is discussed in Chapter 10 Landscape and Visual Effects.

15.4.20 The main potential sources of land contamination are detailed below.

- Site A:
  - Made ground (from residential development)
  - Off-site garage
- Site A2:

- 0 Railway land
- 0 Garage/filling station
- 0 Petrol filling station
- 0 Factories/works
- Site B
  - 0 Farmstead
- Site C
  - 0 Impacted made ground
  - 0 Linen and carpet factories
  - 0 Railway land
- Site D
  - 0 Made ground (from residential development)
  - 0 Factories (carpet, linen and distilleries)
  - 0 Railway land
  - 0 Industrial estate
- Site E
  - 0 Made Ground (from residential development)
  - 0 Factories (bacon and damask)
  - 0 Bus depot/garage
  - 0 Scrap metal yard
- Site F
  - 0 Made ground (from residential development)
- Site H
  - 0 Made ground
  - 0 Saw mill
  - 0 Warehouse and quay
  - 0 Distillery
  - 0 Railway land
- Site I
  - 0 Weaving factory
  - 0 Steel Works
  - 0 Garage

- Site J
  - Weaving factory
  - Laundry
  - Garage
  - Boat factory
  - Engineering works
- Site K
  - Made ground (from residential development)
- Site L
  - Brick works
  - Linen factory
  - Motor works
- Site M
  - Historical railway land
  - Garage
  - Linen works
  - Unspecified chemical/engineering works
- Site N and N2
  - Made Ground (from residential development)
  - Historical railway land
  - Industrial estate
- Site O
  - Farmstead
  - Garage
- Site P
  - Commercial yard
  - Agricultural practises
  - Industrial storage
- Site Q
  - Made ground (Farm)
  - Historical mills (corn and flax)
- Site R

- o Made ground (from residential development)
- Site S
  - o Made ground (from residential development)
  - o Petrol filling station
  - o Car wash
  - o Depot

## 15.5. Evaluation (Value of Resource or Sensitivity of Receptors)

15.5.1 This section details the sensitivity of receptors which have the potential to be impacted by the scheme.

### Population

15.5.2 Population receptors are detailed in Table 15-7.

Table 15-7: Sensitivity of receptors

Type	Receptor	Sensitivity	Justification
Private property and housing	Residential properties	Very high	Over 150 houses within the study area
	Land allocated for housing	Very high	Land allocated for housing covers >5ha
	Planning permission/in the planning process.	Low	Applications granted or in the planning process
Community land and assets	Community assets	High	There is limited severance and used for daily use by the majority of the community
	Education facilities	High	There is limited severance and used for daily for education by the majority of the community
	Religious facilities	Medium	There is limited severance and facilities used frequently by the minority of the community
Development land and business	Commercial assets	Very high	Large number of commercial assets located within the study area
WCH	NCR	Very high	National routes likely used for both commuting and recreation

### Human health

15.5.3 Sensitive human receptors include residential properties, schools, hospitals and care homes as well as users of community land and assets. Receptors such as the elderly (over 65), children under the age of 16 and populations with certain health conditions (such as respiratory diseases) are also considered vulnerable. The population and community in the study area is deemed to be high.

- 15.5.4 Chapter 10 details the sensitive visual receptors within the study area. They include residents, workers and users of open space and WCH routes.
- 15.5.5 Sensitive human health receptors identified in Chapter 13: Soil and Land Contamination are limited to construction workers.

## 15.6. Impact Assessment

- 15.6.1 This section provides an overview of potential impacts from the scheme on the receptors identified in Section 15.5.

### Construction

- 15.6.2 Construction of the scheme is likely to provide an economic boost through possible employment opportunities and spending within the local area. While the number of local people who would gain employment would be low, there is potential for the proposed scheme to influence commercial activity and existing businesses within the study area during the construction phase of the flood management scheme, primarily due to disruption and disturbance from traffic and noise. The effects will be greatest where construction activities including temporary working areas and access routes occur in closest proximity to business premises and may also include indirect effects such as road restrictions.
- 15.6.3 See Chapter 8: Air Quality, Chapter 10: Landscape and Visual, Chapter 13: Soil and Land Contamination, and Chapter 14: Noise and Vibration for further details regarding significant effects relating to human health during construction. This section includes the key significant effects due to construction from each of these chapters that contribute to human health effects where relevant.

### Private property and housing, community land and assets, development land and businesses and agricultural land holdings

- 15.6.4 The proposed scheme will require temporary land take for possible contractor compound sites, access routes and working corridors from private property, community assets, agricultural land and commercial assets. It is envisaged that the construction programme will last 36 months, with the contractor beginning on-site works in 2023. The temporary site compounds will be located on existing hard standing areas, and will result in short term temporary loss of parking at the DfI car park at Shillington's factory and People's Park. Although temporary, the impact is assessed to be **moderate adverse**.
- 15.6.5 There is potential for access to private property and agricultural land and commercial assets to be disrupted due to temporary land take or diversion routes. The extent of these areas are currently unknown. This disruption would be temporary, and landowner access will be accommodated during the construction works, therefore the impact is considered to be **minor adverse**.
- 15.6.6 There is predicted to have **no change** on any applications that have been granted planning permission or are in the planning process as the scheme will result in no loss or alteration to development land.
- 15.6.7 No construction work will take place within areas zoned for housing within the Craigavon Area Plan or commercial properties; therefore, **no change** is predicted. It is also envisaged that all commercial properties will remain accessible.
- 15.6.8 There are no educational or religious facilities located directly adjacent to any schemes; therefore, **no change** is predicted.
- 15.6.9 There is a possibility that there will be a reduction in amenity on a number of community facilities and assets that are located in close proximity to the sites, particularly, sites along the River Lagan and near the People's Park. It is envisaged that all community facilities and assets will remain accessible. Therefore, there is a **minor adverse** impact on community receptors. Recreation and amenity assets may be affected by construction noise, dust or visual impacts; however, these will be assessed in their respective technical chapters within this ES.

## WCH

- 15.6.10 There is a potential impact during construction on the National cycle routes and Newry canal towpath. To ensure that these WCH assets remain accessible to all users, careful planning and liaison with the council is required to ensure effective communication and continued safe operation during the works. Worst-case scenario, it may be required that some assets are partially or temporarily closed. This results in a **moderate adverse** impact.
- 15.6.11 WCH assets may be affected by construction noise, dust or visual impacts; however, these have been assessed in their respective technical chapters within this ES.

## Human health

- 15.6.12 The greatest risk to human health during the construction phases will be to the public that use the area for amenity and recreational purpose. Potential impacts to health in respect of noise, vibration and air quality have been assessed separately in their respective chapters and impacts from these activities during construction have been assessed as being below the threshold for potential impacts to health. These impacts have been considered in Chapter 8: Air Quality and Chapter 14: Noise and Vibration and have not been included in this assessment.
- 15.6.13 Construction of new embankments or walls will require excavations at locations where made ground has been identified in the ground investigations. The excavation and handling of contaminated made ground could result in the increased mobilisation of contaminants which could increase the potential impacts on the surrounding areas. Dependant on the contaminant of concern; these impacts could include:
- Leaching of any contaminants from the made ground to the surrounding area could lead to further areas of soils within the vicinity becoming impacted and the impacting of groundwater and surface water;
  - Risk from gas production; and
  - Human health risk, as excavation of made ground could expose construction works to potential contaminants. If contaminant levels exceed screening thresholds this could present a risk to human health from direct contact and from volatile or semi-volatile vapours.
- 15.6.14 These impacts are discussed further Chapter 13: Soil and Land Contamination and Chapter 16: Hydrology and Drainage and have not been included in this assessment.

## Operation

### Private property and housing, community land and assets, development land and businesses and agricultural land holdings

- 15.6.15 The proposed scheme will require a small amount of land take along some property and field boundaries. Land take will only be required for the footprint of the scheme, resulting in a very minor loss of land but not affecting the viability of the properties. The impact is considered to be **negligible adverse**.
- 15.6.16 Access will not be restricted at private property and commercial assets as a result of the scheme. The impact is considered to be **negligible adverse**. Alternative and appropriate access will be provided to agricultural land if current access is removed. The scheme will not sever agricultural assets resulting in the assets becoming unusable or require the change of land use. The impact is considered to be **negligible adverse**.
- 15.6.17 The operation of the scheme will have **no change** on areas zoned for housing within the Craigavon Area Plan and commercial assets.
- 15.6.18 There are no educational or religious facilities located directly adjacent to any schemes; therefore, **no change** is predicted.
- 15.6.19 There is a possibility that there will be a reduction in amenity on a number of community facilities and assets that are located in close proximity to the sites, particularly, sites along the River Lagan and near the People's

Park, with the introduction of new flood walls and defences. However, it is envisaged that all community facilities and assets will remain accessible. Therefore, there is a **negligible adverse** impact on community receptors. Recreation and amenity assets may be affected by operational visual impacts; however, these will be assessed in Chapter 10: Landscape and Visual Effects within this ES.

## WCH

15.6.20 There is predicted to be **no change** to accessibility during the operational phase of the scheme. The WCH assets will remain accessible to all users.

15.6.21 WCH assets may be affected by visual impacts; however, these are assessed in Chapter 10: Landscape and Visual Effects within this ES.

## Human health

15.6.22 The reduction in flood risk associated with the scheme would have a **positive** impact on the health of the community, including those directly and indirectly affected.

15.6.23 The positive impact gained from flood risk on tangible physical health issues is likely to be small as there is, currently, a low level of physical health risk. However, the impact on intangible mental health issues, such as reduced stress associated with flood risk and dealing with the aftermath of flood events, are anticipated to be larger. Therefore, the impact of the scheme on those properties with reduced flood risk will be a **minor beneficial** impact on physical health and **moderate beneficial** impact on mental health.

15.6.24 The scheme will also benefit the study area through the following and will result in a **positive impact**:

- Ensure continued use as a public amenity
- Protect flora and fauna and enhance biodiversity
- Protect and enhance landscape character and visual amenity.

## 15.7. Mitigation

15.7.1 Mitigation and enhancement measures are detailed below. Specific mitigation and enhancement relating to noise, vibration, landscape, visual and contamination are detailed in the relevant technical chapter within this ES.

### Construction

15.7.2 The contractor will be required to establish and maintain effective liaison with the local community throughout the construction phase. This will include information about ongoing activities and provision of contact details to report incidents or for further information. Residents and other users in the study area would benefit from an organised information campaign on temporary access arrangements and proposed construction detail. Landowners have been consulted with extensively in the development of the scheme design and for those affected landowners which are involved in commercial activities. Ongoing consultation with other land users specifically affected by proposed construction works will be required.

15.7.3 All residential properties, community assets, commercial assets, agricultural land and WCH assets will remain accessible throughout the construction phases. This will be achieved through careful liaison with landowners and the local council prior to and throughout the construction programme.

15.7.4 There will be temporary land take from public areas and private land to accommodate the schemes. Careful planning when considering suitable locations for site offices, stockpiles and compounds will be undertaken to minimise adverse effects of construction activities. Indicative locations for site compounds include areas of existing hard standing, such as People's Park carpark and the DfI carpark at Shillington's factory.

15.7.5 These measures will be identified in a formal Construction Environmental Management Plan (CEMP) (**Appendix 6.2, Volume 3**) and Construction Traffic Management Plan (CTMP) which will be implemented by the contractor to mitigate against adverse impacts during construction. The CEMP will incorporate

mitigation measures to avoid nuisance from construction activities including dust and noise. The aim of the CTMP will be to put in place procedures to manage construction traffic effectively. The plan will consider construction traffic accessing the site via the public road network as well as traffic circulation within the construction site.

### Operation

- 15.7.6 Residential landowners directly affected by the works (when the scheme runs along the landowner's property boundary) have been consulted. Private land agreements with the landowners will be implemented to allow access for routine maintenance.

## 15.8. Residual Effects

### Construction

- 15.8.1 The significance of effects during the construction phase on each receptor, following the implementation of the mitigation set out in 15.7, are detailed in Table 15-8.

Table 15-8: Construction – significance of effects

Type	Receptor	Sensitivity	Magnitude of impacts	Significance of effects
Private property and housing	Residential properties	Very high	Negligible adverse	Slight adverse
	Land allocated for housing	Very high	No change	Neutral
	Planning permission/in the planning process.	Low	No change	Neutral
Community land and assets	Community assets	High	Negligible adverse	Slight adverse
	Education facilities	High	No change	Neutral
	Religious facilities	Medium	No change	Neutral
Development land and business	Commercial assets	Very high	Negligible adverse	Slight adverse
Agricultural holdings	Agricultural land	High	Negligible adverse	Slight adverse
WCH	NCR	Very high	Negligible adverse	Slight adverse
	Public walks	Medium		Slight adverse
Human health	Community/population	High	Negative	-

### Operation

- 15.8.2 The significance of effects during the operational phase on each receptor are detailed in Table 15-9.



Table 15-9: Operational – significance of effects

Type	Receptor	Sensitivity	Magnitude of impacts	Significance of effects
Private property and housing	Residential properties	Very high	Negligible	Slight adverse
	Land allocated for housing	Very high	No change	Neutral
	Planning permission/in the planning process.	Low	No change	Neutral
Community land and assets	Community assets	High	Minor adverse	Slight adverse
	Education facilities	High	No change	Neutral
	Religious facilities	Medium	No change	Neutral
Development land and business	Commercial assets	Very high	Negligible adverse	Slight adverse
Agricultural holdings	Agricultural land	High	Negligible adverse	Slight adverse
WCH	NCR	Very high	No change	Neutral
	Public walks	Medium		Neutral
Human health	Community/population	High	Positive	-

## 15.9. Monitoring

15.9.1 No additional monitoring measures have been identified for the scheme. Monitoring of air quality, visual and noise impacts are reported in Chapter 8: Air Quality, Chapter 10: Landscape and Visual Effects and Chapter 14: Noise and Vibration.

## 15.10. Summary

- 15.10.1 The majority of impacts identified within this assessment concluded that there was no significant effect. During the construction phase, a significant effect on residential properties, community assets, commercial assets and WCH assets were identified as construction work may result in the temporary partial closure of some community facilities. Mitigation measures have been put in place to ensure this effect is minimised.
- 15.10.2 Positive effects on human health were identified during the operational phase on the population and community due to the risk of flooding being reduced.

## 16. Hydrology and Drainage

### 16.1. Introduction

- 16.1.1 This chapter of the Environmental Statement (ES) considers the impact of the proposed scheme on hydrology and drainage. Impacts on surface water quality, hydromorphology and flood risk are considered for the construction phase of the project.
- 16.1.2 A scoping report was produced by Amey Consulting in October 2020 (Ref 16.1). The report concluded that significant impacts on groundwater quality, levels and flows were unlikely during construction and operation and as a result, groundwater was scoped of future assessment. Similarly, significant impacts on surface water quality during operation were considered unlikely and were additionally scoped out of further assessment. In line with good practice however and due to the scale of the proposed scheme, a Water Framework Directive (WFD) Assessment has been carried out for the operational phase to assess the proposed scheme against the objectives of the WFD.
- 16.1.3 Operational impacts on hydrology are also considered for the sites surrounding Derryvore Lane and Tandragee due to the proximity of the proposed flood defences to Areas of Special Scientific Interest.

### 16.2. Statutory and Policy Context

- 16.2.1 This section details the statutory and policy context relevant to hydrology and drainage within Northern Ireland.

#### Statutory Legislation

##### **The Water (Amendment) (Northern Ireland) (EU Exit) Regulations 2019**

- 16.2.2 The Water Framework Directive (WFD) (2000/60/EC) (Ref 16.2) is key piece of European legislation which was introduced in 2000 as a way of protecting and improving the quality of watercourses within European member states. The Directive introduced a holistic approach to the management of water quality through the implementation of River Basin Management on a catchment level. It requires the protection and improvement of all aspects of the water environment including rivers, lakes, estuaries, coastal waters and groundwater.
- 16.2.3 The Directive was first introduced into Northern Ireland legislation through the Water Environment (Water Framework Directive) Regulations 2003 (Ref 16.3), later amended by the Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2017 (Ref 16.4) and the Water (Amendment) (Northern Ireland) (EU Exit) Regulations 2019 (Ref 16.5). The regulations place a responsibility on Northern Ireland to ensure that all inland and coastal waters reach at least good status (or good ecological potential for artificial or heavily modified water bodies). The regulations use a five status classification system for waterbodies; High, Good, Moderate, Poor and Bad and allows for extended deadlines or less stringent objectives to be set for waterbodies, should certain conditions be met.
- 16.2.4 To achieve the target of reaching good status or above, Northern Ireland is required to implement management planning at a river basin level, linking with other key policy areas such as agriculture, land use, biodiversity, tourism, recreation and flood protection. This is done through the publication of a River Basin Management Plan (RBMP) which sets out a programme of measures to be implemented over six-year cycles aimed at improving the status of waterbodies.

##### **The Water and Floods (Amendment) (Northern Ireland) (EU Exit) Regulations 2019**

- 16.2.5 In response to major flood events throughout Europe between 1998 and 2009, the EU prepared and implemented a directive aimed at reducing and preventing impacts from flooding through a flood risk assessment framework. The EU Flood Directive 2007/60/EC (Ref 16.6) on the assessment and management of flood risk came into force on 26th November 2007. The directive required member states to assess the flood risk of all watercourses and coast lines within their regulatory boundaries and to map the flood extent and assets at risk within these areas.

- 16.2.6 This EU Directive was transposed in Northern Ireland legislation through The Water Environment (Floods Directive) Regulations (Northern Ireland) 2009 (Ref 16.7), later amended to The Water Environment (Floods Directive) (Amendment) Regulation (Northern Ireland) in 2018 (Ref 16.8) and most recently The Water and Floods (Amendment) (Northern Ireland) (EU Exit) Regulations 2019 (Ref 16.9).
- 16.2.7 The regulations set out the three main stages of flood risk management as outlined in the Directive, which must be repeated on a cyclical basis every six years. The stages are summarised below:
- Preliminary Flood Risk Assessment: Article 4 of the EU Directive required each Member State to undertake a Preliminary Flood Risk Assessment for their respective territories by 22nd December 2011.
  - Flood Hazard and Risk Mapping: Article 6 of the Directive required each Member State to prepare Flood Hazard and Flood Risk Maps for significant flood risk areas by December 2013.
  - Flood Risk Management Planning: Article 7 of the Directive required each Member State to prepare Flood Risk Management Plans (FRMPs) by December 2015.
- 16.2.8 In December 2011, the Preliminary Flood Risk Assessment (PLRI) for Northern Ireland was published by the Rivers Agency (now DfI Rivers) which assessed the potential adverse consequences of future flooding on human health, economic activity, cultural heritage and the environment taking into account long term developments such as climate change. It considered fluvial and coastal flood risk as well as surface water runoff. The PFRA report also provided the Rivers Agency with information to comply with Article 5 of the Directive which required each Member State to use the PFRA as the basis to 'identify those areas for which they conclude that potential significant flood risk exists or might be likely to occur' (Ref 1.4). These areas were termed Significant Flood Risk Areas (SFRA). The identification of the SFRA was a critical milestone in the implementation of the Directive as these were the only areas for which the later requirements to produce detailed flood maps and flood risk management plans apply.
- 16.2.9 A review of the PFRA took place in 2018 as part of the 2nd six year cycle of the Directive's processes and resulted in the publication of the Northern Ireland Flood Risk Assessment (NIFRA) in December 2018 (Ref 1.5). The NIFRA is a high-level analysis of the potential economic, social and environmental impacts which could result from flooding in Northern Ireland, developing the initial findings of the PFRA. It identifies the areas within Northern Ireland which are at greatest risk of flooding and classifies these as 'Areas of Potential Significant Flood Risk' (APSFR).

### **Drainage (Northern Ireland) Order 1973 (and amendments)**

- 16.2.10 The Drainage (Northern Ireland) Order 1973 (and amendments) (Ref 16.10) provides for the preparation and undertaking of drainage schemes within Northern Ireland. The legislation sets out the functions and responsibilities of the Drainage Council, and provides a mechanism for the environmental assessment of drainage schemes.

### **Local Policy**

#### **Regional Development Strategy 2035**

- 16.2.11 The Regional Development Strategy (RDS) (Ref 16.11) is the spatial strategy of the Northern Ireland Executive and sets out the future development of Northern Ireland to 2035. It provides an overarching strategic planning framework to facilitate and guide the public and private sectors. The strategy has eight aims including the following which relate to the environment;
- Promote development which improves the health and well-being of communities;
  - Improve connectivity to enhance the movement of people, goods, energy and information between places.
  - Protect and enhance the environment for its own sake;
  - Take actions to reduce Northern Ireland's carbon footprint and facilitate adaption to climate change.

16.2.12 In addition to the key aims outlined above, the RDS also lists several Regional Guidance (RG) aims. Those which are relevant to the water environment are summarised below.

***RG9: Reduce our carbon footprint and facilitate mitigation and adaptation to climate change whilst improving air quality***

- Minimise development in areas at risk from flooding from rivers, the sea and surface water run-off. The RDS sets out that flooding is a natural phenomenon that cannot be entirely prevented. It states that a precautionary approach to development in areas of flood risk should be exercised using the latest flood risk information available and that town and cities should be developed in a manner that avoids the risk where possible. Developments in all areas, even those outside flood risk areas, should incorporate Sustainable Drainage Systems (SuDS).

***RG11: Conserve, protect and, where possible, enhance our built heritage and our natural environment***

- Protect, enhance and restore the quality of inland water bodies. Rivers and lakes support habitats and species of national and international importance. The RDS states that the quality and the ecological status of the water environment should be improved through fulfilment of statutory obligations. The Executive's second cycle of River Basin Management Plans outline the current measures being taken to improve the quality of coastal, inland and groundwaters to achieve the Water Framework Directive's aim of good ecological status.

***RG12: Promote a more sustainable approach to the provision of water and sewerage services and flood risk management.***

- Encourage sustainable surface water management. The RDS states that greater use of Sustainable Drainage Systems (SuDS) should be encouraged, particularly as part of significant development proposals. SuDS provide a water quality benefit and if designed appropriately can help control flows into rivers and drains thereby reducing the risk of flooding.

**Strategic Planning Policy Statement for Northern Ireland (SPPS)**

16.2.13 The SPSS (Ref 16.12) sets out the Department for Infrastructure's regional planning policies for ensuring consistent development throughout Northern Ireland under a reformed two-tier planning system. The SPPS consolidates numerous separate policy publications into one document and sets out the Department's policy on important planning matters that should be addressed across Northern Ireland.

16.2.14 The following policy outlined within the SPPS relates to the environment.

**Preserving and improving the built and natural environment**

16.2.15 This is one of five core planning policies outlined within the SPPS. It sets out that the environment must be managed in a sustainable manner in order to preserve and improve the built and natural environment and to prevent biodiversity loss. The SPPS recognises that the importance of the environment goes beyond the immediate benefits it can provide. It states that unique landscapes (including heritage assets) and biological diversity should be protected as it makes an important contribution to the protection of the wider global ecosystem. It is therefore critical that this vital asset is preserved and improved for the enjoyment and benefit of future generations.

16.2.16 In addition to the core planning policies, SPPS details various subject policies. Those relating to the water environment are detailed below:

***Flood risk***

16.2.17 The strategic aims for flood risk include:

- Prevent inappropriate new development in areas known to be at risk of flooding, or that may increase the flood risk elsewhere;

- Ensure that the most up to date information on flood risk is taken into account when determining planning applications and zoning / designating land for development in Local Development Plans (LDPs);
- Manage development in ways that are appropriate to the four main sources of flood risk in Northern Ireland, i.e. fluvial, coastal, surface water and water impoundment (reservoir) breach or failure;
- Seek to protect development that is permitted within flood risk areas by ensuring that adequate and appropriate measures are employed to mitigate and manage the flood risks;
- Promote sustainable development through the retention and restoration of natural flood plains and natural watercourses as a form of flood alleviation and an important environmental and social resource;
- Promote sustainable development through encouraging the use of sustainable drainage for new development and redevelopment / regeneration schemes; and
- Promote public awareness of flood risk and the flood risk information that is available and of relevance to undertaking development.
- Promote an integrated and sustainable approach to the management of development and flood risk which contributes to:
  - The safety and well-being of everyone,
  - The prudent and efficient use of economic resources,
  - The conservation and enhancement of biodiversity, and
  - The conservation of archaeology and the built heritage.

### **Revised Planning Policy**

- 16.2.18 While the Local Councils work on bringing forward their new Local Development Plans in line with the SPPS, planning authorities within Northern Ireland will continue to apply retained planning policy, including Revised Planning Policy Statement 15: Planning and Flood Risk (Ref 16.13). PPS 15 was published in 2014 and sets out the draft planning policies to minimise and manage flood risk to people, property and the environment. Its aim is 'to prevent future development that may be at risk from flooding or that may increase the risk of flooding elsewhere'.

### **Northern Ireland Flood Risk Management Plan 2021-2027**

- 16.2.19 Within the Second Cycle Northern Ireland Flood Risk Management Plan 2021-2027 (Ref 16.14) Portadown is identified as an Area of Potential Significant Flood Risk (APSFR). The plan identifies a range of measures to reduce flood risk in the area, which includes the construction of a series of flood defences along the Ballybay River, Annagh River and the Upper Bann River (the proposed scheme this ES is assessing).

### **Armagh City, Banbridge and Craigavon Borough Local Development Plan**

- 16.2.20 Armagh City, Banbridge and Craigavon Borough Council is responsible for preparing a local development plan (Ref 16.15) for the council area. This council issued their Preferred Options Paper in March 2018, the aim of which is to promote debate on key issues which are likely to influence future development in the Borough up to 2030. One of the objectives for the plan is 'to prevent inappropriate new development in areas known to be at risk of flooding or that may increase the flood risk elsewhere and put in place measures to assist in flood risk management'. Key issues within the plan include ENV7 Developing within areas of flood risk (floodplains) and ENV 8 Encouraging Sustainable Drainage Systems (SuDS).

## 16.3. Methodology

16.3.1 There is no specific guidance for assessing impacts on hydrology and drainage for flood alleviation schemes. As a result, this assessment has drawn upon the methodology outlined within the following guidance documents:

- National Highways: Design Manual for Roads and Bridges (DMRB) LA 113; Road Drainage and the Water Environment (Ref 16.16)
- Northern Ireland Environment Agency: Carrying Out a Water Framework Directive (WFD) Assessment on EIA Developments (Ref 16.17)

### Determining the Study Area

16.3.2 The guidance documents listed above do not specify a specific study area for assessing hydrology and drainage and subsequently, professional judgement has been used to ascertain the area to be assessed. A study area of 500m from the boundary of each site has been adopted, extending where appropriate to include features within the broader catchment (such as surface watercourses) that potentially could be impacted by the proposed scheme. The study area is illustrated in **Figure 16.1a-d, Volume 4**.

### Determining Baseline

#### Desktop Survey

16.3.3 In order to determine baseline conditions, a desk study was undertaken using a number of online sources. This included:

- Armagh City, Banbridge and Craigavon Local Development Plan (Ref 16.14)
- Google Maps (Ref 16.18).
- Department of Agriculture, Environment and Rural Affairs (DAERA), Catchment Data Map Viewer (Ref 16.19)
- DAERA, Water Information Request Web Viewer (Ref 16.20)
- DAERA, Natural Environment Map Viewer (Ref 16.21)
- Department for Infrastructure, Flood Maps (Ref 16.22)
- Northern Ireland Environment Agency, Neagh Bann River Basin Management Plan (Ref 16.23)
- NIEA, Draft Third Cycle River Basin Management Plan, For the North Western, Neagh Bann and North Eastern River Basin Districts (Ref 16.24)
- UK Advisory Group, Water Framework Directive (UKTAG) (Ref 16.25)

### Assessment Method

16.3.4 The assessment has been carried out using the guidance presented within LA 104: Environmental Assessment (Ref 16.26) and Monitoring and LA 113: Road Drainage and the Water Environment. The assessment process involves the following four steps:

- Characterising baseline conditions;
- Assigning a value or sensitivity to baseline features;
- Determining a magnitude of impact on baseline features; and
- Determining a significance of effect on baseline features by combining the magnitude of impact with the sensitivity of the environmental receptor.

16.3.5 It should be noted that this assessment method has been adopted for the construction phase only. Operational impacts on surface water were determined to be unlikely during the scoping stage and were subsequently scoped out of further assessment. A WFD directive assessment has instead been undertaken for the operational phase. The methodology used for the WFD assessment is detailed later within this section.

### Sensitivity

16.3.6 The criteria for assessing the sensitivity of the water environment is set out in **Table 16.1**. The sensitivity ranges from very high to low.

Table 16.1 Sensitivity criteria

Sensitivity	Criteria	Typical examples
Very High	Attribute has a high quality and rarity on regional and national scale.	<ul style="list-style-type: none"> <li>Surface water               <ul style="list-style-type: none"> <li>Watercourse having a Water Framework Directive (WFD) classification shown in a River Basin Management Plan (RBMP) and <math>Q95 \geq 1.0 \text{ m}^3/\text{s}</math>.</li> <li>Site protected/designated under European Commission (EC) or UK legislation (Special Area of Conservation (SAC), Special Protection Area (SPA), Area of Special Scientific Interest (ASSI), Ramsar site, salmonid water)/Species protected by EC legislation.</li> </ul> </li> <li>Flood risk               <ul style="list-style-type: none"> <li>Essential infrastructure or highly vulnerable development</li> </ul> </li> </ul>
High	Locally significant attribute of high importance	<ul style="list-style-type: none"> <li>Surface water               <ul style="list-style-type: none"> <li>Watercourse having a WFD classification shown in a RBMP and <math>Q95 &lt; 1.0 \text{ m}^3/\text{s}</math>.</li> <li>Species protected under EC or UK legislation.</li> </ul> </li> <li>Flood risk               <ul style="list-style-type: none"> <li>More vulnerable development</li> </ul> </li> </ul>
Medium	Of moderate quality and rarity	<ul style="list-style-type: none"> <li>Surface water               <ul style="list-style-type: none"> <li>Watercourses not having a WFD classification shown in a RBMP and <math>Q95 &gt; 0.001 \text{ m}^3/\text{s}</math>.</li> </ul> </li> <li>Flood risk               <ul style="list-style-type: none"> <li>Less vulnerable development</li> </ul> </li> </ul>
Low	Lower quality	<ul style="list-style-type: none"> <li>Surface water               <ul style="list-style-type: none"> <li>Watercourses not having a WFD classification shown in a RBMP and <math>Q95 \leq 0.001 \text{ m}^3/\text{s}</math>.</li> </ul> </li> <li>Flood risk               <ul style="list-style-type: none"> <li>Water compatible development</li> </ul> </li> </ul>

### Magnitude of Impact

16.3.7 The criteria for assessing magnitude of impact is summarised in **Table 16.2**. Magnitude of impact can either be adverse or beneficial and can range between Major to No change.

Table 16.2 Magnitude of impact criteria

Magnitude	Criteria	Typical examples
Major adverse	Results in loss of attribute and/or quality and integrity of the attribute	<ul style="list-style-type: none"> <li>Surface water <ul style="list-style-type: none"> <li>▪ Loss or extensive change to a fishery. Loss of regionally important public water supply. Loss or extensive change to a designated nature conservation site. Reduction in waterbody WFD classification.</li> </ul> </li> <li>Flood risk <ul style="list-style-type: none"> <li>▪ Increase in peak flood level (&gt; 100mm).</li> </ul> </li> </ul>
Moderate adverse	Results in effect on integrity of attribute, or loss of part of attribute	<ul style="list-style-type: none"> <li>Surface water <ul style="list-style-type: none"> <li>▪ Partial loss in productivity of a fishery</li> <li>▪ Degradation of regionally important public water supply or loss of major commercial/industrial/agricultural supplies.</li> <li>▪ Contribution to reduction in waterbody WFD classification.</li> </ul> </li> <li>Flood risk <ul style="list-style-type: none"> <li>▪ Increase in peak flood level (&gt; 50mm).</li> </ul> </li> </ul>
Minor adverse	Results in some measurable change in attributes, quality or vulnerability	<ul style="list-style-type: none"> <li>Surface water <ul style="list-style-type: none"> <li>▪ Minor effects on water supplies.</li> </ul> </li> <li>Flood risk <ul style="list-style-type: none"> <li>▪ Increase in peak flood level (&gt; 10mm)</li> </ul> </li> </ul>
Negligible	Results in effect on attribute, but of insufficient magnitude to affect the use or integrity	<ul style="list-style-type: none"> <li>Surface water <ul style="list-style-type: none"> <li>▪ Very minor loss or detrimental alteration to surface water characteristics, features or elements.</li> </ul> </li> <li>Flood risk <ul style="list-style-type: none"> <li>▪ Negligible change to peak flood level (<math>\leq \pm 10</math>mm).</li> </ul> </li> </ul>
Minor beneficial	Results in some beneficial effect on attribute or a reduced risk of negative effect occurring	<ul style="list-style-type: none"> <li>Surface water <ul style="list-style-type: none"> <li>▪ Minor benefit to surface water key characteristics, features or elements; or a reduced risk of negative impact occurring.</li> </ul> </li> <li>Flood risk <ul style="list-style-type: none"> <li>▪ Creation of flood storage and decrease in peak flood level (&gt; 10mm).</li> </ul> </li> </ul>
Moderate beneficial	Results in moderate improvement of attribute quality	<ul style="list-style-type: none"> <li>Surface water <ul style="list-style-type: none"> <li>▪ Contribution to improvement in water body WFD classification.</li> </ul> </li> <li>Flood risk <ul style="list-style-type: none"> <li>▪ Creation of flood storage and decrease in peak flood level (&gt; 50mm).</li> </ul> </li> </ul>
Major beneficial	Results in major improvement of attribute quality	<ul style="list-style-type: none"> <li>Surface water <ul style="list-style-type: none"> <li>▪ Removal of existing polluting discharge, or removing the likelihood of polluting discharges occurring to a watercourse.</li> <li>▪ Improvement in waterbody WFD classification</li> </ul> </li> </ul>



Magnitude	Criteria	Typical examples
		<ul style="list-style-type: none"> <li>Flood risk <ul style="list-style-type: none"> <li>Creation of flood storage and decrease in peak flood level (&gt; 100mm).</li> </ul> </li> </ul>
No change		No loss or alteration of characteristics, features or elements; no observable impact in either direction.

### Significance of Effect

- 16.3.8 When both the sensitivity and the magnitude of impact have been determined, the overall significance of effect can be established by combining the two, using the matrix outlined in Table 16.3 below. Where the significance falls between two overall effects, professional judgement has been used to determine the significance. It should be noted that a significance of moderate or above is determined to be a significant effect.

Table 16.3 Significance of effect matrix

	Impact magnitude (Degree of change)					
	No Change	Negligible	Minor	Moderate	Major	
Very high	Neutral	Slight	Moderate or large	Large or very large	Very large	
High	Neutral	Slight	Slight or moderate	Moderate or large	Large or very large	
Medium	Neutral					
Low	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or moderate	
Negligible	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight	

### Water Framework Directive Assessment

- 16.3.9 As noted above, significant adverse impacts on the surface water environment during operation were determined to be unlikely during the scoping stage and were subsequently scoped out of further assessment. In line with good practice however, a Water Framework Directive (WFD) assessment has been undertaken for the operational phase.
- 16.3.10 A key requirement of the WFD is for the relevant bodies to ensure that all waterbodies within their boundaries achieve good ecological water quality status and that deterioration in the status of water is prevented. As a result, any new development must ensure that these two fundamental requirements of the WFD are not compromised.

- 16.3.11 In order to ensure this is the case, it is now a requirement for all EIA development to undertake a WFD assessment. The aim of the assessment is to determine if any specific components or activities related to the planned development will compromise a waterbody reaching good ecological status, or result in the deterioration in the status of any other waterbody.
- 16.3.12 In 2012, the Northern Ireland Environment Agency (NIEA) Water Management Unit published its guidance for undertaking a WFD assessment: 'Carrying Out A Water Framework Directive (WFD) Assessment On EIA Developments' (Ref 16.27). This assessment has followed this guidance for the WFD assessment.
- 16.3.13 The guidance states that each specific component of the scheme that may interact with or pose a potential risk to a waterbody, is assessed. The assessment recommends that the following steps are followed:
- Provide a description of the specific scheme component or activity being assessed (for example a watercourse diversion, abstraction, piling etc.)
  - Identify the potentially impacted waterbodies and provide baseline data on each waterbody.
  - Assess the impact of the scheme component or activity against the relevant WFD classification elements:
    - Objective 1: To prevent deterioration in the ecological status of the water body.
    - Objective 2: To prevent the introduction of impediments to the attainment of Good WFD status for the waterbody.
    - Objective 3: To ensure that the attainment of the WFD objectives for the water body are not compromised.
    - Objective 4: To ensure the achievement of the WFD objectives in other waterbodies within the same catchment are not permanently excluded or compromised.
- 16.3.14 Where an assessment predicts a deterioration in waterbody status or prevention of a waterbody meeting its WFD objectives, the scheme and the proposed mitigation should be reviewed.

### Limitations

- 16.3.15 It should be noted that the assessment has used the 2018 Water Framework Directive classifications as these were the most up to date at the time of writing. Since completion of the assessment, the 2021 classifications have been made available, however these have not been incorporated into the assessment. A review of the 2021 classifications has indicated that the outcome of this assessment will not be altered as a result of the updated classifications.

## 16.4. Baseline Conditions

- 16.4.1 This section details the baseline conditions within the study area relating to the water environment. Surface water features and flood risk are considered.

### Surface Water

- 16.4.2 The study area lies within the Neagh Bann River Basin District which covers an approximate area of 5740km<sup>2</sup> and includes County Armagh and large areas of Counties Antrim, Londonderry, Down and Tyrone. The main river systems within this district are the River Bann and the Newry River. Lough Neagh, the largest freshwater lake within the UK, is located within the centre of the district.
- 16.4.3 There are a number of surface watercourses within this river basin district, some of which flow directly through the study area. The surface watercourses that flow within the study area are detailed below and within **Table 16.4**. The watercourses per site are summarised in **Table 16.5** and illustrated in **Figure 16.1a-d, Volume 4**.

## WFD Watercourses

### ***River Bann (UKGBNI1NB030308243)***

- 16.4.4 The River Bann is the largest watercourse that flows through the study area and is identified as the Lough Neagh Peripherals (UKGBNI1NB030308243) under the WFD. The source of the watercourse lies in the south east of Northern Ireland within the region of the Mourne Mountains. From its source, it flows into Spelga Reservoir and follows its natural course in north westerly direction through open countryside before flowing through the urban areas of Banbridge, Lawrencetown, Gilford and Portadown. The river then continues its path in a north westerly direction and discharges into the Lough Neagh (UKGBNI3NB0032), approximately 10km to the north west of the Portadown.
- 16.4.5 The River Bann (Lough Neagh Peripherals) catchment is primarily rural and contains large areas of grassland, woodland, and farmland. The southern area of the catchment is characterised by the urban areas of Portadown and Craigavon while the northern area is primarily rural and includes Lough Gullion. The watercourse flows under the A27 and A3 within Portadown and under the M1 to the north of Portadown.
- 16.4.6 Under the most recent cycle of the WFD in 2018, the river has an overall status of poor ecological potential as it flows through Portadown. Prior to flowing through Portadown, the river has an overall status of moderate. There is currently no data available for the ecological elements of the Lough Neagh peripherals watercourse.

### ***Ballybay River (UKGBNI1NB030308110)***

- 16.4.7 The Ballybay River flows directly through the study area within the centre of Portadown and is a tributary of the River Bann. The source of this watercourse lies to the south west of Portadown close to the small settlement of Markethill. From its source, the watercourse flows in a north easterly direction through agricultural land towards Portadown following its natural course. As the river flows through the centre of Portadown, it becomes Corcrair River at the point where it crosses under Dungannon Road. The river however is still classified as the Ballybay River under the WFD. The watercourse continues to flow in a north easterly direction through Portadown before it discharges into the River Bann, to the east of Garvaghy Road.
- 16.4.8 The catchment of the Ballybay River is primarily rural and is made up of grassland, woodland and agricultural land. Portadown is the only urban area within the catchment. Along its course, the watercourse flows under the A28, A51, B131, A3 and B77.
- 16.4.9 Under the most recent cycle of the WFD, the Ballybay River has an overall status of moderate. This is attributable to a moderate status for the ecological elements with all elements carrying a moderate status. The waterbody carries a high chemical status.

### ***River Annagh (UKGBNI1NB030308091)***

- 16.4.10 The River Annagh is a tributary of the River Bann and flows directly through Portadown within the study area. The source of this watercourse lies to the south of Portadown within agricultural land close to the village of Milltown. From its source, it flows in a north easterly direction following its natural course. It discharges into the River Bann to south east of Meadow Lane within Portadown.
- 16.4.11 The River Annagh catchment covers an approximate area of 21km<sup>2</sup> and is primarily made up of grassland, woodland and agricultural land. The urban areas of Portadown and Laurelvale are present within the catchment. Within the study area, the watercourse flows under Tandragee Road and the main railway line that passes through Portadown.
- 16.4.12 The watercourse has an overall status of bad under the most recent cycle of the WFD due to a bad status for the invertebrate element. In contrast, macrophytes carry a status of high and diatoms a status of good.

### ***Cusher River (UKGBNI1NB030308218)***

- 16.4.13 This watercourse flows within the southern extent of Portadown and is another tributary of the River Bann. Its source lies to the west of Newry and from this point, it flows in a north easterly direction towards Portadown. It is classified under the WFD as having an overall status of moderate, this is due to the

moderate status of the ecological elements due to a moderate status for diatoms. The chemical status of the waterbody is high. It should be noted that this watercourse flows slightly outwith the 500m study area, yet is hydraulically connected to the minor watercourse Ballyworkan, which flows directly through the study area.

### Non WFD Watercourses

16.4.14 In addition to the main WFD watercourses detailed above, there are a number of minor tributaries and drainage channels which flow throughout the study area. These are watercourses which have not been classified under the WFD and so information on their quality is limited. **Table 16.4** summarises the non-WFD watercourses within the study area.

Table 16.4 Non-WFD watercourses within study area

Watercourse name	Description
Ashgrove	Minor watercourse which flows within the northern extent of Portadown close to Churchill Park and Ashgrove Road. The watercourse is fed by a number of minor field drains which flow to the north of Portadown. The watercourse flows in a south easterly direction and discharges into the River Bann.
Ballynagowan	Minor watercourse which flows within the northern extent of Portadown close to Ashgrove. It is fed by numerous drainage ditches from surrounding agricultural land. It flows in a northerly direction and discharges into the River Bann.
Gillford Road Stream	Minor watercourse that flows in through the eastern extent of Portadown. It is a tributary of the River Bann. Its source is unknown yet it likely lies within the agricultural land located to the east of Portadown.
Ballyworkan	Minor watercourse that flows within southern Portadown to the east of Tandragee Road adjacent to the Olde Golf Links residential development. It is hydraulically connected to Annagh River to the west. It flows eastwards and into Cusher River.
Carrowbrack	Minor watercourse that flows within the southern extent of Portadown to the east of Tandragee Road. It is hydraulically connected to Ballyworkan. The watercourse flows in a north easterly direction through farmland and discharges into the River Bann.
Brackagh East	Minor watercourse that flows within the south eastern extent of Portadown. Its source lies in agricultural land to the south of Portadown. It flows in a north easterly then north westerly direction through open farmland before it discharges into Ballyworkan.
Brackagh West	Minor watercourse that flows in a similar area to Brackagh East in south east Portadown. It flows through open farmland in a north/north easterly direction and discharges into Brackagh East.
Kingsway Drive Drain	Drain that flows within western Portadown to the immediate east of Armagh Road. It flows to the rear of a large number of residential properties at Kingsway Drive and flows easterly and into the minor watercourse Kilmoriarty.
Kilmoriarty	Minor watercourse that flows within western Portadown close to the A3. It is fed by surrounding agricultural land and Kilmoriarty branch drain. It flows eastwards adjacent to residential properties before discharging into the River Annagh.
Derryvore No 1/No 2	Minor watercourses that flow adjacent to one another to the north east of Portadown close to Derryvore Lane. They drain agricultural land and discharge into the River Bann.
Derryvore & Seagoe	Minor drain that flows to the north east of Portadown and to the west of the M12. It drains agricultural land and discharges into the River Bann.
Selshion	Minor watercourse that flows within the western extent of Portadown. Its source lies in agricultural land to the north west of Corcullentragh Road. It flows in a south westerly direction and into Ballybay River.

Watercourse name	Description
Tributary of Drumnakelly	Minor unnamed watercourse that flows within the southern extent of Portadown. Its source lies within agricultural land to the north of Laurelvale. It flows in a north westerly direction and into another minor watercourse, Drumnakelly. Drumnakelly later discharges into the River Annagh a short distance away.

### Surface Watercourses by Site

16.4.15 Table 16.5 summarises the surface watercourses that lie within the study area of each site.

Table 16.5 Surface watercourses within each site study area

Site	Location	Watercourses within site study area	Approximate distance from proposed scheme	WFD Reference (where applicable)
Site A – Ashgrove Road	E111613 N513830	Ballynagowan	0m; watercourse is culverted under Island Road.	N/A
		Ashgrove	20m south	
Site A1 – Corcrain Mews	E110862 N512926	Ballybay River/Corcrain River	0m; watercourse flows under the proposed site at Charles Street	GBNI1NB030308110
Site B – Derryanvil Road	E112121 N513869	River Bann	340m east	GBNI1NB030308243
Site C – Woodside Green	E112072 N512696	River Bann	0m; directly adjacent	GBNI1NB030308243
		Corcrain River	0m directly adjacent	GBNI1NB030308110
Site D – People’s Park	E111717 N512558	River Bann	300m	GBNI1NB030308243
		Corcrain River	0m; directly adjacent to works	GBNI1NB030308110
		Ashgrove	420m north east	N/A
Site E – Parkside Obins Street	E111459 N512474	Corcrain River	0m	GBNI1NB030308110
		River Bann	500m east	GBNI1NB030308243
Site F – Rose Cottages	E111284 N512611	Corcrain River	20m south	GBNI1NB030308110
		River Bann	0m; immediately adjacent to the east	GBNI1NB030308243
Site H – Castle Street	E112079 N512540	Corcrain River	160m north	GBNI1NB030308110
		Ashgrove	470m north	N/A
Site I – Foundry Street	E112119 N512563	River Bann	0m; immediately to the west.	GBNI1NB030308243

Site	Location	Watercourses within site study area	Approximate distance from proposed scheme	WFD Reference (where applicable)
		Corcrair River	170m north east	GBNI1NB030308110
Site J – Bowling Green	E112220 N512194	River Bann	7m east at closest point	GBNI1NB030308243
		Corcrair River	460m	N/A
				N/A
		Gillford Road Stream	450m south east	N/A
				GBNI1NB030308243
		Annagh River	40m south east	GBNI1NB030308091
				N/A
		Gillford Road Stream	370m south east	N/A
Site M – Annagh Hill Industrial Estate	E111940 N511477	Corcrair River	490m north west	GBNI1NB030308110
		Annagh River	0m; immediately south east	GBNI1NB030308091
		Unnamed tributary of River Bann	0m; immediately north east	N/A
				GBNI1NB030308091
		Ballyworkan	0m; immediately south	N/A
		Brackagh West	205m east	N/A
		Kingsway Drive Drain	290m north west	N/A
Site N2- Fairways Estate	E112069 N510475	Annagh River	310m north west	GBNI1NB030308091
		Carrowbrack	230m north east	N/A

Site	Location	Watercourses within site study area	Approximate distance from proposed scheme	WFD Reference (where applicable)
		Ballyworkan	100m north	N/A
		Brackagh East	190m east	N/A
				N/A
		Tributary of Drumnakelly	400m west	N/A
				N/A
		River Bann	280m south west	GBNI1NB030308243
		Derryvore No 2	574m north west	N/A
				GBNI1NB030308091
		Kingsway Drive Drain	0m; immediately north west	N/A
Site R – Corcullentragh Road	E109678 N512118	Ballybay River	0m; Immediately east	GBNI1NB030308110
Site S – Corcrain Drive	E110499 N512626	Ballybay River	70m north west	GBNI1NB030308110

## Designated Sites

16.4.16 There are a number of designated sites present within the study area, two of which are wetlands designated for their flora and fauna. The wetlands are likely dependant on local hydrology and drainage patterns and have therefore been considered within this assessment. Details of the two sites are summarised in **Table 16.6**.

Table 16.6 Designated sites within study area

Designated site	Approximate distance from site	Reason for designation
Derryvore ASSI	Nearest Site P; 127m northwest Furthest from Site N; 4.3km north	Designated for its fen habitat, Derryvore ASSI is of special scientific interest for its wetland flora and fauna. It is a diverse herb-rich wetland, with a number of unusual fen communities and several notable species.
Brackagh Bog ASSI	Nearest Site O; 0m east Furthest from Site P; 4.4km south	Designated for its fen and wet woodland habitat, the area is of special scientific interest for its wetland flora and fauna.

16.4.17 Further information on the designated sites is available within **Chapter 11: Terrestrial Biodiversity**.

## Flood Risk

### Fluvial Flooding

16.4.18 Portadown is located within the Neagh Bann River Basin Management District and the River Bann and its tributaries are the key sources of fluvial flooding in the area. The area is of mixed use, with the centre of Portadown containing residential, commercial and community receptors. Outwith the town, land use is primarily agricultural, however there are a number of residential developments and sporadic rural dwellings.

16.4.19 Within the 2018 Northern Ireland Flood Risk Assessment (NIFRA) (Ref 16.28), Portadown and its neighbouring community of Craigavon are identified as 'Areas of Potential Significant Flood Risk'. The report identifies the areas as 'at risk of flooding from fluvial and pluvial sources which could adversely impact on people and property in the area'. The boundary of the Portadown and Craigavon APSFR is illustrated in **Figure 1.3, Volume 4**.

16.4.20 The Neagh Bann Flood Risk Management Plan provides information on the hazards from flooding within the district and how the relevant authorities will work together to reduce flood risk. It also provides information on the sources of fluvial flooding within Portadown and the receptors that are at risk of flooding during a 1% Annual Exceedance Probability (AEP) flood event. **Table 16.7** summarises the approximate number of receptors identified within the FRMP as being at risk of flooding during a 1% AEP flood event.

Table 16.7 Number of receptors at risk of flooding in a 1% AEP flood event (Upper Bann River)

	River Ballybay	Ballynagowan	Annagh River
Residential receptors	75	36	65
Non-residential receptors	10	0	22

16.4.21 Table 16.8 summarises the fluvial flood risk within the study area for each site. This information has been obtained using the DfI River predicted flood maps, which map the modelled extents of various AEP flood extents (0.1%, 1% and 10%). The flood extents are detailed below also illustrated in **Figure 16.2a-d, Volume 4**.

- 0.1% AEP: 1 in 1000 or greater chance in any given year.
- 1% AEP: 1 in 100 or greater chance in any given year.
- 10% AEP: 1 in 10 greater chance in any given year.

Table 16.8 Fluvial flood extent per site

Site	Fluvial Flood Risk
Site A – Ashgrove Road	Majority of site within 10% AEP flood extent. Flood risk at the northern end of Ashgrove Road is within 0.1% AEP extent.
Site A1 – Corcrair Mews	Majority within 1% AEP flood extent. Small area to the north west of the site within 10% AEP extent.
Site B – Derryanvil Road	The majority of the site lies within a combination of 0.1 and 1% AEP extents. To the south east towards the River Bann the area is within 10% AEP extent.
Site C – Woodside Green	Flood risk immediately surrounding the River Bann is within 10% AEP extent. The Ulster Carpets site is primarily within 0.1% AEP extent.
Site D – People's Park	Flood risk immediately surrounding Corcrair River is within 10% AEP extent. People's Park lies within a combination of 0.1 and 1% AEP extents.



Site	Fluvial Flood Risk
Site E – Parkside Obins Street	The area immediately surrounding Parkside lies within a mix of 0.1% and 1% AEP extents. To the north of the site, the area immediately surrounding Corcrair River is within 10% AEP extent.
Site F – Rose Cottages	The area immediately surrounding Corcrair River is within 10% AEP extent. To the south west of the river to the north of Obins Street, the area is within 1% AEP extent. The Rose Cottage development to the north east of the river is within 0.1% AEP extent.
Site H – Castle Street	Majority of the site is within 10% AEP extent as the site lies immediately adjacent to the River Bann. The area to west of the site along Castle Street and Wilson Street is within the 1% AEP extent.
Site I – Foundry Street	Majority of the site is within 10% AEP extent as the River Bann flows immediately to the west. To the east of the river at the storage yards, the area lies within a combination of 0.1% and 1% AEP extents.
Site J – Bowling Green	Majority of the site lies within 10% AEP extent as the River Bann flows immediately to the east. The area surrounding the Tesco supermarket and along Meadow Lane is within 0.1% and 1% AEP extents.
Site K – Health Centre	Majority of the area to the south east of the site is within 10% AEP extents as the River Bann and Annagh River flow within close proximity. To the north west of Meadow Lane, there is a small area within 0.1% AEP extent.
Site L – Irwins Mill	Majority of the site to the west is within 10% AEP extent as the site is immediately adjacent to the River Bann. To the north east of the River at Irwins Mill, the area is within a combination of 0.1% and 1% AEP extents.
Site M – Annagh Hill Industrial Estate	Majority of the site is within 10% AEP extents as the River Annagh flows to the immediate south of the scheme. There are some small areas within 0.1% and 1% AEP extents, particularly to the north of the River Annagh at Mourneview Street.
Site N – Olde Golf Links	The Olde Golf Links development lies within a combination of 0.1% and 1% AEP extents. Outwith the residential development, the majority of the surrounding area is within 10% AEP extent.
Site N2 Fairways Estate	The Fairways Estate lies within a combination of 0.1% and 1% AEP extents. The majority of the area to east of the site is within 10% AEP extent.
Site O – Tandragee Road	The site lies within a combination of 0.1%, 1% and 10% AEP extents. Land to the immediate east of the site is within 10% AEP, while land to the south is primarily within 0.1% and 1%.
Site P – Derryvore Lane	The majority of the site at Derryvore Lane is within 10% AEP extent.
Site Q – Ripley Mews	The majority of the site to the east is within 10% AEP extent. To the north west of the site beyond Ripley Mews there are areas within 0.1% and 1% AEP extents.
Site R – Corcullentragh Road	The majority of the site lies within 10% AEP extent due to its proximity to Ballybay River.
Site S – Corcrair Drive	The area to the immediate west of Corcrair Drive lies within a combination of 0.1% and 1% AEP extents. Beyond this to the west, the area is within 10% AEP extent due to the proximity of the Ballybay River.

## Pluvial Flooding

16.4.22 The NIEA flood maps also provide information on surface water flooding within Portadown and model the extents of 0.1%, 1% and 10% AEP pluvial flood events:

- 3.3% AEP flood extent (1 in 30 or greater chance in any given year)
- 0.5% AEP flood extent (1 in 200 or greater chance in any given year)
- 0.1% AEP flood extent (1 in 1000 or greater chance in any given year).

16.4.23 Table 16.9 summarises the surface water flooding extents per site. These areas are also illustrated in **Figure 16.3a-d, Volume 4.**

Table 16.9 Pluvial flood extent per site

Site	Surface Water Flood Risk
Site A – Ashgrove Road	Areas of Ashgrove Road, Ashgrove Manor and Churchill Park lie within 0.5% AEP flood extent.
Site A1 – Corcrair Mews	Majority of the site lies within a combination of 0.5 and 3.3% AEP extents.
Site B – Derryanvil Road	The area immediately surrounding the site is not within any modelled surface water flooding extent. There are some minor areas surrounding field drainage channels which lie within 3.3% AEP extent.
Site C – Woodside Green	Majority of the study area at this site is outwith the 0.1, 0.5 and 3.3% AEP flood extents. There are some minor areas surrounding Ulster Carpets and Woodside Green that lie within 3.3% AEP extent.
Site D – People’s Park	The area immediately surrounding Corcrair River is within 3.3% AEP extent. The People’s Park and the area to the north west of Park Road are within a combination of 0.1 and 0.5% AEP extents.
Site E – Parkside Obins Street	The majority of the site lies within a combination of 0.1 and 0.5% AEP extents. The area immediately adjacent to Corcrair River is within 3.3% AEP. There are some minor areas along Parkside which are within 3.3% AEP flood extent.
Site F – Rose Cottages	The area immediately surrounding Corcrair River is within 3.3% AEP extent. Within the Rose Cottage development there are some minor areas which lie within 3.3% AEP extent.
Site H – Castle Street	Majority of the site is not within any surface water flood extents. Some minor areas to the west and south of Castle Street fall within a combination of the 0.1, 0.5 and 3.3% AEP flood extents.
Site I – Foundry Street	Majority of the area is not within any surface water flood extents. Some minor areas within the storage yards adjacent to Foundry Street lie within a combination of the 0.1, 0.5 and 3.3% AEP flood extents.
Site J – Bowling Green	Majority of the site is not within any surface water flood extents. There are numerous drainage channels surrounding the site and the area surrounding these are within 3.3% AEP flood extent.
Site K – Health Centre	Majority of the site is not within any surface water flood extents. To the south east of the site surrounding Annagh River, the area is within 3.3% AEP flood extent. A small area surrounding the health centre to the immediate north west of the site is within a combination of 0.1%, 0.5% and 3.3% AEP extents.

Site	Surface Water Flood Risk
Site L – Irwins Mill	Majority of the site is not within any surface water flood extents. There are some minor areas surrounding the warehouses at Irwins Mill which are within 0.5% AEP flood extent.
Site M – Annagh Hill Industrial Estate	Majority of the site is not within any surface water flood extents. There are two minor areas to the south of the site that are within 0.1% AEP flood extent. The area immediately adjacent to Annagh River is within 3.3% AEP extent.
Site N – Olde Golf Links	Majority of the site is not within any surface water flood extents. Within the Olde Golf Links development, there are some minor areas that lie within a combination of 0.1%, 0.5% and 3.3% AEP extents.
Site N2 Fairways Estate	The majority of the area lies outwith any modelled surface water flood extents. A small area of the Fairways Estate lies within the 3.3% AEP flood extent.
Site O – Tandragee Road	The majority of the site lies outwith any modelled surface water flood extents. The area to the east of the site is a combination of 0.1%, 0.5% and 3.3% AEP extents.
Site P – Derryvore Lane	The majority of the site lies within a combination of 0.1%, 0.5% and 3.3% AEP flood extents.
Site Q – Ripley Mews	The majority of the site lies outwith any surface water flood extents. To the south east of the site there are some areas that lie within a combination of 0.1 and 3.3% AEP extents.
Site R – Corcullentragh Road	The majority of the site lies within a combination of 0.1%, 0.5% and 3.3% AEP flood extents.
Site S – Corcraun Drive	The majority of the site is outwith any surface water flood extents. The area immediately surrounding Corcraun River lies within 3.3% AEP flood extent.

## 16.5. Evaluation (Value of Resource or Sensitivity of Receptors)

16.5.1 In line with the criteria outlined within Table 16.1, the sensitivity of each element of the water environment has been determined.

### Surface Water

16.5.2 The sensitivity of the surface water features within the study area are detailed in Table 16.10.

Table 16.10 Sensitivity of surface watercourses

Watercourse	Sensitivity	Justification
River Bann (GBNI1NB030308243)	High	<ul style="list-style-type: none"> <li>WFD watercourse with classification shown in RBMP</li> <li>Q95 at nearest monitoring station is 0.41 (&lt;1)</li> </ul>
Ballybay River/Corcraun River (GBNI1NB030308243)	High	<ul style="list-style-type: none"> <li>WFD watercourse with classification shown in RBMP</li> <li>No Q95 data available</li> </ul>
Annagh River (GBNI1NB030308091)	High	<ul style="list-style-type: none"> <li>WFD watercourse with classification shown in RBMP</li> <li>No Q95 data available</li> </ul>
Cusher River (UKGBNI1NB030308218)	High	<ul style="list-style-type: none"> <li>WFD watercourse with classification shown in RBMP</li> <li>Q95 at nearest monitoring station is 0.197 (&lt;1)</li> </ul>
Ashgrove	Low	

Watercourse	Sensitivity	Justification
Ballynagowan	Low	
Gillford Road Stream	Low	
Ballyworkan	Low	
Carrowbrack	Low	
Brackagh East	Low	
Brackagh West	Low	<ul style="list-style-type: none"> <li>Minor watercourses which have not been classified under the WFD.</li> <li>No Q95 data available.</li> </ul>
Kingsway Drive Drain	Low	
Kilmoriarty	Low	
Derryvore No 1 / No 2	Low	
Derryvore & Seagoe	Low	
Selshion	Low	
Tributary of Drumnakelly	Low	

### Designated Sites

16.5.3 Both Derryvore ASSI and Brackagh Bog ASSI are designated as nationally important sites and therefore, in line with Table 11.4 have a sensitivity of high. Further information on the designated sites within the study area is available within Chapter 11: Terrestrial Biodiversity.

### Flood Risk

16.5.4 As noted within the baseline, the study area is of mixed use and contains residential, community and commercial receptors which are primarily located within Portadown. As per the sensitivity criteria outlined within Table 16.1, the type of development within the study area is linked to the sensitivity of flood risk.

16.5.5 Using the flood risk vulnerability classification criteria outlined within the National Planning Policy Framework (Ref 16.29), the sensitivity of flood risk at each site has been determined and is summarised in Table 16.11 below.

Table 16.11 Flood risk sensitivity per site

Site	Sensitivity	Justification
Site A Ashgrove Road	High	Predominantly residential properties within the site study area. As per the NPPF, residential properties are classified as 'More Vulnerable' development.
Site A1 – Corcrair Mews	High	Predominantly residential properties within the study area.
Site B – Derryanvil Road	High	Mix of agricultural outbuildings and residential properties within the study area.
Site C Woodside Green	High	Predominantly residential and commercial properties within the study area.
Site D People's Park	High	Mix of land uses present within the study area, including residential properties.

Site	Sensitivity	Justification
Site E – Parkside Obins Street	High	Mix of land uses present within the study area, including residential properties.
Site F – Rose Cottages	High	Predominantly residential properties within the study area.
Site H – Castle Street	High	Predominantly commercial properties within the study area, with some residential properties.
Site I – Foundry Street	High	Predominantly commercial properties within the study area, with some residential properties.
Site J Bowling Green	Very high	Mix of land uses within the study area, including Portadown Fire Station. Fire stations are classified within the NPPF as 'Highly Vulnerable' development.
Site K – Health Centre	Very high	Mix of land uses within the study area, including Portadown Fire Station.
Site L – Irwins Mill	High	Mix of land uses within the study area, including residential properties.
Site M – Annagh Hill Industrial Estate	Very high	Mix of land uses, including Portadown Fire Station.
Site N – Olde Golf Links	High	Predominantly residential properties within study area.
Site N2- Fairways Estate	High	Predominantly residential properties within study area.
Site O – Tandragee Road	High	Mix of agricultural outbuildings and residential properties within study area
Site P – Derryvore Lane	High	Mix of commercial and residential properties within study area.
Site Q – Ripley Mews	High	Predominantly residential properties within study area.
Site S – Corcrain Drive	High	Predominantly residential properties within study area.

## 16.6. Impact Assessment

16.6.1 This section details the impacts of the proposed scheme on each element of the water environment, prior to mitigation. The potential impacts are detailed in the following paragraphs, while a site-specific impact assessment is provided in Table 16.12.

### Construction

16.6.2 During the construction phase prior to mitigation, the water environment has the potential to be impacted in a number of ways. Potential impacts may include the following:

- Increased runoff rates and a greater risk of surface water pollution as a result of vegetation clearance and earthworks;
- Chemical/fuel spillages and leaks from plant and machinery entering surrounding watercourses;
- Inappropriate disposal of foul water from the construction site entering drainage systems and nearby waterbodies;
- Increased runoff rates from temporary paved surfaces or roofed areas of site compounds entering into surrounding waterbodies;

- Changes to catchment characteristics as a result of construction activities such as watercourse/drainage diversions and earthworks;
- Increased flood risk as result of vegetation clearance;
- Potential for mud/debris to block surface water drainage systems;
- Formulation of stagnant and polluted water puddles.

## Surface Water

### *Water Quality*

- 16.6.3 Construction of the scheme has the potential to adversely impact surface water quality, particularly as the proposed scheme will require in-river works in some locations , as well as construction works immediately on the banks of many of the watercourses within the study area.
- 16.6.4 Earthworks and site clearance will be required at the majority of the sites throughout Portadown in order to accommodate the proposed flood defences. The flood defences proposed include steel sheet piles, embedded walls and earth bunds. Existing footpaths and roads will also be realigned to new levels in order to reduce their risk from flood events. The full list of construction activities is detailed in **Section 6.3**.
- 16.6.5 Earthworks and site clearance can adversely impact surface water quality, as the activities can result in pollutant laden runoff entering nearby watercourses at an increased rate. Earthworks will create exposed soil surfaces and the removal of vegetation can create pathways for polluted runoff to enter watercourses. Vegetation acts as a natural barrier and usually slows the flow of surface water runoff as it drains into the surrounding surface water environment, while also removing any pollutants. During heavy rainfall, there is potential for sediment laden runoff to wash into the surrounding drainage network and nearby surface watercourses at an uncontrolled rate. Wind blown particulate matter from exposed soil surfaces may also enter the surrounding surface water environment. Any sudden increase in suspended solids within a watercourse can alter its quality and result in adverse impacts on aquatic life.
- 16.6.6 Accidental spillages of fuel, oil and other hazardous material have the potential to enter the surface water environment as runoff if spillages occur that are not properly controlled. Construction sites involve the regular movement of plant and machinery, which also require refuelling and maintenance. There is a high risk of spillages occurring if refuelling and maintenance activities are not completed in designated areas following correct procedures.
- 16.6.7 The stockpiling of construction materials and excavated spoil may contaminate or pollute surface waterbodies if these materials are not stored correctly. Run-off from site compounds may also transport suspended solids into the surface water environment due to the greater level of impermeable surfaces these compounds will create. The indicative locations for site compounds are illustrated in **Figure 6.1, Volume 4**.
- 16.6.8 While the majority of the flood defences are proposed to be constructed along the riverbanks, in-river works will be required at the following locations:
- Site A: Culvert works will be required within the minor watercourse Ballynagowan as it flows under Island Road.
  - Site A1: Corcrair Mews- In-river works will be required within the Corcrair River to accommodate steel sheet piles.
  - Site C: Woodside Green- The footbridge over Corcrair River will likely be replaced within the grounds of Ulster Carpets.
  - Site H: Castle Street- A small section of sheet piling at this site may be required to be installed via a barge within the River Bann.
  - Site I: Foundry Street- Piling at this site will be required to be installed via barge within the River Bann. Works will take place on/over the river rather than directly within the watercourse.

- Site M: Annagh Hill: Works will be required within the Annagh River to accommodate the culvert works/flap valve.
- Site N: Old Golf Links- Culvert works will be required within the minor watercourse Ballyworkan.
- Site N2: Fairways- works will be required within a minor drainage channel for a culvert extension.
- Site P: Derryvore Lane- Culvert works will be required within the minor watercourse Derryvore & Seagoe.
- Site Q: Ripley Mews- In-river works will be required for piling works.

16.6.9 Any works directly within a watercourse can adversely impact water quality due to the mobilisation of sediment or contaminants on the riverbed. Any increase in suspended solids can alter water quality and can subsequently impact aquatic life. The use of plant and machinery directly within the watercourse further increases the risk of pollution if accidental spillages were to occur.

### **Hydromorphology**

- 16.6.10 As noted, construction of the proposed scheme will require in-river works at various sites in order to install culverts, sheet piling and flap valves. Construction activities such as this will likely require partial watercourse diversions, which will temporarily disrupt flow patterns. The activities may also result in a loss of hydromorphological features such as sediment and riparian vegetation, which could further disrupt in-river flows.
- 16.6.11 The majority of works however will take place on the riverbanks, immediately adjacent to many of the watercourses detailed within the baseline. Construction activities such as excavations, vegetation removal and the creation of earth bunds can alter how catchment areas drain to surrounding watercourses and therefore have the potential to impact the baseflows of watercourses. The addition of new infrastructure on or immediately adjacent to watercourses can also physically alter the river banks, particularly through the removal of riparian vegetation.
- 16.6.12 There are two designated sites within the study area (Derrvire ASSI and Brackagh Bog ASSI) which are wetlands designated for their flora and fauna. Construction works will take place close to both ASSI's due to the proximity of the flood defences at sites P and O. Earthworks and the installation of sheet piles have the potential to temporarily alter local drainage patterns which may result in adverse impacts for the wetlands.

### **Flood Risk**

- 16.6.13 Construction of the proposed scheme has the potential to increase the risk of fluvial and surface water flooding. The following elements of the construction phase will likely result in an increase in flood risk prior to mitigation.
- The clearance of vegetation can enhance runoff rates and increase the amount of surface water entering drainage systems and subsequently, the surface water environment. Any influx of surface water runoff can overwhelm drainage systems and lead to fluvial and pluvial flood events.
  - Large areas of impermeable surfaces due to the presence of construction compounds and haul roads, can generate high levels of runoff during periods of heavy rainfall and can result in flash flooding and the erosion of riverbanks.
  - Construction activities such as excavations and the construction of earth bunds further have the potential to impact local drainage patterns, as these activities can act as barriers within the landscape to the natural flow of water therefore increasing the risk of localised flooding.
  - Where temporary watercourse diversions are required for the installation of culverts and the flap valves, the risk of localised fluvial flooding is also enhanced.

## Site Specific Assessment

16.6.14 Table 16.12 summarises the construction impacts on a site-by-site basis, prior to mitigation.

Table 16.12 Magnitude of impact during construction

Site	Receptor	Impact	Magnitude
A: Ashgrove Road	Ashgrove	<b>Water Quality:</b> Earthworks and site clearance will be required within close proximity to Ashgrove to accommodate sheet piling. Potential for polluted runoff and accidental spillages to enter this watercourse.	Minor adverse
		<b>Hydromorphology:</b> No in-river works required. Earthworks and excavations could potentially interact with surface water flows into the watercourse. The banks of this watercourse will not be physically altered due to the distance of the works from the receptor.	Minor adverse
	Ballynagowan	<b>Water Quality:</b> Earthworks/site clearance will be required along the western bank to accommodate the embedded wall, sheet piling and earth bunds. A culvert extension will be required within this watercourse. Potential for polluted runoff and risk of accidental spillage entering watercourse. Culvert extension has the potential to disrupt sediment and any settled contaminants on the riverbed.	Moderate adverse
		<b>Hydromorphology:</b> In-river works will be required for the culvert extension at Island Road. Potential for temporary disruption to the flow of this watercourse and sediment disruption. Changes to the riverbank will be likely due to the removal of riparian vegetation.	Moderate adverse
A1: Corcrain Mews	Flood risk: Residential properties along Ashgrove Road, Ashgrove Lodge, Ballyronan Park and Churchill Park Road.	Temporary increase in fluvial and pluvial flood risk due to presence of construction activities.	Minor adverse
	Ballybay River/ Corcrain River	<b>Water Quality:</b> Earthworks and site clearance will be required along the northern and southern bank of the Ballybay/Corcrain River to accommodate sheet piling. In-river works will be required at Corcrain Road bridge. Landscaping will also be required for embankments on either side of the river. Potential for polluted runoff and accidental spillages to enter watercourse prior to mitigation. Sediment disruption will be likely during in-river works.	Moderate adverse
		<b>Hydromorphology:</b> In-river works will be required at this location to accommodate sheet piling. Excavations and the creation of embankments have the potential to alter surface water flows into the river. There is potential for some alteration to the banks of the watercourse due to the removal of riparian vegetation.	Moderate adverse
	Flood risk: Residential properties	Temporary increase in fluvial and pluvial flood risk due to presence of construction activities.	Minor adverse



Site	Receptor	Impact	Magnitude
	located along Corcrain Mews, Corcrain Gardens and Charles Street/Obins Street.		
B: Derryanvil Road	River Bann	<b>Water Quality:</b> Earthworks and site clearance will be required at this site to accommodate sheet piling. The River Bann however flows over 340m from the construction works and so impacts on surface water quality are likely to be limited. Construction works will take place immediately adjacent to a minor drainage channel that is hydraulically connected to the River Bann and so adverse impacts on the river cannot be ruled out prior to mitigation.	Minor adverse
		<b>Hydromorphology:</b> No in-river works are required at this site. Construction works will take place over 340m away from the River Bann. Impacts on hydromorphology are unlikely.	No change
	Flood risk: Residential and agricultural receptors surrounding Derryanvil Road.	Temporary increase in fluvial and pluvial flood risk due to presence of construction activities.	Minor adverse
C: Woodside Green (Ulster Carpets)	River Bann	<b>Water Quality:</b> Earthworks/site clearance will be required along the western bank of the River Bann in order to accommodate the proposed sheet piling/embedded flood wall. Potential for polluted runoff and accidental spillages entering the watercourse.	Moderate adverse
	River Bann	<b>Hydromorphology:</b> In-river works will not be required at this location, however there is potential for increased runoff to enter into the watercourse which could temporarily disrupt flows. Riparian vegetation along the western bank of the river will likely require to be removed.	Minor adverse
	Corcrain River	<b>Water Quality:</b> Earthworks/site clearance will be required along the eastern and western banks of Corcrain River in order to accommodate the proposed steel sheet piles. In-river works will be required for the replacement of the existing footbridge which spans Corcrain River. There is potential for polluted runoff and accidental spillages to enter the watercourse. Temporary sediment disruption will be likely during the in-river works.	Moderate adverse
	Corcrain River	<b>Hydromorphology:</b> In-river works will be required at this location to accommodate the replacement of the footbridge over the Corcrain River. There is potential for temporary disruption to flow patterns and sediment removal. Minor areas of bankside vegetation will likely be removed.	Moderate adverse
	Ashgrove	<b>Water quality:</b> Earthworks will take place approximately 130m to the south of Ashgrove for the construction of the embedded wall to the rear of the Ulster Carpets building. Prior to mitigation there is potential for adverse impacts on this watercourse from polluted runoff and accidental spillages. Given the distance of the works from the watercourse however, impacts will be unlikely.	Negligible adverse

Site	Receptor	Impact	Magnitude
		<b>Hydromorphology:</b> No in-river works will be required within this watercourse. Disruption to flow patterns is unlikely given the distance of the works from this watercourse.	Negligible adverse
	Flood risk: Residential properties located along Woodside Green, Castle Avenue, Garvagh Road and Water Street. Commercial properties as part of Ulster Carpets.	Temporary increase in fluvial and pluvial flood risk due to presence of construction activities.	Minor adverse
D: People's Park	River Bann	<b>Water Quality:</b> Earthworks and site clearance will be required at this location in order to accommodate sheet piling, embankments and the realignment of footpaths. The River Bann flows approximately 140m to the north west of the construction works at this site and so impacts on surface water quality are likely to be limited, but cannot be ruled out prior to mitigation.	Minor adverse
		<b>Hydromorphology:</b> Given the distance from the construction works from the River Bann, impacts on hydromorphology are likely to be limited. Temporary disruption to flow patterns cannot be ruled out prior to mitigation.	Minor adverse
	Corcrain River	<b>Water Quality:</b> Earthworks and site clearance will be required along the eastern and western banks of Corcrain River at this location to accommodate the sheet piling, flood embankments and landscaping work. There is potential for polluted runoff and accidental spillages to enter the watercourse due to the proximity of the works.	<b>Moderate adverse</b>
		<b>Hydromorphology:</b> No in-river works will be required at this location. The surrounding earthworks/site clearance have the potential to increase runoff entering the river which could temporarily impact flow patterns. There is potential for the removal of bankside vegetation.	Minor adverse
	Flood risk: Residential properties located along Garvagh Road, King Street, Whitten Close and Park Road.	Temporary increase in fluvial and pluvial flood risk due to the presence of construction activities.	Minor adverse
E: Parkside Obins Street	Corcrain River	<b>Water Quality:</b> Minor earthworks and landscaping will be required adjacent to Corcrain River at this location to accommodate the steel sheet piling and footpath improvements. There is potential for polluted runoff and accidental spillages to enter the watercourse.	Minor adverse
		<b>Hydromorphology:</b> No in-river works are required at this location. The surrounding landscape works have the potential to	Minor adverse

Site	Receptor	Impact	Magnitude
		increase runoff flows into the river which may temporarily alter flows prior to mitigation.	
	River Bann	The River Bann flows approximately 500m from the construction works at this site and as a result, adverse impacts on surface water and hydromorphology are not expected.	No change
	Flood risk: Residential properties located along Parkside and Obins Street.	Temporary increase in fluvial and pluvial flood risk due to the presence of construction activities.	Minor adverse
F: Rose Cottages	Corcrain River	<b>Water Quality:</b> Earthworks and site clearance will be required along the northern bank of Corcrain River in order to accommodate the steel sheet piling. There is potential for polluted runoff and accidental spillages to enter into the watercourse prior to mitigation due to the proximity of the work to the river.	<b>Moderate adverse</b>
		<b>Hydromorphology:</b> No in-river works are required at this location. Potential for increased runoff to enter the river which could temporarily alter flow patterns.	Minor adverse
	Flood risk: Residential receptors located within the Rose Cottages development, along Obins Street and Corcrain Road.	Temporary increase in pluvial and fluvial flood risk due to the presence of construction activities.	Minor adverse
H: Castle Street	River Bann	<b>Water Quality:</b> Earthworks and construction activities will be required along the western bank of the River Bann at this location to accommodate the sheet piling, embedded flood wall, temporary flip barrier, flood gates and steel fencing. Landscaping will also take place to construct earth bunds. In-river works are not required however the piling will be required to be installed via a barge. There is potential for polluted runoff and accidental spillages to enter into the watercourse.	<b>Moderate adverse</b>
		<b>Hydromorphology:</b> In-river works will not be required at this site. There is potential for temporary disruption to flow patterns as a result of increased runoff from the construction site. Given the urban setting of this site, the removal of bankside vegetation will likely be minimal.	Minor adverse
	Corcrain River	<b>Water Quality:</b> Corcrain River flows approximately 170m to the north of the construction work at site H. Impacts on surface water quality as a result of construction activities are unlikely, but cannot be ruled out prior to mitigation.	Minor adverse
		<b>Hydromorphology:</b> No in-river works are required within Corcrain River. Given the distance of the construction works from the river, impacts on hydromorphology are unlikely.	No change

Site	Receptor	Impact	Magnitude
	Ashgrove	The minor watercourse Ashgrove flows approximately 470m north of the construction works at site H. Impacts on surface water quality and hydromorphology are not expected.	No change
	Flood risk: Commercial properties located along Garvaghy Road.	Temporary increase in fluvial and pluvial flood risk due to the presence of construction activities.	Minor adverse
	River Bann	<b>Water Quality:</b> Earthworks and site clearance will be required on the eastern bank of the River Bann at this location to accommodate sheet piling and an embedded flood wall. Sheet piling will require to be installed via a barge. Existing fishing platforms within the river may also be removed and replaced if required. There is potential for polluted runoff and accidental spillages to enter the watercourse due to the proximity of the works. Sediment and the riverbed could also be disturbed during the replacement of the fishing platforms.	<b>Moderate adverse</b>
	River Bann	<b>Hydromorphology:</b> The works will require in-river works to accommodate the removal and replacement of fishing platforms. This work has the potential to temporarily disrupt flow patterns. Riparian vegetation on the eastern bank of the River Bann will likely be removed.	<b>Moderate adverse</b>
I: Foundry Street	Corcrair River	<b>Water Quality:</b> Corcrair River flows approximately 170m to the north of the construction work at site I. Impacts on surface water quality as a result of construction activities are unlikely, but cannot be ruled out prior to mitigation.	Minor adverse
	Corcrair River	<b>Hydromorphology:</b> No in-river works are required within Corcrair River. Given the distance of the construction works from the river, impacts on hydromorphology are unlikely.	No change
	Ashgrove	The minor watercourse Ashgrove flows approximately 450m to the north east of the construction works at site I. Impacts on surface water quality and hydromorphology are not expected.	No change
	Flood risk: Commercial receptors located along Foundry Street, Watson Street, Goban Street. Residential properties located along Florence Court and Joseph Street.	Temporary increase in fluvial and pluvial flood risk due to the presence of construction activities.	Minor adverse
J: Bowling Green	River Bann	<b>Water Quality:</b> Earthworks and site clearance will be required close to the western bank of the River Bann at this location to accommodate the flood wall. In-river works may be required for any temporary removal and replacement of the fishing pontoons. There is potential for polluted runoff and accidental spillages to enter the watercourse due to the proximity of the works.	<b>Moderate adverse</b>

Site	Receptor	Impact	Magnitude
		Temporary sediment and riverbed disruption are likely during the in-river works.	
		<b>Hydromorphology:</b> In-river works may be required at this site to accommodate the removal and replacement of the fishing pontoons. This work has the potential to temporarily disrupt river flows and sediment. Considering the size of the River Bann in comparison to the scale of the works however, impacts will likely be limited.	Minor adverse
	Annagh River	<b>Water Quality:</b> Annagh River flows approximately 190m to the south east of the construction work at site J. Impacts on surface water quality due to construction are unlikely, yet cannot be ruled out prior to mitigation.	Minor adverse
		<b>Hydromorphology:</b> No in-river works are required within Annagh River. Given the distance of the construction works from the river, impacts on hydromorphology are unlikely.	No change
	Corcrain River	Corcrain River flows approximately 460m to the north west of the construction work at site J. Impacts on surface water quality and hydromorphology are not expected.	No change
	Gillford Road Stream	Gillford Road Stream flows approximately 450m to the south east of the construction works at site J. Impacts on surface water quality and hydromorphology are unlikely due to the distance between the receptor and construction activities.	No change
	Flood risk: Community receptors including Portadown Fire Station, Portadown Health centre and Portadown Boating club. Commercial properties located to the east of Meadow Lane.	Temporary increase in fluvial and pluvial flood risk.	Minor adverse
K: Health Centre	River Bann	<b>Water Quality:</b> The River Bann flows approximately 140m to the east of the construction work at site K. Earthworks and site clearance will be required at this site to accommodate the embedded flood walls. Adverse impacts on surface water quality are unlikely to occur due to the distance of the works from the watercourse, however adverse impacts cannot be ruled out prior to mitigation.	Minor adverse
		<b>Hydromorphology:</b> Impacts on hydromorphology are unlikely as the construction activities will not take place directly within, or immediately adjacent to the watercourse.	Minor adverse
	Annagh River	<b>Water Quality:</b> Annagh River flows to the immediate south east of the construction works at this location. Earthworks/site clearance will be required to accommodate the embedded flood walls. There is potential for polluted runoff and accidental	<b>Moderate adverse</b>

Site	Receptor	Impact	Magnitude
L: Irwins Mill		spillages to enter the watercourse, particularly due to the level of mature vegetation clearance required at this site.	
		<b>Hydromorphology:</b> In-river works are not required at this site. Large scale vegetation clearance will be required immediately to the north west of the river and so there is potential for increased surface water runoff entering the watercourse. This has the potential to temporarily disrupt flow patterns. The banks of the river will not be impacted by the construction works.	Minor adverse
	Gillford Road Stream	Gillford Road Stream flows approximately 370m to the south east of the construction works at this location. Impacts on surface water quality and hydromorphology are unlikely due to the distance between the receptor and construction activities.	No change
	Flood risk: Community receptors including Portadown Health Centre, Portadown Fire Station. Residential receptors along Hartford Street and Clonavon Avenue.	Temporary increase in fluvial and pluvial flood risk due to the presence of construction activities.	Minor adverse
	River Bann	<b>Water Quality:</b> Earthworks and site clearance will be required along the eastern banks of the River Bann in order to accommodate steel sheet piling and an embedded flood wall. There is potential for polluted runoff and accidental spillages to enter the watercourse due to the proximity of the works. <b>Hydromorphology:</b> No in-river works are required at this location. There is potential for increased surface water runoff entering the river as a result of site clearance which may temporarily alter flows. Riparian vegetation may also be lost along the eastern bank.	Moderate adverse
			Minor adverse
	Corcrair River	Corcrair river flows over 490m to the north west of the construction works. Impacts on surface water quality or hydromorphology are unlikely.	No change
	Annagh River	Annagh flows approximately 370m to the south west of the construction works at this location. Impacts on surface water quality and hydromorphology are unlikely at this distance.	No change
	Flood risk: Commercial receptors off Goban Street. Residential properties located along Goban Street, Carrickblacker Avenue and Wildwood Street.	Temporary increase in fluvial and pluvial flood risk due to the presence of construction activities.	Minor adverse

Site	Receptor	Impact	Magnitude
M: Annagh Hill Industrial Estate	Annagh River	<b>Water Quality:</b> Earthworks and site clearance will be required along the northern bank of Annagh River in order to accommodate the steel sheet piles. In river works will be required at this location to install the flap valve and associated housing structure. There is potential for polluted runoff and accidental spillages to enter the watercourse. Sediment and the riverbed could also be disrupted.	Moderate adverse
	Annagh River	<b>Hydromorphology:</b> In river works will be required at this site in order to install the flap valve and associated housing infrastructure. The works have the potential to temporarily disrupt the flow of the watercourse and sediment on the riverbed. Vegetation on the northern bank will likely be removed to accommodate the sheet piling.	Moderate adverse
	Unnamed tributary of the River Bann	<b>Water Quality:</b> Earthworks and site clearance will be required along the western bank of this watercourse to accommodate the embedded flood wall and reinforced wall. There is potential for polluted runoff and accidental spillages to enter the watercourse due to the proximity of the work.	Moderate adverse
	Unnamed tributary of the River Bann	<b>Hydromorphology:</b> In river works will not be required at this location. There is potential for increased surface water runoff to enter the watercourse which could temporarily alter flow patterns. Vegetation on the western bank of the watercourse will be removed to accommodate the embedded wall.	Minor adverse
	Flood risk: Residential receptors located along Mourneview Street and Thomas Street. Commercial receptors along Annagh Hill. Portadown Fire Station.	Temporary increase in fluvial and pluvial flood risk due to the presence of construction activities.	Minor adverse
N: Olde Golf Links	Annagh River	<b>Water Quality:</b> Earthworks and site clearance will be required within and around the Olde Golf Links development, which lies immediately to the east of Annagh River. Steel sheet piles will be required to be installed along eastern bank of the river. There is potential for polluted runoff and accidental spillages to enter the watercourse.	Moderate adverse
	Annagh River	<b>Hydromorphology:</b> In river works will not be required at this location. The works could potentially increase levels of runoff entering the watercourse, which could temporarily impact flow patterns.	Minor adverse
	Ballyworkan	<b>Water Quality:</b> Earthworks and site clearance will be required along the northern bank of Ballyworkan to accommodate sheet piling. In-river works will be required to install new culverts at the point where the watercourse flows under Tandragee Road. There is potential for polluted runoff and accidental spillages to enter the watercourse. In-river works have the potential to disturb sediment.	Moderate adverse

Site	Receptor	Impact	Magnitude
		<b>Hydromorphology:</b> In river works will be required to install the culverts at Tandragee Road. River flows will temporarily be disrupted. Riparian vegetation and sediment on the riverbed will likely be removed.	<b>Moderate adverse</b>
	Brackagh West	These minor watercourses flow over 200m away from the construction works at this site. Impacts on surface water quality and hydromorphology are unlikely	No change
	Kingsway Drive Drain		
	Kilmoriarty		
	Flood risk: Residential receptors within Olde Golf Links and along Tandragee Road. Annagh United Football Club.	Temporary increase in fluvial and pluvial flood risk due to the presence of construction activities.	Minor adverse
N2: Fairways Estate	Ballyworkan	<b>Water Quality:</b> Earthworks and site clearance will be required around the boundary of the Fairways development in order to accommodate sheet piling. The minor watercourse Ballyworkan flows approximately 100m to the north of the works. There is potential for polluted surface runoff and accidental spillages to enter the watercourse.	<b>Moderate adverse</b>
		<b>Hydromorphology:</b> No in-river works are required for this site. The proximity of the construction works may result in increased surface water runoff entering the watercourse, which could temporarily impact flows.	Minor adverse
	Brackagh West / East	<b>Water Quality:</b> Earthworks and site clearance will be required around the boundary of the Fairways development in order to accommodate sheet piling. The minor watercourses Brackagh West and Brackagh East flow approximately 90m and 150m respectively to the east of the site works and may be impacted by polluted runoff and accidental spillages.	Minor adverse
		<b>Hydromorphology:</b> No in-river works are required for this site. The proximity of the construction works may result in increased surface water runoff entering the watercourse, which could temporarily impact flows.	Minor adverse
	Annagh River	Annagh River flows over 200m from the construction works at site N2. Impacts on surface water quality and hydromorphology are unlikely.	No change
	Carrowback	Watercourse flows over 200m from the construction works at site N2. Impacts on surface water quality and hydromorphology are unlikely.	No change
		Flood risk: Residential properties	Temporary increase in fluvial and pluvial flood risk due to the proximity of construction activities.



Site	Receptor	Impact	Magnitude
	within The Fairways development, along Tandragee Road.		
O: 313 Tandragee Road	Brackagh East	Both of watercourses flow over 400m away from the construction works at site O. While earthworks and site clearance will be required at this site to accommodate cantilever flood walls, impacts on water quality and hydromorphology are unlikely.	No change
	Unnamed tributary of Drumnakelly		
	Brackagh Bog ASSI	The boundary of this ASSI lies immediately to the east of the construction works at site O. There is potential that the earthworks required for the cantilever flood walls may temporarily alter surface water flows/drainage into the ASSI before mitigation.	Moderate adverse
	Flood risk: Residential properties located along Tandragee Road.	Temporary increase in fluvial and pluvial flood risk due to the presence of construction activities.	Minor adverse
P: Derryvore Lane	Derryvore & Seagoe	<b>Water Quality:</b> Earthworks and site clearance will be required along the eastern banks of the minor watercourse Derryvore & Seagoe in order to accommodate the proposed sheet piles, embedded walls and flood gates. In river works will be required to install the culvert which could disturb sediment and pollutants on the riverbed. Due to the proximity of the construction works, there is potential for polluted runoff and accidental spillages to enter the watercourse.	Moderate adverse
		<b>Hydromorphology:</b> In-river works will be required to accommodate the new culvert. This work will likely temporarily disrupt the flow of the watercourse. It is likely that riparian vegetation will require to be removed.	Moderate adverse
	River Bann	The River Bann flows approximately 280m to the south west of the construction works. Impacts on surface quality and hydromorphology are unlikely.	No change
	Derryvore No 1 Derryvore No 2	The minor watercourses Derryvore No1 and No2 flow over 400m from the construction works at site P. Prior to mitigation, impacts on water quality and hydrology are not expected.	No change
	Derryvore ASSI	The boundary of this ASSI lies approximately 140m to the north west of the construction works at site P. There is potential that earthworks and site clearance required for the embedded flood walls and sheet piling may temporarily alter surface water flows into the ASSI before mitigation.	Moderate adverse
	Flood risk: Commercial and residential receptors	Temporary increase in fluvial and pluvial flood risk due to the presence of construction activities.	Minor adverse

Site	Receptor	Impact	Magnitude
	located along Derryvore Lane.		
Q: Ripley Mews	Kingsway Drive Drain	<b>Water Quality:</b> Earthworks and site clearance will be required along the eastern bank of Kingsway Drive Drain to accommodate sheet piling. In-river works will be required at this location to install sheet piles. There is potential for polluted runoff and accidental spillage to enter the watercourse due to the proximity of the construction works. Sediment disruption will be likely during in-river works.	<b>Moderate adverse</b>
		<b>Hydromorphology:</b> In-river works are required at this location to install the sheet piles. The flow of the watercourse will be temporarily disturbed during this process. There is potential for increased runoff to enter the watercourse which could further disrupt flows. Bankside vegetation will be removed.	<b>Moderate adverse</b>
	Annagh River	Annagh River flows approximately 370m east of the construction works at site Q. Impacts on surface water quality and hydromorphology are determined to be unlikely.	No change
	Kilmoriarty	The minor watercourse Kilmoriarty flows approximately 230m from the construction works. Impacts on surface water quality and hydromorphology are determined to be unlikely.	No change
	Flood risk: Residential properties located along Ripley Mews, Ripley Meadows, Ripley Crescent.	Temporary increase in fluvial and pluvial flood risk due to the presence of construction activities.	Minor adverse
R: Corcullentragh Road	Ballybay River	<b>Water Quality:</b> Earthworks and site clearance will be required along the western bank of the Ballybay River to accommodate steel sheet piles, earth bunds and a road re-alignment. There is potential for polluted runoff and accidental spillage to enter the watercourse due to the proximity of the construction activities.	<b>Moderate adverse</b>
		<b>Hydromorphology:</b> No in-river works will be required at this location. Due to the proximity of the earthworks/site clearance, there is potential for increased surface water runoff to enter the river, temporarily altering flows.	Minor adverse
	Selshion	This minor watercourse flows approximately 220m to the north east of the construction works at site R. Impacts on surface water and hydrology are determined to be unlikely.	No change
	Flood risk: Residential and agricultural properties located along Corcullentragh Road.	Temporary increase in fluvial and pluvial flood risk due to the presence of construction activities.	Minor adverse
S: Corcrain Drive	Ballybay River	<b>Water Quality:</b> Earthworks and site clearance will be required along the boundary of the residential properties at Corcrain Drive. The Ballybay River flows approximately 70m to the north west of	<b>Moderate adverse</b>

Site	Receptor	Impact	Magnitude
		the site at its closest point. There is potential for polluted runoff and accidental spillages entering the watercourse.	
		<b>Hydromorphology:</b> No in-river works will be required at this location. The proximity of the construction works may result in increased runoff entering the watercourse which may temporarily disrupt flows.	Minor adverse
	Flood risk: Residential properties located along Selshion Parade, Drumcree Grove, Corcraín Drive and Charles Park.	Temporary increase in fluvial and pluvial flood risk due to the presence of construction activities.	Minor adverse.

## Operation

- 16.6.15 This section details the impacts of the proposed scheme on the water environment during operation. As previously noted, operational impacts on surface water were originally scoped out of the assessment, as no significant effects were identified at the scoping stage.
- 16.6.16 In line with good practice, a WFD assessment has been undertaken. The results of the assessment are summarised below and detailed in full in **Appendix 16.1, Volume 3**.

## Water Framework Directive Assessment

- 16.6.17 Table 16.13 below captures the WFD assessment for each flood defence location in isolation. The table summarises the 2018 WFD data for each waterbody and details the predicted WFD status after completion of the proposed scheme.

### *In Isolation Effects*

Table 16.13 WFD assessment (In-isolation effects)

Site	Waterbody	Current Status	Assessed Post-Construction Status	Comments
A: Ashgrove Road	River Bann	Poor Ecological Potential	Poor Ecological Potential	No deterioration anticipated.
A1: Corcraín Mews	Ballybay River/Corcraín River	Moderate	Moderate	No deterioration anticipated.
B: Derryanvil Road	River Bann	Poor Ecological Potential	Poor Ecological Potential	No deterioration anticipated.
C: Ulster Carpets	River Bann	Poor Ecological Potential	Poor Ecological Potential	No deterioration anticipated.
C: Ulster Carpets	Ballybay/Corcraín River	Moderate	Moderate	No deterioration anticipated.
D: People's Park	River Bann	Poor Ecological Potential	Poor Ecological Potential	No deterioration anticipated.

Site	Waterbody	Current Status	Assessed Post-Construction Status	Comments
D: People's Park	Ballybay /Corcrair River			No deterioration anticipated.
E: Parkside	Ballybay /Corcrair River	Moderate	Moderate	No deterioration anticipated.
F: Rose Cottages	Ballybay /Corcrair River			No deterioration anticipated.
H: Castle Street	River Bann			No deterioration anticipated.
I: Foundry Street	River Bann	Poor Ecological Potential	Poor Ecological Potential	No deterioration anticipated.
J: Bowling Green	River Bann	Poor Ecological Potential	Poor Ecological Potential	No deterioration anticipated.
K: Health Centre	River Bann	Poor Ecological Potential	Poor Ecological Potential	No deterioration anticipated.
K: Health Centre	Annagh River	Bad	Bad	No deterioration anticipated
L: Irwins Mill	River Bann	Poor Ecological Potential	Poor Ecological Potential	No deterioration anticipated.
M: Annagh Hill	River Bann	Poor Ecological Potential	Poor Ecological Potential	No deterioration anticipated.
M: Annagh Hill	Annagh River	Bad	Bad	No deterioration anticipated.
N- Olde Golf Links	Annagh River	Bad	Bad	No deterioration anticipated.
N2- Fairways	Annagh River	Bad	Bad	No deterioration anticipated.
O- Tandragee Road	Annagh River	Bad	Bad	No deterioration anticipated.
P- Derryvore Lane	River Bann	Poor Ecological Potential	Poor Ecological Potential	No deterioration anticipated.
Q- Ripley Mews	Annagh River	Bad	Bad	No deterioration anticipated.
R- Corcullentragh Road	Ballybay/Corcrair River	Moderate	Moderate	No deterioration anticipated.
S: Corcrair Drive	Ballybay/Corcrair River	Moderate	Moderate	No deterioration anticipated.

### ***In Combination Effects:***

- 16.6.18 In addition to the in-isolation effects, the assessment has considered in-combination effects. The impacts on WFD watercourses from sites within 500m of one another have been considered as part of the in-combination effects assessment. The results are summarised in **Table 16.14**. The table shows that while some in-combination effects may occur on the WFD watercourses due to the proximity of multiple defence sites, none of the watercourses will experience a deterioration in their WFD status.

Table 16.14 WFD assessment (In-combination effects)

Site	Waterbody	Comments
A: Ashgrove Road	River Bann	Site A lies within 500m of Site B. In-combination effects on the River Bann will be minor during operation. No deterioration to any WFD element determined.
A1: Corcrair Mews	Ballybay River	Site A1 lies within 500m of Site S. In-combination effects on the Ballybay River will be minor during operation. No deterioration to any WFD element determined.
B: Derryanvil Road	River Bann	Site B lies within 500m of Site A. In-combination effects on the River Bann will be minor during operation. No deterioration to any WFD element determined.
C: Ulster Carpets	River Bann	Site C lies within 500m of Sites D, H, I, J and L. In-combination effects on the River Bann will be minor during operation. No deterioration to any WFD element determined.
C: Ulster Carpets	Ballybay/Corcrair River	Site C lies within 500m of Sites D, H, I, J and L. In-combination effects on Ballybay River will be minor during operation. No deterioration to any WFD element determined.
D: People's Park	River Bann	Site D lies within 500m of Sites C, E, F, H, I, J and L. In-combination effects on the River Bann will be minor during operation. No deterioration to any WFD element determined.
D: People's Park	Ballybay /Corcrair River	Site D lies within 500m of Sites C, E, F, H, I, J and L. In-combination effects on the Ballybay River will be minor during operation. No deterioration to any WFD element determined.
E: Parkside	Ballybay /Corcrair River	Site E lies within 500m of Sites C, D and F. In-combination effects on the Ballybay River will be minor during operation. No deterioration to any WFD element determined.
F: Rose Cottages	Ballybay /Corcrair River	Site F lies within 500m of Sites D and E. In-combination effects on the Ballybay River will be minor during operation. No deterioration to any WFD element determined.
H: Castle Street	River Bann	Site H lies within 500m of Sites C, D, E, F, I, J and L. In-combination effects on the River Bann will be minor during operation. No deterioration to any WFD element determined.
I: Foundry Street	River Bann	Site I lies within 500m of Sites C, D, E, F, H, J and L. In-combination effects on the River Bann will be minor during operation. No deterioration to any WFD element determined.
J: Bowling Green	River Bann	Site J lies within 500m of Sites C, D, H, I and L. In-combination effects on the River Bann will be minor during operation. No deterioration to any WFD element determined.
K: Health Centre	River Bann	Site K lies within 500m of Sites J, L and M. In-combination effects on the River Bann will be minor during operation. No deterioration to any WFD element determined.
K: Health Centre	Annagh River	Site K lies within 500m of Sites J, L and M. In-combination effects on the Annagh River will be minor during operation. No deterioration to any WFD element determined.
L: Irwins Mill	River Bann	Site L lies within 500m of Sites C, D, H, I, J and K. In-combination effects on the River Bann will be minor during operation. No deterioration to any WFD element determined.
M: Annagh Hill	River Bann	Site M lies within 500m of Site K. In-combination effects on the River Bann will be minor during operation. No deterioration to any WFD element determined.
M: Annagh Hill	Annagh River	Site M lies within 500m of Site K. In-combination effects on the Annagh River will be minor during operation. No deterioration to any WFD element determined.

Site	Waterbody	Comments
N: Olde Golf Links	Annagh River	Site N lies within 500m of Site N2. In-combination effects on the Annagh River will be minor during operation. No deterioration to any WFD element determined.
N2: Fairways	Annagh River	Site N2 lies within 500m of Site N. In-combination effects on the Annagh River will be minor during operation. No deterioration to any WFD element determined.
O: Tandragee Road	Annagh River	No other sites are located within 500m of Site O. No in-combination effects for Annagh River are determined and therefore no deterioration to WFD status.
P: Derrylvore Lane	River Bann	No other sites are located within 500m of Site P. No in-combination effects for River Bann are determined and therefore no deterioration to WFD status.
Q: Ripley Mews	Annagh River	No other sites are located within 500m of Site Q. No in-combination effects for Annagh River are determined and therefore no deterioration to WFD status.
R: Corcullentragh	Ballybay/Corcrair River	No other sites are located within 500m of Site R. No in-combination effects for Annagh River are determined and therefore no deterioration to WFD status.
S: Corcrair Drive	Ballybay/Corcrair River	Site S lies within 500m of Site A1. In-combination effects on the Ballybay River will be minor during operation. No deterioration to any WFD element determined.

### Flood risk

16.6.19 During operation, the flood defences at each site will be complete and will offer protection to the local area during a Q100 CC flood event. Beneficial impacts for flood risk are determined for every site due to the reduction in fluvial flood risk the defences will provide. A magnitude of moderate beneficial is determined for each site, resulting in **significant beneficial** impacts for each site.

16.6.20 The operational flood levels are shown in the design drawings in **Appendix 6.1, Volume 3**.

## 16.7. Mitigation

16.7.1 This section details the mitigation measures that will be in place in order to prevent and reduce adverse impacts on the water environment.

### Construction

16.7.2 The following site-specific mitigation measures will be implemented during the construction phase:

- For any construction work that requires discharge to a watercourse or where the work will impact the free flow of a watercourse, approval will be required from DfI Rivers. A schedule 6 application for consent to undertake works to a watercourse will be required.
- A Construction Environmental Management Plan (CEMP) will be produced to ensure that appropriate construction techniques and standards are adhered to throughout the construction phase. This will include a surface water management plan outlining measures such as temporary silt fencing, cut off ditches, settlement ponds and bunds set up early in the construction period to capture all runoff and prevent ingress of sediments and contaminants into existing drainage ditches where necessary;
- Spill kits will be present on site and located in areas where spillages may be likely to occur (e.g. fuel storage areas);

- Control of Substances Hazardous to Health (COSHH) stores on site will be bunded and locked when not in use;
- Drip trays and plant nappies will be placed under all stationary plant;
- Water quality monitoring will take place at the main watercourses within the study area in order to ensure no detrimental impacts on water quality are occurring;
- Dust suppression techniques will be implemented during activities likely to create high levels of dust (e.g excavations, cutting);
- Where required, filter drains will be covered in order to prevent contamination from construction entering the surface water drainage system;
- Haul roads and construction compounds will be designed and sited to minimise the potential for increased surface runoff;
- Where haul roads run within close proximity to watercourses and drainage channels, silt fencing and splash boards will be installed to ensure silty runoff is not entering the watercourses;
- Works will be suspended during out-of-bank river flows or during intense rainstorms;
- CIRIA guidelines and the Environment Agency's groundwater protection guidelines should be followed.

## Operation

16.7.3 There are no mitigation measures proposed for the operation phase. It has been determined from the impact assessment that there will be no significant impacts on surface water quality or hydromorphology during operation.

16.7.4 The scheme has been designed to provide a beneficial impact on flood risk and so no further mitigation is required.

## 16.8. Residual Effects

16.8.1 This section details the magnitude of impact and residual effects of the proposed scheme on the water environment, following the implementation of the mitigation measures outlined within Section 16.7.

### Construction

16.8.2 Following the implementation of the mitigation measures, significant adverse residual effects on the water environment are not determined. The measures outlined within the CEMP will require to be strictly followed on site in order to ensure adverse impacts do not occur. Table 16.15 summarises the residual effects during construction.

Table 16.15 Residual effects during construction

Site	Receptor	Sensitivity	Magnitude of Impact post mitigation	Significance of effect	
A: Ashgrove Road	Ashgrove	Water Quality	Low	Negligible adverse	Slight adverse
		Hydromorphology		Slight adverse	
	Water Quality	Low	Minor adverse	Slight adverse	

	Ballynagowan	Hydromorphology		Minor adverse	Slight adverse
	Flood risk		High	Negligible adverse	Slight adverse
		Hydromorphology		Minor adverse	Slight adverse
	River Bann	Water Quality	High	Negligible adverse	Slight adverse
B: Derryanvil Road	Flood risk		High	Negligible adverse	Slight adverse
		Hydromorphology		Negligible adverse	Slight adverse
		Hydromorphology		Minor adverse	Slight adverse
		Hydromorphology		No change	Neutral
	River Bann	Water Quality	High	Negligible adverse	Slight adverse
D: People's Park	Corcrain River	Water Quality	High	Minor adverse	Slight adverse
	Flood risk		High	Negligible adverse	Slight adverse
		Hydromorphology		Negligible adverse	Slight adverse
		Hydromorphology			Neutral
F: Rose Cottages	Corcrain River	Water Quality	High	Minor adverse	Slight adverse
		Hydromorphology		Negligible adverse	Slight adverse



Site	Receptor	Sensitivity	Magnitude of Impact post mitigation	Significance of effect		
I: Foundry Street	Flood risk	High	Negligible adverse	Slight adverse		
				Slight adverse		
		Hydromorphology		Negligible adverse	Slight adverse	
		Hydromorphology				
		Hydromorphology				
		River Bann	Water Quality	High	Minor adverse	Slight adverse
		Corcrain River	Water Quality	High	Negligible adverse	Slight adverse
	Ashgrove	Water Quality	Low	No change	Neutral	
	Flood risk	High	Negligible adverse	Slight adverse		
				Slight adverse		
		Hydromorphology		Negligible adverse	Slight adverse	
		Hydromorphology		No change	Neutral	
		Hydromorphology				
K: Health Centre	River Bann	Water Quality	High	Negligible adverse	Slight adverse	
					Slight adverse	
	Annagh River	Water Quality	High	Minor adverse	Slight adverse	
		Hydromorphology		Negligible adverse	Slight adverse	

Site	Receptor	Sensitivity	Magnitude of Impact post mitigation	Significance of effect	
	Gillford Road Stream	Water Quality	Low	No change	Neutral
	Flood risk		Very High	Negligible adverse	Slight adverse
		Hydromorphology		Negligible adverse	Slight adverse
		Hydromorphology			
		Hydromorphology			
		Hydromorphology			
M: Annagh Hill Industrial Estate	Annagh River	Water Quality:	High	Minor adverse	Slight adverse
	Unnamed tributary of the River Bann	Water Quality	Low	Minor adverse	Slight adverse
	Flood risk		Very high	Negligible adverse	Slight adverse
		Hydromorphology		Negligible adverse	Slight adverse
		Hydromorphology		Negligible adverse	Slight adverse
		Hydromorphology		Negligible adverse	Slight adverse
		Hydromorphology		Negligible adverse	Slight adverse
	Brackagh West		Low		Neutral
					Neutral
	Kingsway Drive Drain		Low		Neutral
	Flood risk		High	Negligible adverse	Slight adverse
	Ballyworkan	Water Quality	Low	Minor adverse.	Slight adverse

Site	Receptor	Sensitivity	Magnitude of Impact post mitigation	Significance of effect
N2: Fairways Estate	Hydromorphology		Negligible adverse	Slight adverse
	Hydromorphology		Negligible adverse	Slight adverse
	Carrowback	Low		Neutral
O: 313 Tandragee Road	Brackagh East	Water Quality Low		Neutral
	Unnamed tributary of Drumnakelly	Water quality Low	No change	Neutral
	Brackagh Bog ASSI	High	Minor adverse	Slight adverse
P: Derryvore Lane	Derryvore & Seagoe	Water Quality Low	Minor adverse	Slight adverse
	River Bann	High	No change	Neutral
		Water Quality/ Hydromorphology		Neutral
	Derryvore No 2	Low		Neutral
	Flood risk	High	Negligible adverse	Slight adverse
				Slight adverse
	Hydromorphology			Slight adverse
				Neutral
	Kilmoriarty	Water Quality/ Hydromorphology Low	No change	Neutral
	Flood risk	High	Negligible adverse	Slight adverse

Site	Receptor	Sensitivity	Magnitude of Impact post mitigation	Significance of effect	
R: Corcullentragh Road	Ballybay River	Water Quality	High	Minor adverse	Slight adverse
	Selshion	Water Quality / Hydromorphology	Low	No change	Neutral
S: Corcrair Drive	Ballybay River	Water Quality	High	Minor adverse	Slight adverse
	Flood risk		High	Negligible adverse	Slight adverse

## Operation

### Surface Water

16.8.3 The WFD assessment has determined that there will be no significant impacts on surface water quality or hydromorphology during the operational phase of the proposed scheme. As a result, no operational mitigation is required and the residual impact assessment remains what is assessed as in Table 16.13.

### Flood Risk

16.8.4 As the proposed scheme is a flood alleviation project, operational mitigation for flood risk is not required and is embedded into the scheme design. As a result, residual operational impacts for flood risk are the same as those detailed in **Section 6**. Table 16.16 summarises the significance of effects for flood risk during operation.

Table 16.16 Residual significance of effects for flood risk (operation)

Site	Impact	Sensitivity	Magnitude	Significance
A: Ashgrove Road	Reduction in fluvial flood risk for residential properties along Ashgrove Road, Ashgrove Lodge, Ballyronan Park and Churchill Park Road.	High	Moderate beneficial	<b>Moderate beneficial</b>
A1 Corcrair Mews	Reduction in fluvial flood risk for residential properties located along Corcrair Mews, Corcrair Gardens and Charles Street/Obins Street.	High	Moderate beneficial	<b>Moderate beneficial</b>
B: Derryanvil Road	Reduction in fluvial flood risk for residential and agricultural receptors	High	Moderate beneficial	<b>Moderate beneficial</b>

Site	Impact	Sensitivity	Magnitude	Significance
	surrounding Derryanvil Road.			
C: Woodside Green	Reduction in fluvial flood risk for Ulster Carpets site and residential properties located along Woodside Green, Castle Avenue, Garvaghy Road and Water Street.	High	Moderate beneficial	<b>Moderate beneficial</b>
D: People's Park	Reduction in fluvial flood risk for residential properties located along Garvaghy Road, King Street, Whitten Close and Park Road.	High	Moderate beneficial	<b>Moderate beneficial</b>
E: Parkside Obins Street	Reduction in fluvial flood risk for residential properties located along Parkside and Obins Street.	High	Moderate beneficial	<b>Moderate beneficial</b>
F: Rose Cottages	Reduction in fluvial flood risk for residential receptors located within the Rose Cottages development, Obins Street and Corcraun Road.	High	Moderate beneficial	<b>Moderate beneficial</b>
H: Castle Street	Reduction in fluvial flood risk for commercial properties located along Garvaghy Road.	High	Moderate beneficial	<b>Moderate beneficial</b>
I: Foundry Street	Reduction in fluvial flood risk for commercial receptors located along Foundry Street, Watson Street, Goban Street and residential properties located along Florence Court and Joseph Street.	High	Moderate beneficial	<b>Moderate beneficial</b>
J: Bowling Green	Reduction in fluvial flood risk for community receptors including Portadown Fire Station, Portadown Health	Very High	Moderate beneficial	<b>Large beneficial</b>

Site	Impact	Sensitivity	Magnitude	Significance
	centre and Portadown Boating club.			
K: Health Centre	Reduction in fluvial flood risk for community receptors including Portadown Health Centre, Portadown Fire Station.	Very High	Moderate beneficial	<b>Large beneficial</b>
L: Irwins Mill	Reduction in fluvial flood risk for commercial receptors at Irwins Mill and residential properties located along Goban Street, Carrickblacker Avenue and Wildwood Street.	High	Moderate beneficial	<b>Moderate beneficial</b>
M: Annagh Hill Industrial Estate	Reduction in fluvial flood risk for residential receptors located along Mourneview Street. Commercial receptors along Annagh Hill.	Very High	Moderate beneficial	<b>Large beneficial</b>
N: Olde Golf Links	Reduction in fluvial flood risk for residential receptors within Olde Golf Links and along Tandragee Road.	High	Moderate beneficial	<b>Moderate beneficial</b>
N2: Fairways	Reduction in fluvial flood risk for residential properties within The Fairways development, along Tandragee Road.	High	Moderate beneficial	<b>Moderate beneficial</b>
O: 313 Tandragee Road	Reduction in fluvial flood risk for agricultural property at Tandragee Road.	High	Moderate beneficial	<b>Moderate beneficial</b>
P: Derryvore Lane	Reduction in fluvial flood risk for commercial receptors located along Derryvore Lane.	High	Moderate beneficial	<b>Moderate beneficial</b>
Q: Ripley Mews	Reduction in fluvial flood risk for residential properties located along Ripley Mews, Ripley	High	Moderate beneficial	<b>Moderate beneficial</b>

Site	Impact	Sensitivity	Magnitude	Significance
	Meadows, Ripley Crescent.			
R: Corcullentragh Road	Reduction in fluvial flood risk for residential property and agricultural land located along Corcullentragh Road.	High	Moderate beneficial	<b>Moderate beneficial</b>
S: Corcrair Drive	Reduction in fluvial flood risk for residential properties located along Selshion Parade, Drumcree Grove, Corcrair Drive and Charles Park.	High	Moderate beneficial	<b>Moderate beneficial</b>

## 16.9. Monitoring

### Construction

- 16.9.1 During construction, it is recommended that a programme of surface water monitoring is implemented in order to ensure that construction activities are not having any detrimental effects on water quality. The monitoring requirements are outlined within the CEMP **Appendix 6.2, Volume 3**.

### Operation

- 16.9.2 Based on the conclusions of the WFD assessment, significant adverse effects are not determined for the operation phase. As a result, no monitoring is required.

## 16.10. Summary

- 16.10.1 During construction prior to mitigation, there is potential for significant effects on surface water quality and hydromorphology due to the proximity of the construction to many of the watercourses within the study area. Site clearance and vegetation removal have the potential to adversely impact surface water quality and can also alter the banks and flows of nearby watercourses. The presence of plant and machinery also increases the potential of adverse effects on surface water quality due to the risk of accidental spillages.
- 16.10.2 Impacts on Derryvore ASSI and Brackagh Bog ASSI were considered due to the proximity of these designated wetlands to the construction work. Prior to mitigation, significant adverse impacts are determined for the sites due to the potential hydrological changes as a result of earthworks and excavations. Construction activities such as these have the potential to alter surface water and groundwater flows into the sites.
- 16.10.3 During construction however, a Construction Environmental Management Plan (CEMP) will be implemented on site in order to mitigate the potential construction impacts detailed in **Section 16.6**. After the implementation of mitigation, significant adverse effects on surface water quality, hydromorphology and flood risk are not determined. Significant effects on the two designated ASSI's are not determined after mitigation.
- 16.10.4 In line with good practice, A Water Framework Directive (WFD) assessment was undertaken for the operation phase which considered both in-isolation effects and in-combination effects. The assessment concluded that the proposed scheme will not result in the deterioration of any WFD status for any watercourse. There is no risk to any WFD watercourse through in-combination effects.

## 17. Climate

### 17.1. Introduction

- 17.1.1 Climate change is the alteration of enduring weather conditions as a result of interactions between the Earth's atmosphere (Ref 17.1) and its various physical, chemical and biological processes (Ref 17.2). The climate changes periodically; often due to variations in solar output and our planetary orbit. However, the present warming trend is, for the first time, the result of human activity (Ref 17.3). Many human activities emit greenhouse gases (GHGs) which trap heat within the atmosphere, whilst other activities, such as deforestation, limit the capacity of natural systems to sequester these gases. The consequence of this is destabilisation of the prevailing climate with potential to impact upon both natural and man-made receptors, including the proposed scheme.
- 17.1.2 This chapter of the Environmental Statement (ES) reports the findings of an assessment of the likely significant effects of the proposed scheme upon the climate, together with an assessment of the proposed scheme's vulnerability to climate change. This chapter takes the form of:
- A greenhouse gas (GHG) assessment; determining the effects of the emission of GHGs arising from the proposed scheme, upon the climate.
  - A climate change vulnerability assessment; determining both the likelihood and magnitude of climate-related effects upon the proposed scheme.

### 17.2. Statutory and Policy Context

#### The Paris Agreement

- 17.2.1 The Paris Agreement is a legally binding international treaty which commits Parties to the United Nations Framework Convention on Climate Change (UNFCCC) to objectives to reduce GHG emissions, with the view to limiting the global average temperature rise to well below 2°C above pre-industrial levels, whilst "*pursuing efforts to limit the temperature increase to 1.5°C*". The Agreement is revisited five-yearly to allow Parties to the Convention to evaluate and enhance the level of ambition of their climate action plans, known as nationally determined contributions (NDCs).

#### The Climate Change Act 2008

- 17.2.2 The Climate Change Act 2008 set a target of reducing GHG emissions by at least 80% by 2050 from the baseline year of 1990. The Act further established the Climate Change Committee (CCC) as an independent, statutory body to advise the UK and devolved governments on emission reduction targets and report to Parliament on progress. The CCC is further tasked with the production of the UK Climate Change Risk Assessment (CCRA), followed by a National Adaptation Programme, to address those risks every five years. In Northern Ireland, this Climate Change Act makes provision for the NI Executive to publish a Climate Change Adaptation Programme as soon as reasonable after the publication of each CCRA.
- 17.2.3 In 2019, the emission reduction targets set out in the Climate Change Act 2008 were made more ambitious by the Climate Change Act 2008 (2050 Target Amendment) Order 2019. This order made the UK the first major global economy to commit to a net zero target requiring a net reduction of emissions by 100% relative to 1990 levels by 2050.

#### The Climate Change Bill (Northern Ireland) 2021

- 17.2.4 The Climate Change Bill seeks to declare a climate emergency and to establish a mandate for climate change mitigation and adaptation in Northern Ireland. It further seeks to ensure that Northern Ireland achieves net zero emissions by 2045, partly through the preparation of five-yearly Climate Action Plans (targeting the achievement of net-zero emissions and the improvement of water quality, soil quality and biodiversity) and the establishment of an independent Northern Ireland Climate Commissioner and Northern Ireland Climate Office.



## The Climate Change Committee Sixth Carbon Budget

17.2.5 The CCC undertakes an annual assessment of GHG emissions to determine whether the UK is on course to meet its target carbon budget. These budgets are presently set as follows (Table):

Table 17.1: Climate Change Committee Carbon Budgets

Carbon budget	Carbon budget level (MMtCO <sub>2</sub> e)	% reduction below base year
1 <sup>st</sup> (2008 – 12)	3,018	23
2 <sup>nd</sup> (2013 – 17)	2,782	29
3 <sup>rd</sup> (2018 – 22)	2,544	35
4 <sup>th</sup> (2023 – 27)	1,950	50
5 <sup>th</sup> (2028 – 32)	1,725 (1,765 including international shipping)	57
6 <sup>th</sup> (2033 – 37)	965 (including international aviation and shipping)	

17.2.6 In its most recent budget report (released in December 2020), the CCC recommended that the UK set a Sixth Carbon Budget which requires a reduction of emissions of 78% by 2035, relative to 1990 levels (63% reduction from 2019). This represents a commitment consistent with the objectives of the Paris Agreement. The CCC further recommended that the UK set a pledge to reduce GHG emissions by at least 68% by 2030 relative to 1990 levels, noting that this should form part of the UK's NDC ahead of COP26 (November 2021).

## The UK Climate Change Risk Assessment (CCRA) 2017

17.2.7 The Climate Change Act requires the Government to compile its assessment of the risks and opportunities arising for the UK from climate change every five years. It provides the evidence base to inform National Adaptation Programmes in England, Scotland, Wales and Northern Ireland and sets out six priority areas which require action over the next five years to 2022. These are:

- Flooding and coastal change risks to communities, businesses, and infrastructure.
- Risks to health, well-being, and productivity from high temperatures.
- Risk of shortages in the public water supply, and for agriculture, energy generation and industry.
- Risks to natural capital, including terrestrial, coastal, marine, and freshwater ecosystems, soils and biodiversity.
- Risks to domestic and international food production and trade.
- New and emerging pests and diseases, and invasive non-native species, affecting people, plants, and animals.

17.2.8 Due to geographical differences and variation in the projected changes to the Northern Ireland climate, the priority risks identified in the UK CCRA report national summary for Northern Ireland are not the same as those identified for the UK more generally. Instead, they are:

- Risks to soils, farming, natural carbon stores, species, and coastal habitats.
- Flooding risk to (interdependent) infrastructure (sewers, transport networks).
- Potential risks to people from warmer temperatures.
- Risks to international food production and trade.

## Northern Ireland's second Climate Change Adaptation Programme (NICCAP2)

17.2.9 As required by the 2019 Amendment of the 2008 Climate Change Act, the Northern Ireland NAP responds to the risks and opportunities identified in the UK CCRA through the outlining of policies, strategies, and delivery plan actions in order to provide for 'a resilient Northern Ireland which will take timely and well-informed decisions to address the socio-economic and environmental impacts of climate change'. It covers strategic objectives for the period 2019-2024. These objectives for Northern Ireland are:

- Natural capital resilience to the impact of climate change, including all types of ecosystems with their biodiversity, coastal communities, landforms.
- Infrastructure services resilient to the impact of climate change, especially to flooding and extreme weather events.
- Resilient people and buildings to flooding and extreme weather events.
- Businesses and supply chains resilient to climate change and extreme weather events disruptions.
- Food security and production that can cope with climate changes.

17.2.10 The above list is not exhaustive and additional risks of climate change, as already included in follow-up reports and summaries, such as the CCRA3 for Northern Ireland, and the Intergovernmental Panel on Climate Change Physical Science Basis report (2021), include pests, pathogens and invasive species, saltwater intrusion, subsidence, cultural heritage loss, etc.

## Northern Ireland Evidence Report

17.2.11 The Northern Ireland Evidence Report 2021 observes warm-loving species shift trends towards regions north of their original historical range. This is in line with trends observed UK-wide, such as the average temperature rise of around 1°C higher than pre-industrial levels (IPCC 2021), and with the sea level rise, currently 16 cm higher than in 1901. Floods events influence surface and groundwater resources, and a future temperature rise will likely affect the rate of biochemical exchanges and processes: oxygen demand, ammonia discharge, algal growths, low affluent discharge rate, reduced layer mixing, etc. As Northern Ireland rivers are relatively small, increases in precipitation risk inducing soil erosion and sedimentation, and others risks include saltwater intrusion or colonisation by specific pathogenic organisms.

## Armagh City, Banbridge and Craigavon Borough Council Local Development Plan

17.2.12 The existing Armagh City, Banbridge and Craigavon Borough Council Local Development Plan (LDP) makes no reference to the impact of proposed developments upon climate change nor the impact of climate change upon proposed developments (or existing infrastructure).

## Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance

17.2.13 The EIA Guide to Climate Change Resilience and Adaptation of 2020 works as a reference point for EIA-mediated climate change adaptation.

17.2.14 The Guide outlines steps intended to underline the effects of climate change on significant projects: pre-application, additional adaptation measures and the post-EIA stage.

- First stage: "Annex I" and "Annex II" developments need to go through screening to establish their scale of impact. Early-stage involvement and work with the design team maximise the efficiency of GHG reduction measures in all projects. The IEMA EIA guides on Shaping and Delivering Quality Development provide further detailed information for this project stage.
- Second stage: Emissions are calculated through a combination of two main factors:
- Study tools and protocols – such as the GHG Protocol Tool. GHGs associated with the built environment are assessed according to formal standards, including PAS 2080:2016 and BS EN

15978:2011; GHG emission factors are a value for 'GHG emissions per unit of activity' and are expressed in tCO<sub>2</sub>e (tonnes of carbon dioxide equivalent).

- Engagement with planning authorities (such as LPAs) and clients. A list of Statutory Consultees on Applications for Planning Permissions is provided on the government website. Data provided and collected needs to be of appropriate quality, including age, geography, technology mix and competency of entity that developed the data.
- GHG sources need current and future (direct and indirect) baseline values.
- Current values: operational (fuel use, etc.) and in-use emissions, for example vehicles travelling to and from the project site.
- Future values: operational GHG emissions and how these may change over time (UK grid decarbonisation projection scenarios or the adoption of renewables, etc.).
- Mitigation strategies, as underlined in the GHG Protocol Standards, need to be considered at an early stage in accordance with the managing hierarchy, namely (1) Avoid, (2) Reduce, (3) Substitute and (4) Compensate.

### **Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation**

17.2.15 The EIA Guide to Climate Change Resilience and Adaptation of 2020 works as a reference point for EIA-mediated climate change adaptation.

17.2.16 The aim is to identify appropriate mitigation and adaptation measures to short- and long-term weather conditions, and the stage of the project at which they should be incorporated. Flooding, freezing, storm surges, gales, heat waves, are considered short-term weather events. Long-term climatic variations and norms would include changes in seasonal rainfall pattern and precipitation variation, variation in average temperatures, changes in prevailing wind direction or increases in freezing, thawing, droughts, etc.

### **Design Manual for Roads and Bridges (LA 114): Climate**

17.2.17 The LA 114 Climate last published in 2021 establishes the assessment and reporting requirements for climate effects on highways, inclusive of roads and bridges, as well as for the effect of GHG emissions of projects on the environment. The PAS 2080:2016 standard for infrastructural carbon is mentioned as a supporting document.

### **PAS 2080: 2016 Carbon Management in Infrastructure**

17.2.18 PAS 2080 specifies requirements for the accounting and management of whole life carbon in infrastructure in line with international and sectoral norms, relevant standards and guidance, with the view to promoting the reduction of whole life GHG emissions. It sets out the emissions boundaries to be considered in the 'before use stage', the 'use stage' and the 'end of life' stage.

### **Northern Ireland Technical Flood Risk Guidance in relation to Allowances for Climate Change in Northern Ireland**

17.2.19 The Department for Infrastructure (DfI) technical flood risk guidance was published in 2019 and sets out Northern Ireland Water's approaches towards allowing for climate change in the management of flood risk. This document is backed by evidence collected on Northern Ireland in the 2017 UKCCRA.

17.2.20 The guidance suggests allowances for climate change based on UKCP09 which is now out of date. This is acknowledged by the document which suggested use of UKCP18 from its release. For the use of UKCP09, the suggested allowance for Ireland is based upon a 50% probability winter rainfall projection for 2080, under a medium emissions scenario. However, it is suggested that in some instances alternative scenarios may be more appropriate e.g., where developments of a critical or strategic nature are proposed. In such instances, a higher probability level can be used.

## 17.3. Methodology

### Scope (GHG Assessment)

- 17.3.1 The study area concerns GHG emissions arising from construction activities within the footprint of the proposed scheme, including any temporary land take and compounds. It also extends to include the emissions associated with the extraction, manufacture, and transportation of materials to the construction site, and the management of any waste arising from construction processes and earthworks within the spatial boundary of the project.
- 17.3.2 This approach is consistent with the modular framework set out in PAS2080:2016 and BS EN 15978. Table 17.2 provides an indication of the key emissions sources which are anticipated during the construction phase of the proposed scheme.

Table 17.2: Anticipated Key Emissions Sources During the Before Use Stage

Life cycle boundary	Emissions source	Description
Product stage (A1-A3)	Raw material extraction	Embodied emissions associated with the production of material used for construction of the proposed scheme
	Product manufacture	
	Transport to factory gate	
Construction process stage (A4-A5)	Transport to site	Emissions associated with the transport of equipment, materials and members of staff to the site of the proposed scheme
	Construction activities	Emissions associated with the consumption of fuels onsite for the purposes of construction of the proposed scheme
	Waste	Emissions associated with the disposal of waste generated onsite

- 17.3.3 As the proposed scheme comprises hard and soft defences, it is anticipated that during the use stage of the proposed scheme's lifecycle, repair and maintenance activities will be the only source of emissions. With that being said, repair and maintenance works are unlikely to be material insofar as they are anticipated to be infrequent and short in duration.
- 17.3.4 The lifespan of the proposed scheme is undefined, as it is envisaged that scheme will be maintained and repaired until such time that it is no longer feasible to do so. For this reason, the end-of-life stages are not considered as part of this GHG assessment.
- 17.3.5 The global climate is the principal GHG emissions receptor in this assessment. The sensitivity of this receptor is considered to be high, in view of the fact that any additional contribution towards GHG emissions will negatively impact Northern Ireland's contribution towards the net zero target of the UK and its commitment to limiting global surface air temperature rise to well below 2°C.
- 17.3.6 To allow for a valuable determination of significance, the suggested carbon reduction targets (and their associated budgets) by the CCC to the Northern Irish Assembly have been used (as detailed in paragraph 17.3.19).

### Scope (Vulnerability Assessment)

- 17.3.7 The study area concerns the construction activities within the footprint of the proposed scheme, including any temporary land take and compounds. It further extends to include the footprint of the proposed scheme

during its operational phase. It does not include any decommissioning activities for the reasons outlined in paragraph 17.3.4.

17.3.8 Within the scope of this assessment, the sensitive receptors which have been identified for the assessment of the vulnerability of the proposed scheme to climate change include:

- Construction phase receptors including the project's workforce, plant, and machinery
- Operational assets in place throughout the lifetime of the proposed scheme (flood walls, embankments, and pathways)

17.3.9 Whilst other receptors (local residents) were included within the scoping document as sensitive receptors, on consultation with IEMA guidance they have been scoped out, for two reasons:

- Residents are not considered to be part of the proposed scheme. They are considered to be separate from the scheme itself.
- The risk to residents from the impact of climate change on the proposed scheme is considered insignificant with respect to all potential impacts except in relation to flood risk (significant positive effect). The risk to residents is therefore considered in Chapter 16.

17.3.10 The vulnerability of these receptors has been assessed using UK Climate Projection (UKCP18) probabilistic (25km) projections which provide conditional probability density functions to express the relative strength of the evidence from models and observations which support future climate outcomes (scenarios). The probability distributions provide information on ranges of outcomes and the relative likelihood of alternative outcomes within these ranges. For this assessment the 50<sup>th</sup> percentile (as per Department of Infrastructure guidance) was used as the basis for the high emissions scenario; values were extracted also for the 5<sup>th</sup> and 95<sup>th</sup> percentile to give an indication of probability distribution in recognition of relevant guidance (e.g., flood risk guidance).

17.3.11 UKCP18 uses emissions scenarios based on those used in the Intergovernmental Panel on Climate Change's (IPCC) assessment report (AR5). These Representative Concentration Pathways (RCPs) specify GHG concentrations that would result in target amounts of radiative forcing at the top of the atmosphere by 2100, relative to pre-industrial levels. Four RCPs are used in UKCP18: RCP2.6, RCP4.5, RCP6.0 and RCP8.5 (the numbers denote radiative forcing levels in W/m<sup>2</sup>). The global mean temperature increase associated with each RCP is shown in Table 17.3.

Table 17.3: Increase in Global Mean Surface Temperature Averaged over 2081-2100 Compared to the Preindustrial Period (1850-1900 avg) for the RCPs (best estimate, 5-95%).

RCP	Increase in GMST (°C) by 2081-2100
RCP2.6	1.6 (0.9-2.3)
RCP4.5	2.4 (1.7-3.2)
RCP6.0	2.8 (2.0-3.7)
RCP8.5	

17.3.12 RCP 8.5 is the high emission scenario and the scenario chosen for this assessment. This scenario has been considered in relation to the proposed scheme over the following timeframes:

- 2020-2039 (for construction and early operation)
- 2080-2099 (for operation in line with recommendations of the Department for Infrastructure, see paragraph 17.2.19).

## Methodology (GHG Assessment)

- 17.3.13 The assessment of the effects of GHG emissions arising from the proposed scheme has been carried out in accordance with the Institute of Environmental Management and Assessment (IEMA) Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance; having consideration also for PAS 2080:2016 Carbon Management in Infrastructure, the Royal Institute of Chartered Surveyors (RICS) Whole life carbon assessment for the built environment (2017) and the Design Manual for Roads and Bridges: LA 114 (Climate).
- 17.3.14 Accordingly, the assessment quantifies the Kyoto Protocol GHGs, as applicable, and measures them in terms of tonnes of carbon dioxide (tCO<sub>2</sub>) equivalence (tCO<sub>2</sub>e), where equivalence means having the same warming effect as CO<sub>2</sub> over 100 years.
- 17.3.15 The six Kyoto Protocol gas groups are CO<sub>2</sub>, methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), sulphur hexafluoride (SF<sub>6</sub>) and perfluorocarbons (PFCs). The global warming potential (GWP) of each is presented in Table 17.4.

Table 17.4: Global warming potential of Kyoto Protocol gas groups

Greenhouse gas/group	Chemical formula	GWP (CO <sub>2</sub> e)
Carbon dioxide	CO <sub>2</sub>	1
Nitrous oxide	N <sub>2</sub> O	298
Sulphur hexafluoride	SF <sub>6</sub>	22,800

- 17.3.16 Data associated with the activities which will contribute towards the construction of the proposed scheme has been collected from which GHG emissions have been quantified by applying the most relevant and up-to date emission factors from published reputable sources such as those by the Department for Environment, Food and Rural Affairs (Defra). The emission factors used are included in **Appendix 17.1, Volume 3**.
- 17.3.17 An emission factor is a representative value that relates the quantity of a pollutant released into the atmosphere with an activity associated with the release of that pollutant. Emission factors are typically available from government publications, independent agencies, and scientific research journals; however, the quality and accuracy of such factors can vary significantly. Factors can differ depending on the research body and/or underlying methodologies applied. It is therefore good practice to apply emission factors only from reputable sources.
- 17.3.18 The IEMA Environmental Impact Assessment Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance sets out three overarching principles for determining significance of GHG emissions:
- The GHG emissions from all projects will contribute to climate change; the largest inter-related cumulative environmental effect.
  - The consequences of a changing climate has the potential to lead to significant environmental effects on all topics in the EIA Directive – e.g., population, fauna, soil etc.
  - GHG emissions have a combined environmental effect that is approaching a scientifically defined environmental limit, as such any GHG emissions or reductions from a project might be considered to be significant.
- 17.3.19 The guidance determines that “*it might be considered that all GHG emissions are significant and an EIA should ensure the project addresses their occurrence by taking mitigation action*”. However, in order to

provide context with respect to the emissions of the proposed scheme, a measurement of the degree of significance will be provided with reference to the emissions reduction targets (compared to 1990 levels) proposed by the CCC to the Northern Ireland Assembly. These are:

- 48% reduction by 2030
- 69% reduction by 2040 and
- 82% reduction by 2050

17.3.20 The National Atmospheric Emissions Inventory reports that as of 2019, Northern Ireland was responsible for the emission of 21,414.09ktCO<sub>2</sub>e. Baseline emissions in 1990 were 26,070.80 ktCO<sub>2</sub>e. The 2030 target for Northern Ireland should thus be 13,556.82 ktCO<sub>2</sub>e. Using this as the metric against which to measure the significance of the emission impact of the proposed scheme, the criteria for impact magnitude is as follows:

Table 17.5: GHG Assessment Significance Criteria

Magnitude of Impact	Sensitivity of Receptor	Significance of Effect
Low (<1% of the proposed 2030 carbon budget)	High	Minor
	High	

### Assumptions and Limitations

17.3.21 The accuracy of a GHG assessment depends on the quality of the data provided. Primary data should always be used where available. Where it has not been possible to collect this data, in view of the fact that this assessment represents a forecast of emissions and some information may not yet be known, secondary data (including estimates, extrapolations, benchmarks and proxy data such as distance travelled) have been used. Assessments such as this, based largely on secondary data, should only be viewed as an estimate of GHG emissions impact, and actual emissions may vary.

### Methodology (Vulnerability Assessment)

17.3.22 This assessment of climate-related risks to the proposed scheme is delivered in line with the guidance provided by the IEMA Guide to Climate Change Resilience and Adaptation. As such, it employs a standard risk assessment-based methodology towards the identification of potentially significant effects, having consideration for both their likelihood and their magnitude.

17.3.23 The likelihood of effects is premised upon both the probability and frequency of the projected occurrence. The criteria for likelihood are thus defined as follows:

Table 17.6: Likelihood Criteria for the Climate Change Vulnerability Assessment\*

Likelihood category	Description (probability and frequency of occurrence)
Very high	The event occurs multiple times during the lifetime of the project (80 years), e.g., approximately annually.
High	The event occurs several times during the lifetime of the project (80 years), e.g., approximately once every five years.
Medium	The event occurs limited times during the lifetime of the project (80 years), e.g., approximately once every 15 years.
Low	The event occurs during the lifetime of the project (80 years), e.g., once in 80 years.
Very low	The event may occur once during the lifetime of the project (80 years).

\*Note that the proposed scheme is seeking consent without a limit to operational lifetime. However, in order to ensure a meaningful result is achieved from this assessment, an operational lifespan of 80 years has been assumed.

17.3.24 The magnitude of impact takes account of the timing, scale, size, and duration of the potential effect. The criteria for magnitude are thus defined as follows:

Table 17.7: Magnitude Criteria for the Climate Change Vulnerability Assessment

Magnitude category	Description (consequence of impact)
Very large adverse	Substantial change, affecting the majority of locations of the sites and for a prolonged period of time (more than one month) including irreversible changes
Large adverse	Noticeable change, affecting many of the locations of the sites and for a relatively long period of time (more than one week but less than one month)
Moderate adverse	Noticeable change, affecting a few of the locations of the sites and for a moderate amount of time (more than three days but less than one week)
Minor adverse	Noticeable change, affecting very few of the locations of the sites and for a small amount of time (no more than three days)
	Negligible and/or unnoticeable change or no change lasting one day or less.

17.3.25 The assessment of significant effects employs professional judgement to cross-examine the magnitude and likelihood scores using the criteria for significance of effects, as shown in Table 17.8. It takes into account the mitigation measures which have been designed into the proposed scheme.

Table 17.8: Significance Criteria for the Climate Change Vulnerability Assessment

		Measure of Likelihood				
		Very high	High	Medium	Low	Very low
Measure of Magnitude	Very large adverse	Significant	Significant	Significant	Significant	Not significant
	Large adverse					
	Moderate adverse	Significant	Significant	Significant	Not significant	Not significant
	Minor adverse					
	Negligible	Not significant	Not significant	Not significant	Not significant	Not significant

### Assumptions and Limitations

17.3.26 As with all climate models, there are inherent limitations to the models used. In particular, the estimated ranges for future climate variability are conditional on a number of assumptions with expert judgement playing a role in the various methodological and data choices. For further information regarding model limitations, uncertainty, and bias, please see UKCP18 Guidance at [ukcp18-guidance---caveats-and-limitations.pdf \(metoffice.gov.uk\)](https://www.metoffice.gov.uk/publications/ukcp18-guidance---caveats-and-limitations.pdf).



## 17.4. Baseline Conditions

### Baseline Conditions (GHG Assessment)

17.4.1 The baseline conditions for the GHG impact assessment is a business-as-usual scenario whereby the proposed scheme does not go ahead.

### Baseline Conditions (Vulnerability Assessment)

17.4.2 The baseline conditions describe the conditions of a business-as-usual scenario whereby the proposed scheme is not undertaken.

17.4.3 Portadown is located in Co Armagh, within the southern part of the UK Meteorological (Met.) Office's Northern Ireland climate region. It is characterised by an equitable climate, consisting of relatively mild winters and cool summers, which are a consequence of the moderating effects of the Atlantic Ocean. For example, winter temperatures in Northern Ireland are largely determined by surface temperatures of the surrounding sea, which reach their lowest in late February and early March. Frost days are also dependent upon relative altitude and distance from the sea. Due to its low altitude and inland location, Portadown records an average of 8.6 and 8.8 frost days in January and February respectively, compared to the Northern Ireland average of 9.2 and 9.1. Portadown is also relatively warmer than the Northern Ireland average maximum temperature (12.4°C), reporting an annual average maximum temperature of 13.3°C. It experiences slightly less sunshine than the Northern Ireland average (1,255.8 hours), with an annual average of 1,245.5 hours.

17.4.4 The nearest weather station to Portadown is in Armagh. It recorded information relating to temperature and precipitation for the thirty-year period between 1981 and 2010, as shown in Table 17.9.

Table 17.9: Portadown Weather Station Data for the Period between 1981-2010

Climate Change Variable	Value (1981 – 2010)
Average Annual Maximum Temperature (°C)	13.3
Warmest Month (Max Temperature (°C))	July (19.7)
Total Annual Rainfall (mm)	812.3
Wettest Month (mm)	December (77.1)

17.4.5 The climate in Northern Ireland has been slowly changing over the most recent decades, as shown in Table 17.10. Temperature has increased across the decades studied, with an increase of 0.5°C from the average annual maximum temperatures of 1961 – 1990 to those in 1981 – 2010. The maximum temperature of the warmest and minimum temperature of the coldest days have increased, alongside an increase in total annual rainfall. Whilst the driest month experienced similar volumes of rainfall across the decades studied, the wettest month saw a significant increase in rainfall from 1961-1990 to 1981 – 2010.

Table 17.10: Climate Change in Northern Ireland since 1961

Climate Change Variable	(1961 – 1990)	(1971 – 2000)	(1981 – 2010)
Average Annual Maximum Temperature (°C)	11.9	12.2	12.4
Warmest Month (Max Temperature (°C))	July (17.9)	July (18.4)	July (18.5)

Climate Change Variable	(1961 – 1990)	(1971 – 2000)	(1981 – 2010)
Coldest Month (Min Temperature (°C))	February (0.8)	January / February (1.2)	February (1.2)
Driest Month (mm)	July (71.2)	May (68.1)	May (72.6)
Wettest Month (mm)	January (115.9)	January (119.1)	October (199.7)

## Future Conditions

### Future Conditions (GHG Assessment)

17.4.6 If the proposed scheme were not to go ahead it is assumed that the use of the project area would remain as it is. In this case emissions are likely to remain as they are at present.

### Future Conditions (Vulnerability Assessment)

17.4.7 Future climatic conditions are projected to change in comparison to the present baseline conditions. In particular, winters are projected to become increasingly warmer and wetter whilst summers are projected to become increasingly hotter and drier, as shown in the following tables.

17.4.8 As noted in paragraph 17.3.10, the climate projections displayed in Table 17.11 to Table 17.13 have been extracted from the UKCP18 data developed by the UK Climate Impacts Programme. The projections displayed cover the indicative lifetime of the proposed scheme at the 10<sup>th</sup>, 50<sup>th</sup> and 90<sup>th</sup> probability level for the RCP 8.5 (high emissions) scenario.

Table 17.11: Projected Change in Temperature in the Neagh Bann River Catchment

Climate Variable	Time Horizon (relative to 1981-2000)	
	2020 – 2039	2080 – 2099
Mean annual air temperature anomaly at 1.5m (°C)	+1 (+0.4 to +1.5)	+3.6 (+2.2 to +5.3)
Mean winter air temperature anomaly at 1.5m (°C)	+0.9 (-0.1 to +1.7)	+3.2 (+1.3 to +5.2)
Minimum winter air temperature anomaly at 1.5m (°C)	+0.9 (+0.2 to +1.6)	+3 (+1.5 to +4.8)

Table 17.12: Projected Change in Precipitation Rate in the Neagh Bann River Catchment

Climate Variable	Time Horizon (relative to 1981 – 2000)	
	2020 – 2039	2080 – 2099

	Time Horizon (relative to 1981 – 2000)	
Summer precipitation rate anomaly (%)	-8 (-21 to +6)	-26 (-50 to -4)
Winter precipitation rate anomaly (%)	+6 (-3 to +16)	+18 (-2 to +42)

Table 17.13: Projected Change in Sea Level Pressure in the Neagh Bann River Catchment

	Time Horizon (relative to 1981 – 2000)	
Climate Variable	2020 – 2039	2080 – 2099
Annual sea level pressure (hPa)	+0.2 (-0.6 to +1.1)	+0.5 (-1.3 to +2.4)
Summer sea level pressure (hPa)	+0.8 (-0.4 to +2.1)	+2.1 (-0.9 to +5.7)
Winter sea level pressure (hPa)	-0.3 (-2.5 to +1.8)	

## 17.5. Evaluation (Value of Resource or Sensitivity of Receptors)

17.5.1 The global climate is the principal GHG emissions receptor in this assessment. The sensitivity of this receptor is considered to be high, in view of the fact that any additional contribution towards GHG emissions will negatively impact Northern Ireland's contribution towards the net zero target of the UK and its commitment to limiting global surface air temperature rise to well below 2°C.

17.5.2 The sensitive receptors which have been identified for the assessment of the vulnerability of the proposed scheme to climate change include:

- Construction phase receptors including the project's workforce, plant, and machinery
- Operational assets in place throughout the lifetime of the proposed scheme (flood walls, embankments, and pathways).

17.5.3 Whilst other receptors (local residents) were included within the scoping document as sensitive receptors, on consultation with IEMA guidance they have been scoped out, for two reasons:

- Residents are not considered to be part of the proposed scheme. They are considered to be separate from the scheme itself.
- The risk to residents from the impact of climate change on the proposed scheme is considered insignificant with respect to all potential impacts except in relation to flood risk (significant positive effect).

## 17.6. Impact Assessment

### GHG Assessment

#### Construction

17.6.1 The total GHG emissions estimated to arise from construction is approximately 22,357 tCO<sub>2</sub>e. Table 17.14 provides a breakdown of the primary GHG emission sources considered in the assessment. A breakdown of emissions by individual site is provided in **Appendix 17.1, Volume 3**.

17.6.2 The embodied carbon of construction products is the largest emission sources of construction GHG emissions accounting for 67% of emissions.

Table 17.14: Estimated GHG Emissions from the Construction of the Proposed Scheme

A1 – A3	Embodied carbon of products	15,659	67
A4	Transport of materials and equipment to site	2,407	10
			18
	Emissions from construction compounds	1,050	4
Total		23,407	

17.6.3 Average annual construction emissions across an anticipated three-year construction period are estimated as 7,802 tCO<sub>2</sub>e. This accounts for approximately 0.057% of Northern Ireland's 2030 carbon budget of 13,556.83 ktCO<sub>2</sub>e. This would constitute as a **minor significant** impact.

### Impact Assessment (Vulnerability Assessment)

#### Construction

17.6.4 The receptors identified in paragraph 17.3.8 are projected to be vulnerable to climate risks during the construction process. These have been identified in Table 17.15. In brief, potential impacts during the construction phase include:

- Threat to human health and the wellbeing of the workforce during severe weather events, ranging from minor discomfort to serious ill-health. This may also result in decreased employee productivity.
- Restricted access to site and/or unsuitable conditions for certain construction activities due to extreme weather events.
- Damage to plant, materials and site compound resulting from extreme weather.
- Risk to supply chain and the availability of materials due to climate events around the world.

#### Operation

17.6.5 Whilst the purpose of the proposed scheme is to mitigate against climate risks to the local community, the operation of the proposed scheme is itself vulnerable to climate change risks, particularly in the medium to long term. These have been identified in Table 17.15. In brief, potential impacts during the operational phase include:

- Material and asset deterioration due to extreme events resulting in the need for enhanced maintenance.
- Risk that the protection afforded by embankment vegetation and vegetation adjacent to the river within other areas of the catchment may be undermined, limiting the potential for natural flood management and increasing the load on the proposed scheme.

- Increased need for on the ground monitoring and maintenance due to chronic climatic change.

## 17.7. Mitigation

### GHG Assessment – Construction

17.7.1 Measures to mitigate the impact of the GHG emissions generated by the construction of the proposed scheme is summarised below:

- Maximise opportunities for the reuse of excavated material and other materials which could be considered waste within the project or at a local donor site ensuring compliance to NIEA's Regulatory Position Statement on the Reuse of Material.
- Embed carbon reduction practices as a core principle for the design team. Where reduction ideas are suggested they should be recorded and potential impact quantified. Earlier engagement with carbon reduction allows for the greatest returns.
- Where technical specifications allow, maximise the recycled content of construction materials such as concrete and steel.
- Maximise the specification of materials with an environmental product declaration with the aim of reducing embodied carbon emissions
- Incentivise use of local suppliers with a view to shorten project supply chains and environmental footprint
- Encourage main contractor partners to obtain grid connections for construction office and welfare facilities, removing the need for generators. Where grid connections are not possible hybrid generators using solar power or HVO should be used to reduce consumption of fossil fuels.
- Onsite mobile and non-mobile plant should conform to the latest emissions standards, with mobile vehicles conforming to EURO 6 standards as a minimum. All plant should investigate the option of using HVO fuels or electric versions where possible.
- Require main contractors to report on energy data, water usage and waste disposal and their GHG emissions as part of the scheme's Construction Environmental Management Plan (CEMP).
- Replant felled trees in viable local areas including People's Park where the Department wishes to encourage the planting of additional trees.

### Vulnerability assessment – construction

17.7.2 Measures to mitigate and adapt to climate change risks to the construction of the proposed scheme have been identified in Table 17.15 and summarised below:

- A CEMP will be developed and implemented to manage environmental issues associated with the construction of flood defences, which will include the following measures:
- Prior to construction, adverse weather procedures will be developed and included within the CEMP. This will include an incident response plan (including an evacuation procedure) and contingency plans in the event of extreme weather.
- During construction, the weather forecast and water levels will be monitored daily to identify adverse weather events. Upon identification of these, appropriate procedures will be followed, including those measures outlined in Table 17.15.
- Weather-relevant PPE will be provided to all on-site workers, including sun protection and loose light clothing.

- All equipment specifications will be observed, recorded, and adhered to with regard for weather-related specifications such as wind speed tolerance etc. Where deemed necessary by the site manager and/or the Clerk of Works, limit and/or cease construction activities until weather conditions re-stabilise.
- When not in use, all equipment will be stored in a secure location away from areas of potential risk (e.g., due to pluvial ponding, wind etc.).
- Where supply chains are used to source materials or construction plant from outside of the UK, investigate multiple suppliers and provide for sufficient delivery time ahead of construction to avoid project delays.

## Operation

17.7.3 Measures to mitigate, and adapt, to climate change risks to the operation of the proposed scheme have been identified in Table 17.15 and are summarised below:

- Consideration will be given to the use of construction materials with enhanced tolerance to fluctuating temperatures.
- Climate change has been considered during the design phase and incorporated into design outputs.
- The condition and integrity of assets will be regularly and efficiently assessed, with the view to carrying out maintenance and repair operations as soon as possible.
- Signposting the risk of fire due to sparks (from cigarettes, barbeques etc.) will be considered as appropriate to help reduce the risk of fire during high heat events.
- Following extreme events, assessment of the condition of assets will be carried out with the view to maintaining or repairing assets as soon as possible.
- An invasive species management plan will be produced to inform relevant personnel about biosecurity protocols when carrying out routine maintenance works. This will reduce the risk of undermining the protection provided by native vegetation.

Table 17.15 Climate impact assessment

Primary Climate Hazard	Primary Impact	Description	Mitigation	Likelihood post-mitigation	Magnitude post-mitigation	Significance
<b>Construction</b>						
Increased summer temperatures	Decreased employee productivity	An increase in average summer temperatures has the potential to reduce employee productivity during the summer months.	Monitor changing weather forecasts on a daily basis and implement an adverse hot weather procedure which includes communication of high-risk temperatures (with consideration of humidity). Dependent on PPE needed for construction activities, ensure access to high temperature PPE, such as sun hats, sunscreen and loose light clothing. Provide breaks, shade and hydration. If possible, avoid undertaking particularly hot or strenuous activities with excessive/heavy PPE and consider a change in working hours/shift patterns to avoid the hottest part of the day.	Low	Minor adverse	Not significant
Heat waves and high heat days	Increased threat to human health and wellbeing	Extended periods of increased heat have the potential to increase risks to human health and wellbeing including discomfort, dehydration,	Monitor changing weather forecasts on a daily basis and implement an adverse hot weather procedure which includes communication of	Low	Moderate adverse	Not significant

Primary Climate Hazard	Primary Impact	Description	Mitigation	Likelihood post-mitigation	Magnitude post-mitigation	Significance
		sunburn, heat stress, stroke or exhaustion.	high-risk temperatures (with consideration of humidity). Depending on PPE needed for construction activities, ensure access to high temperature PPE, such as sun hats, sunscreen and loose light clothing. Provide breaks, shade and hydration. Avoid undertaking particularly hot/strenuous activities with excessive/heavy PPE and consider a change in working hours/shift patterns to avoid the hottest part of the day.			
Heat waves and high heat days	Unsuitable conditions for construction activities	Particularly high temperatures can cause unsuitable conditions for construction, e.g., being unable to pour concrete because it sets too quickly.	Monitor changing weather forecasts on a daily basis and implement an adverse hot weather procedure if needed, including increased frequency of monitoring – e.g., tyre pressure checks, metal fatigue etc. In the initial design phase, consider use of materials and equipment with superior qualities with regards to extreme or variable operating	Low	Minor adverse	Not significant



Primary Climate Hazard	Primary Impact	Description	Mitigation	Likelihood post-mitigation	Magnitude post-mitigation	Significance
			conditions. Cross check temperatures with equipment and material design specifications, and, if possible, allow flexibility in schedule to undertake activities during cooler periods of the day.			
Winter precipitation increase	Unsuitable conditions for construction activities	Extended periods of increased rainfall have the potential to increase pluvial and fluvial flood risk which may in turn prevent the undertaking of some construction activities.	An Incident Response Plan should be developed which identifies pluvial and fluvial flooding as a key site risk and identifies the correct policies and procedures to follow in the event of such. In support of this plan, monitor changing weather forecasts and river levels on a daily basis, or more frequently if adverse weather is forecast. If possible, allow flexibility in schedule to undertake activities away from any flooded areas or stop activities all together until conditions return to normal levels.	Low	Minor adverse	Not significant
Winter precipitation increase	Increased threat to human health and wellbeing	Extended periods of increased rainfall have the potential to increase	An Incident Response Plan should be developed which	Low	Moderate adverse	Not significant

Primary Climate Hazard	Primary Impact	Description	Mitigation	Likelihood post-mitigation	Magnitude post-mitigation	Significance
		<p>pluvial and fluvial flood risk which may in turn present heightened health and safety risk to the construction workforce. This could be made worse by the operating and manoeuvring of heavy plant.</p>	<p>identifies pluvial and fluvial flooding as a key site risk and identifies the correct policies and procedures to follow in the event of such. In support of this plan, monitor changing weather forecasts and river levels on a daily basis, or more frequently if adverse weather is forecast. Appoint an on-site Health and Safety Manager and communicate emergency evacuation procedures for on-site workers and visitors and in relation to key assets if a fast emergency response is needed. Identify a place/places of immediate safety for personnel and safe access routes. Cease or limit (as appropriate) all works until conditions return to normal.</p>			
Winter precipitation increase	Damage to plant and machinery	Extended periods of increased rainfall have the potential to increase pluvial and fluvial flood risk, which could cause	Monitor changing weather forecasts and river levels on a daily basis, or more frequently if adverse weather is forecast.	Low	Minor adverse	Not significant

Primary Climate Hazard	Primary Impact	Description	Mitigation	Likelihood post-mitigation	Magnitude post-mitigation	Significance
		damage to plant and machinery.	<p>Ensure a plan is in place to protect sensitive assets, such as relocating to a safer location or establishing in-situ protection, including a prioritisation system for most sensitive assets. Ensure any items left cannot cause further hazard. Ensure all items not in use are at a safe distance from the river and are located on stable and secure ground away from areas of potential pluvial flood risk. Ensure that all liquids that might contaminate surrounding land in the event of spillage are stored in bunded and lined enclosures designed for the containments of spills (as per GPP2/21) . These should be no less than 10m from a watercourse and located near a spill kit.</p>			
Winter precipitation increase	Access to site for workforce and plant/machinery	Extended periods of increased rainfall have the potential to increase pluvial and fluvial flood risk which could hamper	Monitor changing weather forecasts and river levels on a daily basis, or more frequently if adverse	Low	Minor adverse	Not significant

Primary Climate Hazard	Primary Impact	Description	Mitigation	Likelihood post-mitigation	Magnitude post-mitigation	Significance
		access to site, particularly in high traffic areas where the operating and manoeuvring of heavy plant in wet conditions causes ground disturbance and access tracks to become unnavigable. This has the potential to delay the project, with associated cost implications.	weather is forecast. Ensure safe access is always available to key assets with consideration given to ground conditions.			
Summer precipitation decrease	Ground instability	Instances of extreme drought may reduce groundwater levels and soil saturation thereby resulting in ground instability, hampering access to site or operations on site. Increase in dust and soil erosion likely to have implications on air quality and workforce health (See Air Quality Chapter 6).	Monitor changing weather forecasts on a daily basis, and in dry periods assess ground water levels (e.g., from standpipes and river level). Ensure safe access is always available to key assets with consideration given to ground conditions. Where possible, take reasonable measures to minimise the mobilisation and dispersal of dust, including dampening down of roadways and avoidance of any activities especially liable to generate dust when strong winds are forecast.	Low	Minor adverse	Not significant

Primary Climate Hazard	Primary Impact	Description	Mitigation	Likelihood post-mitigation	Magnitude post-mitigation	Significance
Decrease in atmospheric pressure	Unsuitable conditions for construction activities	Decrease in winter pressure can cause cloudiness, wind, precipitation, and stormy weather, resulting in unsuitable conditions for construction, particularly during times of high-wind speeds.	Monitor changing weather forecasts on a daily basis, or more frequently if adverse weather is forecast. Be mindful of equipment use specifications (e.g., wind speed tolerances) and avoid using equipment beyond these. Where deemed necessary by the site- or health and safety manager, limit and/or cease all activities until atmospheric conditions re-stabilise.	Low	Minor adverse	Not significant
Decrease in atmospheric pressure	Damage to construction plant and materials due to extreme weather events	Decrease in winter pressure can cause cloudiness, wind, precipitation, and stormy weather, resulting in damage to plant or materials, including the spread of waste.	Monitor changing weather forecasts on a daily basis, or more frequently if adverse weather is forecast. Implement an adverse weather procedure, including preparing site in advance and ensuring plant is safe (e.g., cannot blow around, locked lids/contained materials). Ensure that all liquids that might contaminate surrounding land in the event of spillage are stored in enclosures designed	Low	Moderate adverse	Not significant

Primary Climate Hazard	Primary Impact	Description	Mitigation	Likelihood post-mitigation	Magnitude post-mitigation	Significance
			<ul style="list-style-type: none"> <li>for the containments of spills (see GPP2/21). Store all waste in suitable containers of sufficient capacity to avoid loss during high winds. Designated areas should be isolated outside of floodplains.</li> </ul>			
Decrease in atmospheric pressure	Creation of nuisance and ill-health	Decrease in atmospheric pressure can result in windy conditions which may exacerbate dusty conditions result in ill-health for on-site workers and nuisance for local residents and passers-by.	<ul style="list-style-type: none"> <li>Monitor changing weather forecasts on a daily basis, or more frequently if adverse weather is forecast.</li> <li>Plan dust-generating activities such as topsoil stripping accordingly. Where wind is forecast, implement measures such as damping down stockpiles etc. to reduce dust arising and disseminating on-site. Minimising the amount of time stripped ground and soil stockpiles are exposed will support this intervention.</li> <li>During periods of elevated wind, the appropriate PPE should be worn on-site, including eye protection.</li> </ul>	Low	Minor adverse	Not significant

Primary Climate Hazard	Primary Impact	Description	Mitigation	Likelihood post-mitigation	Magnitude post-mitigation	Significance
Enhanced climatic variation/ extremes	Supply chain risk	Extreme climate events across the world such as flooding, drought and wildfires, can impact on the wider supply chain used to source materials or construction plant. This has the potential to result in project delays.	Investigate multiple suppliers from various geographic regions with differing sensitivity to risk. Where possible, arrange for supply of materials in sufficient time to allow for possible delays to construction commencing. Consider trying to be not contractually tied to any one supplier.	Low	Minor adverse	Not significant
Increased summer temperatures	Material and asset deterioration	An increase in temperature could cause material and asset deterioration due to increased intensity and duration of hot summers, and exacerbated by any decrease in rainfall e.g., desiccation of clay fills and peats.	Climate change has been considered during the design phase and incorporated into design outputs. Regularly assess the condition and integrity of assets. Maintenance of these should be habitual and consideration will be given to the use of construction materials with enhanced tolerance to fluctuating temperatures.	Low	Minor adverse	Not significant

Primary Climate Hazard	Primary Impact	Description	Mitigation	Likelihood post-mitigation	Magnitude post-mitigation	Significance
Increased summer temperatures	Lack of vegetation cover for natural flood management	Increased temperatures and diminished precipitation rates may contribute towards drought which may undermine the protection afforded by embankment vegetation and vegetation adjacent to the river within concerned and other areas of the catchment, limiting the potential for natural flood management.	Initial planting of drought-tolerant species. Regularly assess the condition of vegetation cover. Maintenance of cover should be habitual and consideration should be given to the use of damping spray or sprinklers during extreme heat. Upstream river inspections should be carried out intermittently to identify potential risks associated with vegetation cover affording up-stream natural flood management.	Low	Minor adverse	Not significant
Increased summer temperatures	Ground instability	Instances of extreme drought may reduce groundwater levels and soil saturation thereby resulting in ground instability in areas where vulnerable soils are located.	Climate change has been considered during the design phase and incorporated into design outputs. Regularly assess ground conditions, particularly in areas of vulnerable soils. Stable conditions should be maintained and consideration should be given to the use of damping spray or sprinklers during extreme heat.	Low	Minor adverse	Not significant



Primary Climate Hazard	Primary Impact	Description	Mitigation	Likelihood post-mitigation	Magnitude post-mitigation	Significance
Increased summer temperatures	Fire risk to vegetation	Instances of extreme drought may result in vegetation stress and the reduction of groundwater levels and soil saturation thereby exposing areas of embankment and/or vegetation cover to fire risk and resulting in loss of vegetation protection.	Regularly assess the condition and integrity of embankment, and other, vegetation. Maintenance of vegetation should be habitual and consideration should be given to the use of damping spray or sprinklers during extreme heat. Signposting of the risk of fire due to sparks (from cigarettes or barbeques etc.) will also help to reduce risk.	Low	Minor adverse	Not significant
Increased summer temperatures	Maintenance requirements	Increased requirements for maintenance as a result of above-mentioned exposure to risk. This has implications for heightened emissions too.	Aspire to achieve efficiency during monitoring and maintenance checks, e.g., seek to ensure all regular (seasonal) checks at once in a competent manner to reduce unnecessary duplication of activities.	Medium	Minor adverse	Not significant
Winter precipitation increase	Material and asset deterioration	Material and asset deterioration due to heavy rainfall and/or enhanced flooding (increased loading due to increased peak flood conditions) causing e.g., slippage, scour and erosion.	Climate change has been considered during the design phase and incorporated into design outputs. Regularly assess the condition of assets and be aware of material	Medium	Minor adverse	Not significant

Primary Climate Hazard	Primary Impact	Description	Mitigation	Likelihood post-mitigation	Magnitude post-mitigation	Significance
			and asset tolerances. Replace/repair assets as early as required.			
Winter precipitation increase	Flooding	Flood defence and embankment breach/overtopping (exceedance of current design rates).	Climate change has been considered during the design phase and incorporated into design outputs.	Low	Minor adverse	Not significant
Winter precipitation increase	Maintenance requirements	Increased requirements for maintenance due to increased winter precipitation. This has implications for heightened emissions too.	Ensure efficiency during monitoring and maintenance checks, e.g., ensure all (seasonal) checks are done at once in a competent manner so that further visits are not needed.	Medium	Minor adverse	Not significant
Decrease in atmospheric pressure	Damage to assets due to severe weather events.	Decrease in atmospheric pressure can cause cloudiness, wind, precipitation and stormy weather, resulting in high winds, flying debris, flash-flooding and associated damage to assets.	Climate change has been considered during the design phase and incorporated into design outputs. Following extreme weather events, assess the condition of assets and maintain or repair assets as required.	Low	Minor adverse	Not significant
Enhanced climatic variation/extremes	Ground instability (e.g., shrink-swell related failures)	The oscillation of climatic conditions could result in soil moisture fluctuations which have the potential to increase risk of shrink-swell related failures.	Climate change has been considered during the design phase and incorporated into design outputs.	Low	Minor adverse	Not significant

Primary Climate Hazard	Primary Impact	Description	Mitigation	Likelihood post-mitigation	Magnitude post-mitigation	Significance
			<ul style="list-style-type: none"> <li>Regular monitoring and maintenance checks should be carried out and repairs delivered as early as possible.</li> </ul>			
Enhanced climatic variation/extremes	Maintenance requirements	Increased requirements for monitoring and maintenance due to enhanced severity of climate change, e.g., damage to asset from storms, fallen trees damaging assets/blocking river channel. This has implications for heightened emissions too.	<ul style="list-style-type: none"> <li>Ensure efficiency during monitoring and maintenance checks, e.g., ensure all checks done at once in a competent manner so that further visits are not needed.</li> <li>Replace/repair assets as early as required.</li> </ul>	Medium	Minor adverse	Not significant
Climate change	Change in vegetation	<ul style="list-style-type: none"> <li>Vegetation type and coverage is likely to change in response to climate change, as conditions become more preferable for some species than others.</li> <li>There is a risk of invasive species undermining native vegetation, and an overall risk that the protection afforded by embankment vegetation and vegetation adjacent to the river within other areas of the catchment may be undermined, limiting the potential for natural flood management.</li> </ul>	<ul style="list-style-type: none"> <li>An invasive species management plan should be produced to inform site personnel on biosecurity protocols when carrying out routine maintenance works to prevent the unlawful spread of species to additional areas.</li> <li>Regularly assess the condition of vegetation cover. Maintenance of cover should be habitual.</li> </ul>	Low	Minor adverse	Not significant

## 17.8. Residual Effects

### Residual Effects (GHG Assessment)

- 17.8.1 The sensitivity of the climate is high and the magnitude of change, following mitigation, is low. Therefore, there is likely to be a direct, permanent, long-term minor, adverse residual effect on the global climate (minor significant) following the implementation of GHG mitigation measures because emissions will still be released despite the mitigation measures to reduce them as much as possible.

### Residual Effects (Vulnerability Assessment)

- 17.8.2 The proposed scheme has the potential to be impacted upon by climate change, both in the operation phase and in the in-use phase. Mitigation measures have been proposed which will render these effects not significant.

## 17.9. Monitoring

### Construction

- 17.9.1 The CEMP will set out details of the monitoring to be undertaken during the construction of the proposed scheme to determine whether mitigation and adaptation measures are being appropriately implemented. These will correspond with the mitigation measures outlined in Section 17.7. Specifically, they will include no less than the use of grid electricity, or alternative sustainable fuel sources, plant and machinery conformance to standards, the implementation of adverse weather procedures, weather forecast monitoring, the use of weather-appropriate PPE and the safe storage of equipment.

### Operation

- 17.9.2 Regular monitoring will be required to assess the condition of assets within the proposed scheme. Additional monitoring beyond this may further be required during and/or following extreme events, as appropriate (and safe).

## 17.10. Summary

- 17.10.1 This chapter outlines the results of an assessment of the impact of the proposed scheme upon the climate as well as an assessment of the vulnerability of the proposed scheme to climate change.
- 17.10.2 The assessments determined that the impact of the proposed scheme would have a significant negative effect upon the climate in view of the cumulative nature of emissions and the highly sensitive nature of the climate. However, in the context of Northern Ireland's contribution towards global emission reductions, the GHG assessment determined that the impact of the proposed scheme, having consideration for the mitigation measures outlined within this chapter, would be a minor significant effect insofar as it will contribute less than 1% towards Northern Ireland's 2030 emissions budget.
- 17.10.3 With respect to the assessment of the vulnerability of the proposed scheme to climate change, results show that the scheme is vulnerable to climate change during the construction and operational phases. However, mitigation measures have been outlined which will limit the magnitude and likelihood of effects thus rendering residual effects not significant.
- 17.10.4 This chapter outlines the results of an assessment of the impact of the proposed scheme upon the climate as well as an assessment of the vulnerability of the proposed scheme to climate change.
- 17.10.5 The assessments determined that the impact of the proposed scheme would have a significant negative effect upon the climate in view of the cumulative nature of emissions and the highly sensitive nature of the climate. However, in the context of Northern Ireland's contribution towards global emission reductions, the GHG assessment determined that the impact of the proposed scheme, having consideration for the mitigation measures outlined within this chapter, would be a minor significant effect insofar as it will contribute less than 1% towards Northern Ireland's 2030 emissions budget.

17.10.6 With respect to the assessment of the vulnerability of the proposed scheme to climate change, results show that the scheme is vulnerable to climate change during the construction and operational phases. However, mitigation measures have been outlined which will limit the magnitude and likelihood of effects thus rendering residual effects not significant.

## 18. Interactions and Cumulative Effects

### 18.1. Introduction

- 18.1.1 In accordance with the EIA regulations, EIAs must consider cumulative effects within the assessment. Cumulative effects are those that arise as a result of impacts from more than one project, or element of a single project, combining to have an effect on a receptor, or group of receptors, that may be larger than if the effect were considered separately.
- 18.1.2 There are two types of cumulative effects that are considered within the ES, as detailed below:
- Single project effects (combined effects): These are effects resulting from the combined effects of individual impacts from the scheme, for instance noise, dust and visual impacts from the scheme on a particular receptor.
  - Different project effects (cumulative effects): These effects are from several developments, which individually might be insignificant but when considered together could result in a significant cumulative effect.

### 18.2. Methodology

- 18.2.1 There is currently no standard methodology for the assessment of cumulative effects, however some limited guidance is available. The following standards and guidance have been taken into consideration during the preparation of this chapter:
- Design Manual for Roads and Bridges (DMRB) LA 104 Environmental assessment and monitoring (Ref 18.1). This sets out a high-level methodology for assessing cumulative effects for highways projects. While the proposed scheme is not a highways project, the general approach to the cumulative assessment can be adopted.
  - Planning Inspectorate advice note seventeen: This advice note sets out a staged approach to assessing cumulative effects for Nationally Significant Infrastructure Projects (NSIPs) in England and Wales. While this is not applicable to Northern Ireland, there is currently no equivalent guidance for Northern Ireland. As a result, the advice note has been used as a guide for the cumulative assessment.

#### Single project effects

##### Study area

- 18.2.2 The study area for the assessment of single project effects is defined by the study areas identified within the relevant environmental topics set out in the preceding chapters of this ES.

##### Assessment methodology

- 18.2.3 The assessment of combined effects requires an assessment of the impacts of the proposed scheme on single receptors. Combined effects occur where a number of separate environmental impacts (e.g. noise and air quality) affect a single receptor (e.g. fauna). The assessment of potential combined effects therefore considers the scope for all such effects to interact spatially and temporally to create inter-related impacts on a receptor. The combined effects assessment considers only those effects produced by the project and not from other developments. The assessment includes consideration of where multiple non-significant effects could combine to become significant.
- 18.2.4 In assessing the potential for combined effects, each topic has been reviewed in terms of the sensitive receptors it identifies and the likely effects. Effects reviewed are residual effects from each topic assessment, following the implementation of mitigation. Those topics with receptors in common and where individual impacts would likely result in cumulative effects on a receptor or group of receptors are considered in the assessment.

18.2.5 It should be noted that combined effects from the action of a number of different impacts upon a single resource/receptor are considered within Chapter 11: Terrestrial Biodiversity and Chapter 15: Population and Human Health, which are receptor-based assessments. These chapters consider the range of impacts that could affect both ecological and human receptors, and therefore present a combined effects assessment for those receptors. Similarly, the environmental factors topic chapters (Chapters 8-17) consider the in-combination effects of climate change and the scheme, to identify whether the effects of climate change could exacerbate or change the effects that have been considered within the assessment.

18.2.6 To determine if single project effects will be significant, the definitions listed in Table 18.1 are used.

Table 18.1 Significance of effect categories

Significance Category	Typical Descriptions
Very large	Effects that the decision-maker must take into account as the receptor/resource is irretrievably compromised.
Large	Effects that may become a key decision-making issue
Moderate	Effects that are unlikely to become issues on whether the project design should be selected, but where future work may be needed to improve on current performance.
Slight	Effects that are locally significant.
Neutral	Effects that are beyond the current forecasting ability or are within the ability of the resource to absorb such change.

## Different projects effects

### Study area

18.2.7 The study area for the assessment of different projects is a Zone of Influence (ZOI) based on the study areas defined for the topic assessments in ES Chapters 8 to 17. These are summarised in Table 18.2.

Table 18.2 Zone of influence per environmental topic

Environmental Topic	Zone of Influence
Air quality	<ul style="list-style-type: none"> <li>The ZOI extends 200m from the boundary of the proposed scheme.</li> </ul>
Cultural Heritage	<ul style="list-style-type: none"> <li>The ZOI extends 300m from the boundary of the proposed scheme.</li> </ul>
Landscape and Visual Effects	<ul style="list-style-type: none"> <li>The ZOI extends 500m from the proposed scheme for landscape and visual receptors. Beyond this, any other development in combination with the project will be unlikely to give rise to any significant effects on visual receptors due to the distance reducing the perceived scale and massing of the built elements and associated operational elements and the screening from intervening landform and vegetation.</li> </ul>
Terrestrial Biodiversity	<ul style="list-style-type: none"> <li>The ZOI extends 2km from the boundary of the proposed scheme. Within this, the ZOI for assessment purposes varies according to specific biodiversity receptors and is informed by best practice guidance from the Chartered Institute of Ecology and Environmental Management and other sources.</li> </ul>

Environmental Topic	Zone of Influence
Fisheries and Aquatic Ecology	<ul style="list-style-type: none"> <li>The ZOI extends 2km from the boundary of the proposed scheme. Within this, the ZOI for assessment purposes varies according to specific biodiversity receptors and is informed by best practice guidance from the Chartered Institute of Ecology and Environmental Management and other sources.</li> </ul>
Soil and land contamination	<ul style="list-style-type: none"> <li>The ZOI extends 100m from the boundary of the proposed scheme for land contamination sources.</li> </ul>
Noise and Vibration	<ul style="list-style-type: none"> <li>The ZOI extends 300m from the boundary of the proposed scheme.</li> </ul>
Population and Health	<ul style="list-style-type: none"> <li>The ZOI extends 500m from the boundary of the proposed scheme. Extension of the ZOI beyond 500m may be necessary to capture potential impacts to receptors beyond the ZOI boundary (i.e. where changes to land use and accessibility or health determinants are identified outside this area (e.g. due to impacts identified by other EIA topics).</li> </ul>
Hydrology and Drainage	<ul style="list-style-type: none"> <li>The ZOI extends 500m from the boundary of the proposed scheme for hydrology and drainage features. This is based on the 'source-pathway-receptor' pollutant linkage principle. Extension of the ZOI beyond 500m may be necessary to capture potential impacts to receptors beyond the ZOI boundary (i.e. where the scheme is likely to impact surface water receptors upstream or downstream of the study area or groundwater receptors where there is hydraulic connectivity).</li> </ul>

### Assessment methodology

18.2.8 The assessment methodology for cumulative effects involves identification of incremental changes likely to be caused by potential 'other developments' together with the proposed scheme.

18.2.9 Planning Inspectorate advice note seventeen provides a systematic approach to the cumulative effects assessment which can be split into four distinct phases, as detailed in Table 18.3.

Table 18.3 Four stages of cumulative effects assessment

Stage	Activity
Stage 1: Establish the Zone of Influence (ZOI) of the scheme and identify long list of 'other developments'.	<ul style="list-style-type: none"> <li>Identify the ZOI for each of the environmental topics</li> <li>Identify a long list of 'other developments' in the vicinity of the project which may have cumulative effects</li> <li>Undertake desktop review of available environmental information for identified cumulative developments</li> </ul>
Stage 2: Identify short list of 'other developments'.	<ul style="list-style-type: none"> <li>Identify which of the 'other developments' from Stage 1 has the potential to give rise to significant cumulative effects by virtue of overlaps in temporal scope, the scale and nature of the 'other development' and receiving environment; or any other relevant factors.</li> </ul>
Stage 3: Information gathering	<ul style="list-style-type: none"> <li>Information related to the shortlisted cumulative developments is gathered and reviewed.</li> </ul>



Stage	Activity
Stage 4: Assessment	<ul style="list-style-type: none"> <li>▪ Cumulative effects assessment of shortlisted cumulative development is undertaken. Each individual 'other development' is reviewed in turn to identify whether there is potential for significant cumulative effects.</li> <li>▪ Mitigation measures are identified.</li> </ul>

18.2.10 The guidance recommends that a wide range of future projects is included within the cumulative effects assessment.

18.2.11 The less information that is available for the future projects (i.e. environmental impacts predicted, project definition), the less likely that the cumulative effects assessment will be able to make any robust assessment in relation to these projects.

### **Stage 1 Establishing the ZOI and longlist of 'Other Development'**

18.2.12 As part of Stage 1, an initial Zone of Influence (ZOI) was established for each environmental topic, as presented previously in Table 18.2.

18.2.13 Relevant 'other developments' have been identified through a combination of consultation with relevant planning authorities and through a desk study. Information on planning applications and local plan allocations has been gathered from the following data sources:

- Northern Ireland Planning Portal (Ref 18.3)
- Armagh, Banbridge and Craigavon Borough Council (Ref 18.4).

18.2.14 The planning applications were screened through a filtering process to remove the following developments:

- Any planning applications older than five years (taken as prior to December 2016);
- Small scale applications, for example:
  - Construction of small-scale agricultural buildings;
  - House extensions or cosmetic changes to buildings;
  - Micro-generation wind turbines;
  - Roof mounted solar PV panels;
  - Renewal of planning permission for retention of existing operational use; and
  - Tree works.
- Listed building applications;
- Withdrawn applications;
- Dismissed appeals;
- Refused applications where the opportunity for appeal has passed (six months);
- Prior notification (Notice of Intention) applications;
- Non-material amendments;
- Discharge or variation of conditions.

## Stage 2: Identify shortlist of 'Other Developments'

18.2.15 At Stage 2, each of the developments in the longlist identified at Stage 1 have been considered in terms of whether they would likely generate impacts which could combine to result in cumulative effects in combination with the proposed flood alleviation scheme. A shortlist of 'other developments' was prepared using the criteria outlined in Table 18.4. Generally, only 'other developments' where an EIA is required are considered appropriate for inclusion in the cumulative assessment, however all factors in Table 18.4 have been considered.

Table 18.4 Criteria for shortlist of 'other development'.

Threshold	Description
The temporal scope of 'other development' potential for interaction.	<ul style="list-style-type: none"> <li>Consideration of relative construction, operation and decommissioning programmes of the 'other development' identified in the ZOI with the project programme, to establish whether there is overlap, or similar temporal scope for construction and operation phases, and any potential for interaction.</li> </ul>
The scale and nature of 'other development'	<ul style="list-style-type: none"> <li>Consideration of whether the scale and nature of the developments identified in the ZOI are likely to interact with the project and to result in a cumulative effect;</li> <li>Characteristics of other developments in relation to impacts to sensitive receptors, use of natural resources, pollution and nuisances, and risks to human health;</li> <li>The scale of developments which are more than 1 hectare of urban development which is not a dwelling development; or</li> <li>The development includes more than 150 dwellings; or</li> <li>The overall area of the development exceeds 5 hectares.</li> </ul>
Any other relevant factors	<ul style="list-style-type: none"> <li>Nature and/or capacity of the receiving environment that would make a significant cumulative effect with 'other development'. The sensitivity of the receiving environment includes whether the sites are within:               <ol style="list-style-type: none"> <li>known species locations</li> <li>wetlands, riparian areas, river mouths</li> <li>coastal zones and the marine environment</li> <li>mountain and forest areas</li> <li>nature reserves and parks</li> <li>European sites and other areas classified or protected under international and national legislation</li> <li>areas in which there has already been a failure to meet the environmental quality standards, laid down in European Union legislation and relevant to the project, or in which it is considered that there is such a failure</li> <li>densely populated areas</li> <li>landscapes and sites of historical, cultural, geological or archaeological significance.</li> </ol> </li> <li>The relative abundance, availability, quality and regenerative capacity of natural resources in the area.</li> <li>Potential for creation of source-pathway-receptor impacts.</li> </ul>

## Stage 3: Information gathering

18.2.16 At Stage 3, further information on the shortlisted 'other developments' is compiled. The further information includes the following, where possible:

- Proposed design and location information;

- Proposed programme of construction, operation and decommissioning; and
- Environmental assessments that set out baseline data and effects arising from the other existing development and/or approved development.

#### **Stage 4: Assessment**

- 18.2.17 At Stage 4, the assessment is undertaken. The assessment of significance of the cumulative effects is determined in accordance with the significance assessment as detailed within Section 2.4 Environmental Impact Assessment Methodology.
- 18.2.18 For the purposes of the assessment, the value of a resource and magnitude of impact is determined according to the criteria set within the preceding chapters of this ES: Chapters 8-17. The significance of effect is then carried forward from preceding chapters to identify the significance of cumulative effects with other developments.
- 18.2.19 Where significant cumulative effects beyond those identified as residual significant effects from the scheme in isolation are identified, an assessment of the need for additional mitigation (further to that already set out in the preceding ES chapters) is undertaken.
- 18.2.20 The assessment of cumulative effects varies depending on each environmental factor's individual assessment criteria and thresholds for significant effects. Significant effects are generally those where the significance of the effect is 'moderate' or greater.

### **18.3. Single Project Effects Assessment**

#### **Construction**

- 18.3.1 Following a review of each technical chapter, the following receptors have been identified as those being affected by more than one environmental impact:
- Residential and commercial properties within close proximity to the flood defence works;
  - Community assets within close proximity to the flood defence works;
  - Recreational users of People's Park and its amenities;
  - Recreational users of the River Bann riverside walk;
  - NCR 9/94: Loughshore Trail;
  - Walking Route 31: People's Park;
  - Brackagh Bog ASSI;
  - Derryvore ASSI;
  - River Bann;
  - Ballybay/Corcrain River;
  - Annagh River;
  - Anglers using the River Bann;
  - Bats; and
  - Badger.
- 18.3.2 Adverse construction effects on the residential, commercial and community receptors which lie within close proximity to the flood defences will include increased noise from construction machinery and piling (for some

locations), dust nuisance from earthworks, visual intrusion from all construction activities and disruption to access.

- 18.3.3 A number of WCH routes within the study area which run in close proximity to the flood defences will experience similar combined effects. This includes NCR 9/94 Loughshore Trail, Walking Route 31 and the River Bann riverside walk. Combined construction effects on these receptors will include nuisance from increased noise, dust from earthworks, disruption to access, visual intrusion from construction activities and changes in visual amenity as a result of the removal of screening vegetation.
- 18.3.4 There is potential for adverse effects on surface water quality for all watercourses within the study area from polluted runoff and accidental spillages during construction. Any pollution event can affect the biodiversity associated with the watercourses, through direct toxicity/mortality or indirectly through changes in prey availability. Any increase in particulate matter within the air has the potential to impact water quality if particles settle in surrounding watercourses.
- 18.3.5 Combined construction effects on biodiversity will include disturbance from non-chemical pollution, including noise, vibration, light and the presence of site personnel. Disturbance can affect a species ability to forage, by causing them to avoid or move away from noise, light and areas of site clearance. This can reduce the time they spend feeding which can subsequently affect their reproductive capability and have long term effects on local populations. Displacement to other feeding areas can result in an increase in competition for resources. The ecology assessment has determined that badger and bat species are present within the study area and are therefore at risk from such combined adverse effects during construction.
- 18.3.6 During construction, anglers using the River Bann will experience combined impacts as a result of disruption to access to the river for fishing and changes in amenity from construction noise and dust. Indirect impacts may arise from pollution affecting fish in the river, reducing the availability of fishing resource, which may in turn cause anglers to move to more productive areas on the River Bann.
- 18.3.7 Brackagh Bog ASSI will likely experience combined effects during construction. The designated site lies within close proximity to Site O Tandragee Road and will likely experience dust nuisance as well as increased noise and vibration from construction machinery. Temporary changes to local drainage patterns during construction may result in altered surface water and groundwater flows into the designated site.
- 18.3.8 With the implementation of the control measures outlined within this ES and CEMP, it is determined that there will be no significant combined single project effects during construction.

### **Operation**

- 18.3.9 Combined single project effects are not anticipated for the operation phase. The residential, commercial and community receptors located within close proximity to the proposed scheme will experience beneficial impacts as a result of reduced flood risk, however the beneficial impacts will be balanced by adverse impacts due to the visual intrusion of the flood defences.

## **18.4. Different Projects Effects Assessment**

### **Longlist of 'Other Developments'**

- 18.4.1 A search for other developments located within the ZOI for each environmental topic was undertaken using the Northern Ireland Planning Portal and Armagh City, Banbridge and Craigavon Borough Council website. Relevant developments within the ZOI were included within a longlist of other developments, as summarised in Table 18.5.

Table 18.5 Longlist of 'Other Developments'

Development	Description	Status
<b>2022</b>		
LA08/2022/0530/PAN  Shamrock Park, Brownstown Rd, Portadown, BT62 3PZ	Upgrading of Shamrock Park to include replacement of existing spectator stand, new training facilities to be contained with dome structure, relocation of existing grass pitch and floodlighting, provision of business/incubation and community space and other ancillary works.	<ul style="list-style-type: none"> <li>Application received: 28/04/2022</li> <li>Status: Proposal of Application Notice Acceptable</li> </ul>
LA08/2022/0415/F  Lands adjacent to and West of No.8 Moy Road and East of Number 9 10 12 13 and 21, Selshion Hall, Portadown, Armagh, BT62 4JR	Proposed erection of 30 no. dwellings with associated site works and landscaping.	<ul style="list-style-type: none"> <li>Application received: 23/03/2022</li> <li>Status: Consultations issued</li> </ul>
LA08/2022/0180/F  Lands approximately 50m North West of 34-36 Ballyoran Manor Portadown, Armagh, BT62 1PU	The erection of 13no. social housing dwellings consisting of 10no. 3P2B semi-detached houses, 2no. 5P3B semi-detached houses and 1no. 5P3B wheelchair house along with associated site works.	<ul style="list-style-type: none"> <li>Application received: 28/01/2022</li> <li>Status: Under consideration</li> </ul>
LA08/2022/0081/F  Lands North of 8 Ballybay View and to the rear of 172-183 Baltylum Meadows and 20m West of 18 Ballybay Meadows, Portadown, BT62 4DY	Proposed erection of 6 No. semi detached chalet bungalows	<ul style="list-style-type: none"> <li>Application received: 12/01/2022</li> <li>Status: Under consideration</li> </ul>
<b>2021</b>		
LA08/2019/1600/F  Embankment adjacent to & immediately east of Glen Dimplex Factory 5 Lurgan Road, Portadown	2.4m high acoustic fence along top of embankment	<ul style="list-style-type: none"> <li>Application received: 04/12/2021</li> <li>Status: Under consideration</li> </ul>
LA08/2018/0971/F  North of Epworth Methodist Church Montague Street, Portadown	Erection of new single storey standalone nursery playgroup building	<ul style="list-style-type: none"> <li>Application received: 02/07/2021</li> <li>Status: Permission granted 28/09/2021</li> </ul>
LA08/2021/1130/F  Lands 390 metres East of 36 Mahon Road, Portadown, BT62 3EH	Erection of 3 No. general industrial units Class B3 (in substitution of previous approved industrial units) and proposed amendments to approved warehouse from previously approved permission LA08/2016/1228/F.	<ul style="list-style-type: none"> <li>Application received: 28/07/2021</li> <li>Status: Consultations issued</li> </ul>
LA08/2021/1434/F	Erection of new club house, separate toilet block with food kiosk, installation of three	<ul style="list-style-type: none"> <li>Application received: 29/09/2021</li> <li>Status: Under consideration</li> </ul>

Development	Description	Status
Brownstown Park Sports Ground, Portadown, Armagh, BT62 3QJ	prefabricated spectator stands and formation of new synthetic training pitch with associated perimeter fence.	
LA08/2021/1142/F  Lands 40m north of 40 Clendinning Way (Site 31) Oakwood Hall housing development, Mahon Road, Portadown BT62 3FN	Erection of a dwelling and garage (Change of house type from N/2014/0463/F).	<ul style="list-style-type: none"> <li>Application received: 28/07/2021</li> <li>Status: Permission granted 04/10/2021</li> </ul>
LA08/2021/0902/F  Lands adjacent to No.6 Moy Road Portadown, BT62 1QL	Proposed new 2 No. 3G small sided playing pitch with fencing, new clubhouse and changing building, new viewing shelters, 3 No. floodlights at 12.2m and 3 No. floodlights at 15.2m height and associated siteworks (Amended description)	<ul style="list-style-type: none"> <li>Application received: 11/06/2021</li> <li>Status: Consultations issued</li> </ul>
LA08/2021/1589/F  Lands approximately 105m North West of 34-36 Ballyoran Manor, Drumcree Road, Portadown, Armagh, BT62 1PU	The proposed erection of 8 No. social housing dwellings consisting of 4 No. 3 person 2 bedroom apartments, 2 No. 2 person 1 bedroom apartments and 2 No. 3 person 2 bedroom wheelchair apartments.	<ul style="list-style-type: none"> <li>Application received: 01/11/2021</li> <li>Status: Under consideration</li> </ul>
LA08/2021/1388/F  139 Garvaghy Road, Portadown, Armagh, BT62 1EH	Erection of extension to supermarket to provide storage.	<ul style="list-style-type: none"> <li>Application received: 13/09/2021</li> <li>Status: Under consideration</li> </ul>
LA08/2021/0682/F  Ballyoran Primary School, Ballyoran Park, Portadown, Armagh, BT62 1JY	Provision of a 26 no. space car park, 2 no. drop off zones and 2 no. DDA accessible ramps also including 5 x 13m high column mounted LED lantern floodlights and new one way access from Ashgrove Road with one way exit onto Ballyoran Park with associated site works and landscaping	<ul style="list-style-type: none"> <li>Application received: 19/04/2021</li> <li>Status: Permission granted 18/10/2021</li> </ul>
LA08/2021/0700/F  Ballyoran Primary School, Ballyoran Park, Portadown, Armagh, BT62 1JY	Erection of 2.4m high Security Fencing to secure and prevent incursion, vandalism and anti-social behaviour on school property.  Situated along the front boundary of the school facing onto a minor road. Proposed fence to be joined to already existing fencing along school boundary.	<ul style="list-style-type: none"> <li>Application received: 29/04/2021</li> <li>Status: Permission granted 02/08/2021</li> </ul>
LA08/2021/0287/F  Land immediately adjacent to and south of No's 1-9 Ashton Hall Loughgall Road, Portadown	Proposed housing development of 13no. dwellings (1no. detached and 12no. semi-detached) with associated garages, estate roadway and site works	<ul style="list-style-type: none"> <li>Application received: 10/02/2021</li> <li>Status: Application withdrawn</li> </ul>

Development	Description	Status
BT62 4EF and 200m SW of Brownstown Business Centre including lands opposite / North of Tullyroan Drive, Portadown.		
LA08/2021/0978/F  30m North East of, 93a Loughgall Road, Portadown, BT62 4EG	Proposed tea room and associated ancillary space for sale of farm products, including production/store area with customer parking and site works.	<ul style="list-style-type: none"> <li>Application received: 23/06/2021</li> <li>Status: Permission granted 03/03/2022</li> </ul>
LA08/2021/0539/O  80m North East of, 120 Loughgall Road, Portadown, Armagh, BT62 4EG	Erection of dwelling	<ul style="list-style-type: none"> <li>Application received: 07/04/2021</li> <li>Status: Consultations issued</li> </ul>
LA08/2021/0158/F  Presentation Primary School, Thomas Street, Portadown, BT62 3AH	Two storey extension to rear of existing Primary School and internal refurbishment of existing building	<ul style="list-style-type: none"> <li>Application received: 02/02/2021</li> <li>Status: Consultations issued</li> </ul>
LA08/2021/0380/F  Site adjacent to and immediately to the rear and East of No's 20 18 14 & 12 Enniscrone Park and to the South West of No's 54 50 & 46 Bachelors Avenue, Portadown, BT63 5DQ (plot No's 5 9 15 2 4 14 & 16)	Erection of 7 semi-detached dwellings (change of house type application to those approved under N/2005/0788/F) to erection of 6 semi-detached houses with sunrooms at sites 5, 9, 15, 16, 2 and 4 and change of house type at site 14 and associated site works).	<ul style="list-style-type: none"> <li>Application received: 05/03/2021</li> <li>Status: Permission granted 31/08/2021</li> </ul>
LA08/2021/0194/F  1- 2 Upper Church Lane, Portadown, Armagh, BT63 5JE	Proposed erection of 5 no. two storey dwellings	<ul style="list-style-type: none"> <li>Application received: 08/02/2021</li> <li>Status: Consultations issued</li> </ul>
LA08/2021/1378/PAN  Lands south of Mandeville Road, approximately 450 metres west of 26 Clanrolla Road, Portadown, Co. Armagh, BT63 5SS	Proposed industrial unit, service compound, car parking, landscaping, access and ancillary site works.	<ul style="list-style-type: none"> <li>Application received: 24/09/2021</li> <li>Status: Proposal of Application Notice Acceptable</li> </ul>
LA08/2020/1192/F  172 Tandragee Road Portadown BT62 3BP (including lands to the south and adjacent to 172. Lands to west of and adjacent to 170 & 170a Tandragee Road and to the south of Woodview Avenue & Builders yard	Proposed housing developing comprising 5 no detached and 16 no semi detached and associated site works.	<ul style="list-style-type: none"> <li>Application received: 01/10/2021</li> <li>Status: Consultations issued</li> </ul>
LA08/2021/1495/O  Florencecourt rear of and North East of 7-21 Watson Street Portadown Armagh BT63 5AQ	Proposed housing development (to provide 9no. town houses and 6no. semi-detached).	<ul style="list-style-type: none"> <li>Application received: 11/10/2021</li> <li>Status: Under consideration</li> </ul>

Development	Description	Status
LA08/2020/1523/F  Lands between 80 and 90 Charles Street Portadown and lands to the rear of 90 - 94 Charles Street Portadown, Armagh, BT62 1DQ	Erection of 2 No. units (1 No. retail unit for the existing Garden Aids business and 1 No. unit for a Coffee Shop) to include all associated site works.	<ul style="list-style-type: none"> <li>Application received: 11/12/2020</li> <li>Status: Permission granted 24/06/2021</li> </ul>
LA08/2021/0497/F  Site 78m North West of, No. 47 Ballybay Meadows, Off Loughgall Road, Portadown, Armagh BT62 4DY	Housing development consisting of eight 3 bedroom semi-detached dwellings.	<ul style="list-style-type: none"> <li>Application received: 29/03/2021</li> <li>Status: Consultations issued</li> </ul>
<b>2020</b>		
LA08/2020/0283/O  Land bounded by SE boundary 77m due NW of existing Asda retail unit extending 67m due NW towards line of A3 Northway road. NE boundary bounded by Portadown RFC. SW boundary bounded by Joseph Street north of the roundabout towards Northway Road. Lands South East of Northway Road, Portadown.	Site for 1 No. cafe unit (drive thru) and 3 No. cafe/restaurant units and car parking spaces. (Renewal of previous approval under planning reference LA08/2015/1040/O)	<ul style="list-style-type: none"> <li>Application received: 28/02/2020</li> <li>Status: Permission granted 10/07/2021</li> </ul>
LA08/2020/0490/O  88 - 90 Loughgall Road, Portadown, BT62 4EG	Redevelopment of a vacant and derelict site to provide 1 No. replacement dwelling, 1 No. refurbished dwelling and a veterinary agricultural clinic with a flat over.	<ul style="list-style-type: none"> <li>Application received: 19/06/2020</li> <li>Status: Application Withdrawn</li> </ul>
LA08/2020/1282/F  Meadow Lane Pumping Station, 200 metres North East of No. 44 Meadow Lane, Portadown, Armagh, BT62 3NJ	Erection of a Northern Ireland Water control kiosk, the installation of an underground storm water storage tank, including the erection of a 2.4m black weldmesh paladin fence and the alteration of the existing car park access road to facilitate the extension of the existing pumping station site.	<ul style="list-style-type: none"> <li>Application received: 05/10/2020.</li> <li>Status: Permission granted 18/05/2022</li> </ul>
LA08/2020/0640/F  Lands 30 metres south of 37 - 42 Ballyoran Heights and 1 - 10 Garvaghy Park Portadown, BT62 1HB accessed off Ballyoran Hill Portadown BT62 1DJ.	Residential development of 40NO. dwellings, consisting of 18NO. 2 bed apartments, 14NO. 3 bed semi-detached dwellings and 8NO. detached dwellings.	<ul style="list-style-type: none"> <li>Application received: 22/07/2020.</li> <li>Status: Consultations issued.</li> </ul>
LA08/2020/1531/F  Dungannon Road Portadown - Lands 200m North West of No. 25 Dungannon Road and North East	Proposed housing development of 24 dwellings (10no.detached dwellings and 14no. semi detached dwellings) with single storey garages, landscaping, car parking	<ul style="list-style-type: none"> <li>Application received: 14/12/2020</li> <li>Status: Permission granted 20/04/2021</li> </ul>



Development	Description	Status
of No's 1 and 3 Selshion Gardens, Portadown.	and associated site works consisting of a road widening scheme to the retained Drumcree Road.	
<b>2019</b>		
LA08/2019/0216/O  Lands 45m to the north and east of 7 Swallowfield Court and immediately west of 70 Clendinning Way and 30m south west of 59 Clendinning Way Mahon Road Portadown.	Proposed site for residential development including new access and provision of public open space associated with the development and retention of existing footpath. Additional land to be transferred to the Council for the provision of a future children's play park.(amended description)	<ul style="list-style-type: none"> <li>Application received: 09/02/2019</li> <li>Status: Permission granted 16/03/2021</li> </ul>
LA08/2019/1635/F  Lands adjacent to and to the north of Meadows Retail Park, Meadow Lane, Portadown, BT62 3NJ	Proposed single storey drive through cafe, outdoor seating, height limiter, order point kiosk, landscaping, access, parking, provision, lighting and ancillary site works (Amended layout)	<ul style="list-style-type: none"> <li>Application received: 10.12.2019</li> <li>Status: Permission granted 20/04/2021</li> </ul>
LA08/2019/1374/F  High Street Mall, High Street Portadown, Armagh, BT62 1HX	Redevelopment of High Street Mall to include its partial demolition to form an external plaza. The proposal involves internal and external alterations with new facades and extended pedestrian entrances to the car park and Woodhouse Street. Amendments of the access, reconfiguration of service yard, new loading bay or dock and service ramp, with amended customer ramp and ancillary works	<ul style="list-style-type: none"> <li>Application received: 27/09/2019</li> <li>Status: Permission granted 18/12/2021</li> </ul>
LA08/2019/1667/F  Dungannon Road, Portadown - Lands 200m north of No. 25 Dungannon Road, Portadown, BT62 1LF	Proposed housing development of 41no. dwellings (13no. detached and 28no. semi detached) with single storey garages, landscaping, car parking and associated site works plus proposed culvert of existing watercourse to south eastern side of sites 61 & 63 (amended scheme)	<ul style="list-style-type: none"> <li>Application received: 18/12/2019</li> <li>Status: 21/01/2022</li> </ul>
LA08/2019/0424/F  Dungannon Road, Portadown - Lands north west of No. 25 Dungannon Road and north east of No. 4 Selshion Gardens, Portadown, BT62 1AT	Proposed Housing Development of 29no. dwellings (7no. detached and 22no.semi detached) with single storey garages, landscaping, car parking, associated site works plus pumping station for foul drainage (Amended description)	<ul style="list-style-type: none"> <li>Application received: 20/03/2019</li> <li>Status: Permission granted 20/09/2019</li> </ul>
LA08/2019/1009/PAN  The site is Located On Lands at and Surrounding (north East South And Southwest) St. Malachys Hurling Club 24 Moy Road Portadown (adjacent And South West And East Of No.22 Moy Road	Provision of 4No. new pitches (replacing existing pitch) sports changing pavilion with multi-purpose hall gym building maintenance building spectator stands/terraces keep nets; ball wall/training structure inflatable sports bubble floodlighting; car & coach parking landscaping	<ul style="list-style-type: none"> <li>Application received: 22/07/2019</li> <li>Status: Proposal of application notice acceptable</li> </ul>

Development	Description	Status
Adjacent And South Of No.17 Moy Road And No.2 Ashbrook Adjacent And West And North West Of No.4 Selshion Hall Adjacent And West And South West Of Nos.16 18 And 20 Moy Road Portadown.	footpath crossing & upgrade of link to existing footpath at Ashbrook and alterations to access and all associated site works.	
LA08/2019/0473/F  Parsons Gate, site Adjacent to south west of no. 23-27 (inclusive) Old Rectory Park, Portadown, BT62 3QH	Housing development consisting of 14 no. dwellings and associated site works	<ul style="list-style-type: none"> <li>▪ Application received: 01/04/2019</li> <li>▪ Status: Permission granted 31/07/2019</li> </ul>
<b>2018</b>		
LA08/2018/0734/F  Lands immediately to the south of 11-17 Roslyn Avenue Edenderry Portadown BT63 5BG. Approximately 40m North-West of Knock Eden and Edenderry Gardens Fold Housing Association. Approximately 90m West of Nos 12-16 Wildwood Levaghery Portadown BT63 5EE and East of R.A Irwin & Co Ltd Goban Street Edenderry Portadown BT63 5AG.	Proposed residential development scheme involving the erection of 21 single storey dwellings, comprising of 8 semi-detached and 13 detached unit, proposed new access via Roslyn Avenue, associated domestic garages, public open space, site works and landscaping. (Amended development description).	<ul style="list-style-type: none"> <li>▪ Application received: 30/05/2018</li> <li>▪ Status: Permission granted 20/04/2021</li> </ul>
LA08/2018/1375/O  4 Shillington Street, Portadown	Proposed demolition of existing structure and redevelopment to provide mixed use commercial and apartments.	<ul style="list-style-type: none"> <li>▪ Application received: 25/09/2018</li> <li>▪ Status: Permission granted 13/10/2020</li> </ul>
LA08/2018/1389/F  Lands northeast of no.21 Carn Road, Carn Industrial Estate, Craigavon.	Proposed anaerobic digestion plant to receive vegetable waste, animal slurry and energy crops to generate electricity and heat with biogas fuelled combined heat and power generator (CHP Unit), incorporating a reception tank, digester tank, post digester storage tank, underground surface water runoff tank, feeder unit, gas flare and control / engine room container with exhaust.	<ul style="list-style-type: none"> <li>▪ Application received: 27/09/2018</li> <li>▪ Status: Permission granted 06/01/2020</li> </ul>
LA08/2018/1402/F  Lands 40m north of 25 Bocombra Manor, Old Lurgan Road, Portadown	Proposed erection of 15no. dwellings consisting of 9 detached bungalows and 6 semi detached bungalows (revised layout and house types to previously approved sites 52 - 78 (22 sites) of approval N/2006/0653/F).	<ul style="list-style-type: none"> <li>▪ Application received: 01.10.2018</li> <li>▪ Status: Consultations issued</li> </ul>
LA08/2018/1224/F  Lands at St Marys Hall including Nos. 189 and 191 Obins Street, Portadown, BT62 1BT	Erection of housing development of 22 No. dwellings comprising of 5 No. pairs of semi-detached, 2 No. detached & 10 No. townhouses, with associated site works and landscaping	<ul style="list-style-type: none"> <li>▪ Application received: 23/08/2018</li> <li>▪ Status: Permission granted 26/05/2020</li> </ul>

Development	Description	Status
LA08/2018/0379/O  Castleisland Factory Garvaghy Road, Portadown	Demolition of existing factory buildings and construction of replacement industrial accommodation, including factory buildings, showroom, visitor centre, offices, and other ancillary works (Renewal of planning approval N/2012/0481/O).	<ul style="list-style-type: none"> <li>Application granted: 22/03/2018</li> <li>Status: Permission granted 13/09/2018</li> </ul>
LA08/2018/0868/O  Lands at Tandragee Road, Portadown (East of Nos 211, 217, 227 and 229 Tandragee Road North of 4, 6, 8 and 12 Harcourts Hill South of The Fairways Residential development) Portadown	Site for residential development (180 no dwellings) and associated open space, infrastructure and landscaping with access from Tandragee Road	<ul style="list-style-type: none"> <li>Application received 21/06/2018</li> <li>Status: Permission granted 25/05/2021</li> </ul>
LA08/2018/0604/O  71 Seagoe Road, Portadown, BT63 5HS	Proposed residential housing development, comprising of 14 two storey dwelling houses, semi-detached & detached complete with private garden, amenity space and car parking.	<ul style="list-style-type: none"> <li>Application received 08/05/2018</li> <li>Status: Permission granted 16/08/2019</li> </ul>
<b>2017</b>		
LA08/2017/1706/F  Former Wades Factory Premises Watson Street, Portadown.	Demolition of former industrial premises. Erection of new Church, with associated facilities including creches, kids rooms, multi-purpose halls, meeting rooms and offices, car parking and associated site works. (additional information received)	<ul style="list-style-type: none"> <li>Application received 06/12/2017</li> <li>Status: Consultations issued</li> </ul>
LA08/2017/1070/O  Lands to the east of Bracken Lodge /Lisnisky Lane, Portadown, BT63 5XD.	Residential development (approximately 500 dwellings) and creche on lands located to the east of Bracken Lodge / Lisnisky Road / Lisnisky Lane, Portadown BT65 5XD	<ul style="list-style-type: none"> <li>Application received 01/08/2017</li> <li>Status: Permission granted 13/08/2020</li> </ul>
LA08/2017/0239/F  Foundary Street Carpark Edenderry Portadown, BT63 5AB	Provision of additional carparking spaces and environmental improvement works to site which includes the demolition of the existing lighter shed, landscaping scheme and the resurfacing of existing carpark in part.	<ul style="list-style-type: none"> <li>Application granted 17/02/2017</li> <li>Status: Permission granted 15/03/2022</li> </ul>
LA08/2017/1478/F  Lands adjacent to and immediately north of No. 151 Ballylum Meadows, Loughgall Road Portadown, BT62 4BW	Erection of 10 No. dwellings and associated site works	<ul style="list-style-type: none"> <li>Application received: 27/10/2017</li> <li>Status: Permission granted 29/06/2018</li> </ul>
LA08/2017/1500/F	Erection of 23 No. dwellings, including revised layout, levels, landscaping and design from N/2010/0363/F (to include retention of 16 No. dwellings at 1-	<ul style="list-style-type: none"> <li>Application received: 30/10/2017</li> <li>Status: Permission granted 04/03/2019</li> </ul>

Development	Description	Status
Parsons Gate (land adjacent to southwest side of Old Rectory Park) Armagh Road, Portadown	16 Parsons Gate) Amended scheme	
<b>2016</b>		
LA08/2016/1559/F  Lands North of junction between Corcrair Road and Northway (Bodega Junction). Adjacent to Curran Street and Former Henry Denny and Sons Ltd Factory at 6 Corcrair Road, Portadown, Armagh BT62 3UF	Provision of 347 space Park and Ride facility including lighting, CCTV, cycle shelter, general storage area, landscaping and all associated access and egress facilities including Right Turn Lane to Corcrair Road (amended details)	<ul style="list-style-type: none"> <li>▪ Application received: 21/11/2016</li> <li>▪ Status: Permission granted 15/09/2017</li> </ul>
LA08/2016/0175/F  Lands between Ashgrove Manor and 38 Ashgrove Road, Portadown	Construction of 70 Dwellings (12 Detached dwellings and 58 Semi Detached dwellings) with associated works.	<ul style="list-style-type: none"> <li>▪ Application received: 09/02/2016</li> <li>▪ Status: Permission granted 14th September 2016</li> </ul>

### Shortlist of 'Other Developments'

18.4.2 From the longlist of other developments there are no other EIA projects. Using the criteria outlined in Table 18.4, the longlist of other developments has been reviewed and reduced to a proportionate shortlist of developments to assess. The shortlisted developments are detailed below along with some further information as part of the Stage 3 information gathering process as outlined in **Section 18.2**.

- LA08/2022/0530/PAN: Upgrading of Shamrock Park to include replacement of existing spectator stand, new training facilities to be contained with dome structure, relocation of existing grass pitch and floodlighting, provision of business/incubation and community space and other ancillary works. This development was submitted for planning approval in April 2022 and is currently awaiting decision. The closest site to the development is Site Q Ripley Mews. There are no construction dates for the development and so it is possible that it may coincide with the Portadown FAS. No environmental information has been submitted alongside the planning application.
- LA08/2022/0415/F: Proposed erection of 30 dwellings with associated site works and landscaping. The nearest development to this site is Site A1 Corcrair Mews. The development was submitted for planning approval in March 2022 and it is currently at the consultation stage. There are currently no details on when the development will be constructed and it is possible it could coincide with construction of the Portadown FAS. The development is not an EIA development and the only environmental documentation submitted alongside the planning application was a Preliminary Ecological Appraisal (PEA).
- LA08/2018/0379/O: Demolition of existing factory buildings and construction of replacement industrial accommodation, including factory buildings, showroom, visitor centre, offices and other ancillary works. This development lies immediately adjacent to Site C Ulster Carpets and within close proximity to Site D People's Park. The development was granted planning permission in September 2019, yet construction has not yet started. The scale of the development means it is possible that construction may overlap with construction of the proposed scheme. While this project not an EIA development, the following environmental assessments have been submitted as part of the planning application; geology assessment, flood risk assessment and noise impact assessment. No significant adverse impacts are determined within the assessments.
- LA08/2018/1224/F: Erection of housing development of 22 dwellings comprising of five semi-detached dwellings, two detached dwellings and ten townhouses, with associated site works and landscaping. This development lies in close proximity to the proposed Site F Rose Cottages. The development was granted planning permission in May 2020 and construction has since not started. It is possible that

given the scale of the development construction of the housing may coincide with construction of the proposed scheme. The following environmental assessments were submitted with the planning application: biodiversity checklist, drainage assessment and bat roosting assessment report. No significant environmental effects are determined within the assessments.

- LA08/2020/0640/F: Residential development of 40 dwellings, consisting of 18 two bed apartments, 14 three bed semi-detached dwellings and 8 detached dwellings. This development lies in close proximity to the proposed Site F Rose Cottages. The development was submitted for planning approval May 2020 and construction has since not started. It is possible that given the scale of the development construction of the housing may coincide with construction of the proposed scheme. The following environmental information was submitted alongside the planning application; Preliminary Ecological Appraisal (PEA), noise impact assessment and drainage assessment. No significant impacts are determined within the assessments provided.
- LA08/2018/0734/F: Proposed residential development scheme involving the erection of 21 single storey dwellings, comprising of eight semi-detached and 13 detached unit, proposed new access via Roslyn Avenue, associated domestic garages, public open space, site works and landscaping. This development lies in close proximity to Site H Castle Street, Site I Foundry Street, Site J Bowling Green, Site L Irwins Mill. The development was granted planning permission in April 2021 and construction of the scheme has commenced. It is possible that the final phases of construction may coincide with construction of the proposed scheme. The following environmental information was submitted alongside the planning application; Preliminary Ecological Appraisal (PEA), drainage assessment, flood risk assessment, ecological impact assessment and noise assessment. No significant adverse impacts are determined within the assessments.
- LA08/2017/1706/F: Demolition of former industrial premises. Erection of new Church, with associated facilities including creches, kids rooms, multi-purpose halls, meeting rooms and offices, car parking and associated site works. This development lies in close proximity to Site H Castle Street, Site J Bowling Green, Site L Irwins Mill. The application was submitted with the following environmental information: air quality assessment, bat roost assessment and drainage assessment. No significant adverse effects are determined.
- LA08/2018/0868/O: Site for residential development (180 dwellings) and associated open space, infrastructure and landscaping with access from Tandragee Road. This development lies in close proximity to Site N Olde Golf Links and Site N2 Fairways Estate. The development was granted planning permission in May 2021. Construction of the scheme has not yet commenced. It is possible that given the scale of the development, construction of the housing may coincide with construction of the proposed scheme. The application was submitted with the following environmental information; ecological report, flood risk and drainage assessment and air quality impact assessment. No significant effects are outlined within the reports.
- LA08/2021/1130/F: Erection of three general industrial units Class B3 (in substitution of previous approved industrial units) and proposed amendments to approved warehouse from previously approved permission LA08/2016/1228/F. This development lies in close proximity to Site N Olde Golf Links, Site N2 Fairways Estate and Site Q Ripley Mews. The planning application was submitted in July 2021 and planning permission was granted in December 2021. There is possibility that construction of the industrial units may coincide with the proposed scheme. The following environmental information was submitted with the planning application: noise assessment, flood risk assessment and drainage assessment. No significant effects are determined within the assessments.
- LA08/2021/0497/F: Housing development consisting of eight three bedroom semi-detached dwellings. This development lies in close proximity to Site S Corcrain Drive. The application was submitted in March 2021 and its currently awaiting a decision. There is potential for construction of the scheme to coincide with the proposed development. The following information was submitted with the planning application: Biodiversity checklist, drainage and flood risk assessment and landscape management pan. No significant effects are determined within the assessments.
- LA08/2020/1192/F: Proposed housing developing comprising five detached and 16 semi-detached and associated site works. This application was submitted in October 2021 and is currently at the

consultation stage. The site lies immediately adjacent to Site N Olde Golf Links and within close proximity to Site N2 Fairways Estate. The following environmental reports were submitted along with the application: drainage assessment and biodiversity checklist. No significant effects are identified within the drainage assessment and no impact assessment is included within the biodiversity checklist.

- LA08/2021/1495/O: Proposed housing development to provide nine townhouses and six semi-detached. This application was submitted in October 2021 and is currently under consideration. The closest site to the development is Site I Foundry Street. A drainage assessment was submitted alongside the planning application. The report does not identify any significant effects on drainage.
- LA08/2020/1282/F: Erection of a Northern Ireland Water control kiosk, the installation of an underground storm water storage tank, including the erection of a 2.4m black weldmesh paladin fence and the alteration of the existing car park access road to facilitate the extension of the existing pumping station site. This application was submitted in October 2020 and planning permission was granted in May 2022. The development lies immediately adjacent to Site J Bowling Green. The following environmental information has been submitted alongside the application: flood risk assessment and habitats regulations assessment. No significant effects are determined within these reports.
- LA08/2020/1531/F: Proposed housing development of 24 dwellings (10 detached dwellings and 14 semi detached dwellings) with single storey garages, landscaping, car parking and associated site works consisting of a road widening scheme to the retained Drumcree Road. This application was received in December 2020 and permission was granted in April 2021. The closest site to the development is Site A Corcrain Mews. No environmental information was submitted alongside the planning application.
- LA08/2019/0216/O: Proposed site for residential development including 38 dwellings, new access and provision of public open space associated with the development. This application received planning permission in March 2021, yet at the time of writing construction of this development has not commenced. The closest site to the development is Site N2 Fairways Estate. It is possible that construction of this development could coincide with the Portadown FAS. The following environmental information has been submitted alongside the application: flood risk assessment, drainage assessment, biodiversity checklist, tree survey report and bat survey report. No significant effects are identified within the reports.
- LA08/2019/0424/F: Proposed housing development of 29 dwellings. Planning permission for this scheme was granted in September 2019 and construction of the housing is currently under way. The closest site to the development is Site A1 Corcrain Mews. It is likely that the majority of this development will be complete by the time the proposed FAS is due for construction. The following environmental information has been submitted alongside the planning application: drainage assessment, biodiversity checklist, archaeological programme of works and construction environmental management plan. There are no significant effects outlined within any of the assessments.
- LA08/2018/1389/F: Proposed anaerobic digestion plant to receive vegetable waste, animal slurry and energy crops. Planning permission for this scheme was granted in January 2020, yet at the time of writing, construction is yet to commence. The closest site to the development is Site P Derryvore Lane. Given the uncertainty surrounding the construction dates of this scheme, it is possible that construction could coincide with the Portadown FAS. The following environmental information was submitted alongside the application: air quality assessment, drainage assessment, noise impact assessment and biodiversity checklist. No significant effects are outlined within the assessments.
- LA08/2021/0158/F: Two storey extension to rear of existing Primary School and internal refurbishment of existing building. This application was submitted in February 2021 and is currently at the consultation stage. The development lies immediately adjacent to the proposed flood defences at Site M Annagh Hill. As the application has not received planning permission as of May 2022, it is uncertain when this project will progress to construction. At this stage, it is possible that construction could coincide with the Portadown FAS. No environmental information has been submitted alongside the planning application.

### **Cumulative assessment**

18.4.3 The assessment of shortlisted other developments is provided in Table 18.6.

Table 18.6 Cumulative effects assessment of short listed 'other developments'

Development	Description	Status	Overlap in temporal scope	Scale and nature of development likely to have a significant effect?
LA08/2022/0530/PAN  Shamrock Park Brownstown Rd Portadown BT62 3PZ	Upgrading of Shamrock Park to include replacement of existing spectator stand, new training facilities to be contained with dome structure, relocation of existing grass pitch and floodlighting, provision of business/incubation and community space and other ancillary works	<ul style="list-style-type: none"> <li>Application received: 28/04/2022</li> <li>Status: Proposal of Application Notice Acceptable</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction dates – as construction dates are unavailable.</li> <li>Overlap in operational phase.</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction programmes which may give rise to cumulative construction air quality, noise and population and human health effects.</li> <li>Significant effects unlikely with mitigation in place.</li> </ul>
LA08/2022/0415/F  Lands adjacent to and West of No.8 Moy Road and East of Number 9 10 12 13 and 21 Selshion Hall Portadown Armagh BT62 4JR	Proposed erection of 30 dwellings with associated site works and landscaping.	<ul style="list-style-type: none"> <li>Application received: 23/03/2022</li> <li>Status: Consultations issued</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction dates – as construction dates are unavailable.</li> <li>Overlap in operational phase.</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction programmes which may give rise to cumulative air quality, noise, landscape/visual and population and human health effects, particularly due to the proximity of Site A1 Corcrair Mews (within 500m).</li> <li>Significant effects are unlikely with mitigation in place.</li> </ul>
LA08/2021/1130/F  Lands 390 metres East of 36 Mahon Road, Portadown, BT62 3EH	Erection of three general industrial units Class B3 (in substitution of previous approved industrial units) and proposed amendments to approved warehouse from previously approved permission LA08/2016/1228/F.	<ul style="list-style-type: none"> <li>Application received: 28/07/2021</li> <li>Status: Permission granted 07/12/2021</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction dates. Permission was granted in December 2021, yet a search on Google Maps indicates that construction of the development has not yet commenced. Construction dates are currently unknown.</li> <li>Overlap in operational phase.</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction programmes which may give rise to cumulative construction air quality, noise, landscape/visual and population and human health effects, particularly due to the proximity of Site N Olde Golf Links (immediately adjacent), Site N2 Fairways Estate and Site Q Ripley Mews.</li> <li>Significant effects are unlikely with mitigation in place.</li> </ul>



Development	Description	Status	Overlap in temporal scope	Scale and nature of development likely to have a significant effect?
LA08/2021/0497/F  Site 78m north west of No. 47 Ballybay Meadows Off Loughgall Road, Portadown, Armagh BT62 4DY	Housing development consisting of eight three bedroom semi-detached dwellings.	<ul style="list-style-type: none"> <li>Application received 29/05/2021</li> <li>Status: Consultations issued</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction as construction dates are currently unknown.</li> <li>Overlap in operational phase.</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction programmes which may give rise to cumulative construction air quality, noise, landscape/visual and population and human health effects, particularly due to the proximity of Site S Corcrain Drive.</li> <li>Significant effects are unlikely with mitigation in place.</li> </ul>
LA08/2020/1192/F  172 Tandragee Road Portadown BT62 3BP	Proposed housing developing comprising 5 no detached and 16 no semi detached and associated site works.	<ul style="list-style-type: none"> <li>Application received: 01/10/2020</li> <li>Status: Consultations issued</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction as construction dates are currently unknown.</li> <li>Overlap in operational phase.</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction programmes which may give rise to cumulative construction air quality, noise, landscape/visual and population and human health effects, particularly due to the proximity of Site N Olde Golf Links.</li> <li>Significant effects are unlikely with mitigation in place.</li> </ul>
LA08/2021/0158/F  Presentation Primary School, Thomas Street, Portadown, BT62 3AH	Two storey extension to rear of existing Primary School and internal refurbishment of existing building	<ul style="list-style-type: none"> <li>Application received: 02/02/2021</li> <li>Status: Consultations issued</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction dates. The development is currently at the consultation stage and construction dates are currently unknown.</li> <li>Overlap in operational phase.</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction programmes which may give rise to cumulative air quality, noise, landscape/visual and population and human health effects, particularly due to the proximity of the development to Site M Annagh Hill (immediately adjacent) and Site K Health Centre.</li> <li>Significant effects are unlikely with mitigation in place.</li> </ul>
LA08/2021/1495/O  Florencecourt rear of and North East of 7-21 Watson Street Portadown Armagh BT63 5AQ	Proposed housing development (to provide nine town houses and six semi-detached).	<ul style="list-style-type: none"> <li>Application received: 11/10/2021</li> <li>Status: Under consideration</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction dates - construction dates are currently unknown.</li> <li>Overlap in operational phase.</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction programmes which may give rise to cumulative air quality, noise, landscape/visual and population and human health effects, particularly</li> </ul>

Development	Description	Status	Overlap in temporal scope	Scale and nature of development likely to have a significant effect?
				<p>due to the proximity to Site I Foundry Street.</p> <ul style="list-style-type: none"> <li>Significant effects are unlikely with mitigation in place.</li> </ul>
<p>LA08/2020/1282/F</p> <p>Meadow Lane Pumping Station, 200 metres North East of No. 44 Meadow Lane, Portadown, Armagh, BT62 3NJ</p>	<p>Erection of a Northern Ireland Water control kiosk, the installation of an underground storm water storage tank, including the erection of a 2.4m black weldmesh paladin fence and the alteration of the existing car park access road to facilitate the extension of the existing pumping station site.</p>	<ul style="list-style-type: none"> <li>Application received: 05/10/2020.</li> <li>Status: Permission granted 18/05/2022.</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction dates. Planning permission was granted in May 2022. It is currently unknown if construction works have commenced. The construction programme is currently unknown.</li> <li>Overlap in operational phase.</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction programmes which may give rise to cumulative construction traffic, noise, air quality and population and human health effects, particularly due to the proximity to Site J Bowling Green.</li> <li>Significant effects are unlikely with mitigation in place. Modelling has indicated that the proposed FAS will protect the development site from a 1% AEP climate change flood event.</li> </ul>
<p>LA08/2020/0640/F</p> <p>Lands 30 metres south of 37 - 42 Ballyoran Heights and 1 - 10 Garvagh Park Portadown, BT62 1HB accessed off Ballyoran Hill Portadown BT62 1DJ.</p>	<p>Residential development of 40 dwellings, consisting of 18 two bed apartments, 14 three bed semi-detached dwellings and 80 detached dwellings.</p>	<ul style="list-style-type: none"> <li>Application received: 22/07/2020.</li> <li>Status: Consultations issued.</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction dates - construction dates are currently unknown.</li> <li>Overlap in operational phase.</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction programmes which may give rise to cumulative air quality, noise, landscape/visual and population and human health effects, particularly due to the proximity to Site F Rose Cottages.</li> <li>Significant effects are unlikely with mitigation in place.</li> </ul>
<p>LA08/2020/1531/F</p> <p>Dungannon Road Portadown - Lands 200m North West of No. 25 Dungannon Road and North East of No's 1 and 3 Selshion Gardens Portadown</p>	<p>Proposed housing development of 24 dwellings (10no. detached dwellings and 14no. semi detached dwellings) with single storey garages, landscaping, car parking and associated site works consisting of a road widening scheme to the retained Drumcree Road.</p>	<ul style="list-style-type: none"> <li>Application received: 14/12/2020</li> <li>Status: Permission granted 20/04/2021</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction dates – planning permission was granted in April 2021. A search using Google Maps indicates that site clearance for the development had commenced as of July 2021. It is possible that the final phases of the housing development may coincide with the FAS.</li> <li>Overlap in operational phase.</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction programmes, however the nearest flood defence site is located at Site A1 Corcrair Mews over 700m away. Cumulative effects are unlikely.</li> <li>Significant effects are not determined.</li> </ul>

Development	Description	Status	Overlap in temporal scope	Scale and nature of development likely to have a significant effect?
<p>LA08/2019/0216/O</p> <p>Lands 45m to the north and east of 7 Swallowfield Court and immediately west of 70 Clendinning Way and 30m south west of 59 Clendinning Way Mahon Road Portadown.</p>	<p>Proposed site for residential development including new access and provision of public open space associated with the development and retention of existing footpath. Additional land to be transferred to the Council for the provision of a future children's play park.(amended description)</p>	<ul style="list-style-type: none"> <li>Application received: 09/02/2019</li> <li>Status: Permission granted 16/03/2021</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction dates – planning permission was granted in March 2021. A search using Google Maps indicates that construction of the development had not commenced as of July 2021. It is possible that the final phases of the housing development may coincide with the FAS.</li> <li>Overlap in operational phase.</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction programmes, however the nearest flood defence site is located at Site N2 Fairways over 900m away. Cumulative effects are unlikely.</li> <li>Significant effects are unlikely with mitigation in place.</li> </ul>
<p>LA08/2019/0424/F</p> <p>Dungannon Road, Portadown - Lands north west of No. 25 Dungannon Road and north east of No. 4 Selshion Gardens, Portadown, BT62 1AT</p>	<p>Proposed Housing Development of 29 dwellings (seven detached and 22 semi-detached) with single storey garages, landscaping, car parking, associated site works plus pumping station for foul drainage (Amended description)</p>	<ul style="list-style-type: none"> <li>Application received: 20/03/2019</li> <li>Status: Permission granted 20/09/2019</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction dates – planning permission was granted in September 2019. A search using Google Maps indicates that construction of the development has since commenced. It is possible that the final phases of the housing development may coincide with the FAS.</li> <li>Overlap in operational phase.</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction programmes, however the nearest flood defence site is located at Site A1 Corcrain Mews over 900m away. Cumulative effects are unlikely.</li> <li>Significant effects are unlikely with mitigation in place.</li> </ul>
<p>LA08/2018/0734/F</p> <p>Lands immediately to the south of 11-17 Roslyn Avenue Edenderry Portadown BT63 5BG. Approximately 40m North-West of Knock Eden and Edenderry Gardens Fold Housing Association. Approximately 90m West of Nos 12-16 Wildwood Levaghery Portadown BT63 5EE and East of R.A Irwin &amp; Co Ltd Goban Street Edenderry Portadown BT63 5AG.</p>	<p>Proposed residential development scheme involving the erection of 21 single storey dwellings, comprising of 8 semi-detached and 13 detached unit, proposed new access via Roslyn Avenue, associated domestic garages, public open space, site works and landscaping. (Amended development description).</p>	<ul style="list-style-type: none"> <li>Application received: 30/05/2018</li> <li>Status: Permission granted 20/04/2021</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction dates – planning permission was granted in April 2021 and construction has commenced. It is possible that the final phases of the housing development may coincide with the FAS.</li> <li>Overlap in operational phase.</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction programmes which may give rise to cumulative construction air quality, noise, landscape/visual and population and human health effects, particularly due to the proximity of the development to Site H Castle Street, Site I Foundry Street, Site J Bowling Green, Site L Irwins Mill. It is likely however that construction of this development will be complete prior to construction of the FAS scheme.</li> <li>Significant effects are unlikely with mitigation in place. The development lies outwith the floodplain and has</li> </ul>

Development	Description	Status	Overlap in temporal scope	Scale and nature of development likely to have a significant effect?
				been designed to be above the flood levels.
LA08/2018/1389/F  Lands northeast of no.21 Carn Road, Carn Industrial Estate Craigavon.	Proposed anaerobic digestion plant to receive vegetable waste, animal slurry and energy crops to generate electricity and heat with biogas fuelled combined heat and power generator (CHP Unit), incorporating a reception tank, digester tank, post digester storage tank, underground surface water runoff tank, feeder unit, gas flare and control / engine room container with exhaust.	<ul style="list-style-type: none"> <li>Application received: 27/09/2018</li> <li>Status: Permission granted 06/01/2020</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction dates – planning permission was granted in January 2020. A search using Google Maps indicates that construction of the development has not yet commenced. It is possible that construction of the development may coincide with the FAS.</li> <li>Overlap in operational phase.</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction programmes. The development lies over 1.7km from the nearest flood defence (Site P Derryvore Lane). Cumulative construction effects are unlikely.</li> <li>Significant effects are not determined.</li> </ul>
LA08/2018/1224/F  Lands at St Marys Hall including Nos. 189 and 191 Obins Street Portadown BT62 1BT	Erection of housing development of 22 dwellings comprising of five pairs of semi-detached, two detached and 10 townhouses, with associated site works and landscaping	<ul style="list-style-type: none"> <li>Application received: 23/08/2018</li> <li>Status: Permission granted 26/05/2020</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction dates – planning permission was granted in May 2020. A search using Google Maps indicates that construction of the development has not yet commenced. It is possible that the final phases of the housing development may coincide with the FAS.</li> <li>Overlap in operational phase.</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction programmes which may give rise to cumulative construction air quality, noise, landscape/visual and population and human health effects, particularly due to the proximity of the development to Site F Rose Cottages.</li> <li>Significant effects are unlikely with mitigation in place.</li> </ul>
LA08/2018/0379/O  Castleisland Factory Garvaghy Road Portadown	Demolition of existing factory buildings and construction of replacement industrial accommodation, including factory buildings, showroom, visitor centre, offices, and other ancillary works (Renewal of planning approval N/2012/0481/O).	<ul style="list-style-type: none"> <li>Application granted: 22/03/2018</li> <li>Status: Permission granted 13/09/2018</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction dates. Planning permission was granted in May 2020. A search using Google Maps indicates that construction of the development has not yet commenced. It is possible that the development may coincide with the FAS.</li> <li>Overlap in operational phase.</li> </ul>	<ul style="list-style-type: none"> <li>Potential overlap in construction programmes which may give rise to cumulative construction air quality, noise, landscape/visual and population and human health effects, particularly due to the proximity of the development to Site H Castle Street.</li> <li>Significant effects are unlikely with mitigation in place.</li> </ul>

Development	Description	Status	Overlap in temporal scope	Scale and nature of development likely to have a significant effect?
<p>LA08/2018/0868/O</p> <p>Lands at Tandragee Road, Portadown (East of Nos 211, 217, 227 and 229 Tandragee Road North of 4, 6, 8 and 12 Harcourts Hill South of The Fairways Residential development) Portadown</p>	<p>Site for residential development (180 dwellings) and associated open space, infrastructure and landscaping with access from Tandragee Road</p>	<ul style="list-style-type: none"> <li>▪ Application received: 21/06/2018</li> <li>▪ Status: Permission granted 25/05/2021</li> </ul>	<ul style="list-style-type: none"> <li>▪ Potential overlap in construction dates – planning permission was granted in May 2021. A search using Google Maps indicates that construction of the development has not yet commenced. It is possible that the final phases of the housing development may coincide with the FAS.</li> <li>▪ Overlap in operational phase.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Potential overlap in construction programmes which may give rise to cumulative air quality, noise and population and human health effects, particularly due to the proximity of the development to Site N2 Fairways Estate (immediately adjacent) and Site N Olde Golf Links.</li> <li>▪ This development lies immediately adjacent to the proposed flood defences at Site N2 Fairways. The development has considered flood risk in its planning application and concluded no significant effects. The proposed flood defences at Site N2 will not increase the flood risk at the development site. Significant cumulative effects are not determined during operation.</li> </ul>
<p>LA08/2017/1706/F</p> <p>Former Wades Factory Premises Watson Street Portadown.</p>	<p>Demolition of former industrial premises. Erection of new Church, with associated facilities including creches, kids rooms, multi-purpose halls, meeting rooms and offices, car parking and associated site works. (additional information received)</p>	<ul style="list-style-type: none"> <li>▪ Application received: 06/12/2017</li> <li>▪ Status: Consultations issued.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Potential overlap in construction dates – planning application was submitted in December 2017 and no decision has been made of June 2022. It is possible that the development may coincide with the FAS.</li> <li>▪ Overlap in operational phase.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Potential overlap in construction programmes which may give rise to cumulative air quality, noise, landscape/visual and population and human health effects, particularly due to the proximity of the development to Site I Foundry Street.</li> <li>▪ Significant effects are unlikely with mitigation in place.</li> </ul>

## 18.5. Monitoring

18.5.1 The assessment has concluded that there will be no significant cumulative effects. As a result, no further mitigation or monitoring beyond what is outlined within the ES is required.

## 18.6. Summary

- 18.6.1 In accordance with the EIA regulations, this ES has considered the cumulative effects of the proposed flood alleviation scheme. Two types of cumulative effects have been considered: single project effects and different project effects.
- 18.6.2 The single project assessment has concluded no significant cumulative effects. During construction it is likely that various receptors will experience combined effects of individual impacts from the scheme, however it is determined that significant effects are unlikely with mitigation measures in place.
- 18.6.3 The different projects assessment has concluded no significant cumulative effects. The majority of other developments within the study area are at stage where construction dates are unknown. It is possible that some of the developments will coincide with the proposed flood alleviation scheme and cumulative construction effects will arise. Cumulative effects on air quality, noise and vibration, landscape and visual and population and human health will be likely, however, with mitigation in place effects are not determined to be significant.

## 19. Schedule of Environmental Commitments

- 19.1.1 In line with the EIA regulations, the environmental commitments should be reported within the ES. The commitments are the mitigation measures recommended within each topic chapter which ensure that construction and operation impacts are prevented or minimised, in order to ensure no significant effects arise as a result of the proposed scheme. The commitments are outlined in Table 19.1 and 19.2.

## 19.1. Construction

19.1.1 The environmental commitments for the construction phase are outlined in Table 19.1.

Table 19.1 Schedule of environmental commitments (construction)

Mitigation item	Mitigation objective	Responsible for implementation	Mitigation measures	Potential timing of measure	Potential monitoring requirements
<b>Air Quality</b>					
AQ1	Ensure effective communication	Contractor	<ul style="list-style-type: none"> <li>Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.</li> <li>Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.</li> <li>Display the head or regional office contact information.</li> </ul>	In advance of, and concurrent with construction.	Monitoring of works to ensure compliance with requirements and standards.
AQ2	Ensure site is managed to prevent and reduce impacts on air quality	Contractor	<ul style="list-style-type: none"> <li>Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.</li> <li>Make the complaints log available to the local authority when asked.</li> <li>Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the logbook.</li> <li>Hold regular liaison meetings with other high risk construction sites and / or sources of fugitive dust emissions (as detailed in section 8.4) within 500m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport / deliveries which might be using the same strategic road network routes.</li> <li>Develop and implement a DMP, which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk and should include as a minimum the highly recommended measures in the IAQM Guidance. The desirable measures should be included as appropriate for the site. The DMP may include monitoring of dust deposition, dust flux, real-time PM<sub>10</sub> continuous monitoring and/or visual inspections.</li> </ul>	In advance of, and concurrent with construction.	Monitoring of works to ensure compliance with requirements and standards.



Mitigation item	Mitigation objective	Responsible for implementation	Mitigation measures	Potential timing of measure	Potential monitoring requirements
AQ3	Ensure regular site monitoring is undertaken to prevent and reduce impacts on air quality	Contractor	<ul style="list-style-type: none"> <li>Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100m of site boundary, with cleaning to be provided if necessary.</li> <li>Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.</li> <li>Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.</li> <li>Agree dust deposition, dust flux, or real-time PM10 continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or before work on a phase commences.</li> </ul>	In advance of, and concurrent with construction.	Monitoring of works to ensure compliance with requirements and standards.
AQ4	Ensure site is prepared and maintained to prevent and reduce impacts on air quality.	Contractor	<ul style="list-style-type: none"> <li>Plan a site layout so that machinery and dust causing activities are located as far away as possible from sensitive receptors.</li> <li>Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.</li> <li>Fully enclose site or specific operations where there is a high potential for dust production.</li> <li>Keep site fencing, barriers and scaffolding clean using wet methods.</li> <li>Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.</li> <li>Cover, seed or fence stockpiles to prevent wind whipping.</li> </ul>	In advance of, and concurrent with construction.	Monitoring of works to ensure compliance with requirements and standards.
AQ5	Operating vehicle, machinery and sustainable travel	Contractor	<ul style="list-style-type: none"> <li>Ensure all vehicles switch off engines when stationary – no idling vehicles.</li> <li>Avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment where practicable.</li> <li>Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the</li> </ul>	In advance of, and concurrent with construction.	Monitoring of works to ensure compliance with requirements and standards.

Mitigation item	Mitigation objective	Responsible for implementation	Mitigation measures	Potential timing of measure	Potential monitoring requirements
			<p>nominated undertaker and with the agreement of the local authority, where appropriate).</p> <ul style="list-style-type: none"> <li>Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.</li> <li>Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).</li> </ul>		
AQ6	Construction activities	Contractor	<ul style="list-style-type: none"> <li>Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g., suitable local exhaust ventilation systems.</li> <li>Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.</li> <li>Use enclosed chutes and conveyors and covered skips.</li> <li>Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.</li> <li>Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.</li> <li>Avoid bonfires and burning of waste.</li> <li>Avoid scabbling (roughening of concrete surfaces) if possible.</li> <li>Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.</li> <li>Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.</li> <li>For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.</li> </ul>	During construction	Monitoring of works to ensure compliance with requirements and standards.
AQ7	Measures specific to demolition	Contractor	<ul style="list-style-type: none"> <li>Ensure effective water suppression is used during demolition operations. Hand-held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.</li> </ul>	During construction	Monitoring of works to ensure compliance with requirements and standards.

Mitigation item	Mitigation objective	Responsible for implementation	Mitigation measures	Potential timing of measure	Potential monitoring requirements
			<ul style="list-style-type: none"> <li>Avoid explosive blasting, using appropriate manual or mechanical alternatives.</li> <li>Bag and remove any biological debris or damp down such material before demolition.</li> </ul>		
AQ8	Measures specific to earthworks	Contractor	<ul style="list-style-type: none"> <li>Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.</li> <li>Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.</li> <li>Only remove the cover in small areas during work and not all at once.</li> </ul>	During construction	Monitoring of works to ensure compliance with requirements and standards.
AQ9	Measures specific to trackout	Contractor	<ul style="list-style-type: none"> <li>Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.</li> <li>Avoid dry sweeping of large areas.</li> <li>Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.</li> <li>Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.</li> <li>Record all inspections of haul routes and any subsequent action in a site logbook.</li> <li>Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.</li> <li>Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).</li> <li>Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.</li> <li>Access gates to be located at least 10m from receptors where possible.</li> </ul>	During construction	Monitoring of works to ensure compliance with requirements and standards.

Mitigation item	Mitigation objective	Responsible for implementation	Mitigation measures	Potential timing of measure	Potential monitoring requirements
<b>Cultural Heritage</b>					
CH1	Prevent direct effects on cultural heritage assets	Contractor	<ul style="list-style-type: none"> <li>Any cultural heritage remains should be preserved in-situ through avoidance of direct effects. Where this is not possible, preservation through record, using some or all of the following methods; archaeological survey, building recording, evaluation, excavation, post-excavation analyses and publication, should be achieved following consultation with HED.</li> <li>Any potential accidental damage to the Shillington Building (CHS 33) and WWII Pillbox - DHP no.221 Scheduled Monument (CHS 71) could be prevented by fencing the buildings off during the construction works.</li> <li>The groundworks on Charles Street Bridge (CHS 44) have the potential to uncover earlier iterations of the bridge and a watching brief at this location would allow any earlier remains to be recorded in line with national policy.</li> </ul>	In advance of, and concurrent with construction.	Monitoring of works to ensure compliance with requirements and standards.
CH2	Prevent indirect effects on cultural heritage assets	Contractor	<ul style="list-style-type: none"> <li>Where possible the settings of any designated cultural heritage sites should be preserved through avoidance or mitigation of indirect effects.</li> <li>During the construction phase, the mitigation of indirect effects upon the settings of The Shillington Building (CHS 33) and WWII Pillbox - DHP no.221 Scheduled Monument (CHS 71) will not be possible as preventing direct effects upon these designated cultural heritage sites will take precedence and the structures will be fenced-off.</li> </ul>	In advance of, and concurrent with construction.	Monitoring of works to ensure compliance with requirements and standards.
<b>Landscape and Visual</b>					
LV1	Prevent and reduce landscape and visual impacts	Contractor	<ul style="list-style-type: none"> <li>Clear signage during temporary route diversions to aid road users and also ensure prompt delivery of site materials.</li> <li>Tidy site management would reduce the uncharacteristic clutter associated with building works.</li> <li>Storage compound areas would be reinstated to former use upon completion of works.</li> <li>Fencing used around site offices, welfare units and parking within the compound where used would be carefully chosen in order to integrate with the surrounding area as far as possible.</li> <li>Existing trees to be retained and protected would be protected in accordance with BS 5837: 2012. Prior to commencement of works, existing trees proposed to be retained would be protected to ensure no works are carried out under reach of their canopies.</li> </ul>	In advance of, and concurrent with construction.	Monitoring of works to ensure compliance with requirements and standards.

Mitigation item	Mitigation objective	Responsible for implementation	Mitigation measures	Potential timing of measure	Potential monitoring requirements
			<ul style="list-style-type: none"> <li>Construction works lighting to involve the use of suitably located units, in accordance with current best practice standards to minimise lighting intrusion to surrounding sensitive receptors, including residents.</li> </ul>		
<b>Terrestrial Biodiversity</b>					
BTE1	General measures	Contractor	<ul style="list-style-type: none"> <li>Given the mobile nature of badger and otter, pre-construction surveys will be undertaken to ensure no new badger setts or otter holts have been constructed in the intervening period between the end of the surveys for this ES and the beginning of construction.</li> <li>The trees and buildings with moderate bat roost potential will be surveyed prior to construction to develop any necessary mitigation to avoid adverse impacts on the local bat population.</li> <li>Vegetation removal likely to support breeding birds (including ground nesting species) will be removed prior to the bird breeding season (March to August inclusive). If this is not possible a pre-construction check for nesting birds will be undertaken to ensure no breeding birds present. If birds are present, then a standoff distance of 20m will be erected using demarcation tape and works will cease until the young have fledged, potentially a 6–8-week delay.</li> <li>A pre-construction survey will be undertaken of all proposed works adjacent to the River Bann where there are exposed earth cliffs and banks to ensure no active kingfisher nest burrows are present. If active nest burrows are found, then standoff distance and cessation of works until birds have fledged will be undertaken as described above.</li> <li>Reasonable measures will be specified to minimise the mobilisation and dispersal of dust during dry weather including dampening down of roadways and avoidance of any activities especially liable to generate dust when strong winds are forecast (see Air Quality Chapter 8 for further details).</li> <li>Liquids that might contaminate surrounding land in the event of a spillage will be stored and so far as possible handled, in bunded and lined enclosures designed for the containment of spills.</li> <li>Contractors and site staff will receive a talk on the various ecological sensitivities of the site and surrounding area as part of their site induction.</li> </ul>	In advance of, and concurrent with construction.	Monitoring of works to ensure compliance with requirements and standards.

Mitigation item	Mitigation objective	Responsible for implementation	Mitigation measures	Potential timing of measure	Potential monitoring requirements
			<ul style="list-style-type: none"> <li>Adherence to the relevant Environment Agency Pollution Prevention Guidelines during construction will substantially reduce the risk of polluting surface waters during the works.</li> <li>With the exception of vehicle movements, night-time lighting during construction phases will be avoided in all ecologically sensitive areas i.e. along hedgerows and rivers. These dark corridors will reduce the impact on bats and badgers allowing free movement for foraging.</li> <li>Comprehensive details of methods for avoiding and minimising the impacts on habitats and protected species.</li> <li>A site Environmental Clerk of Works (ECOW) will be employed during the construction phase to manage and implement embedded and specific mitigation measures.</li> </ul>		
BTE2	Prevent and reduce impacts on statutory designated sites	Contractor	<ul style="list-style-type: none"> <li>Assent will be obtained from Department of Agriculture, Environment and Rural Affairs (DAERA) for working adjacent to the Brackagh Bog ASSI and in close proximity to the Derryvore ASSI and any requested mitigation measures adhered to.</li> <li>Site staff will be briefed on the location and importance of the ASSI sites and boundaries demarked to prevent accidental incursion into these areas by personnel or plant.</li> <li>Reasonable measures will be specified to minimise dispersal of dust during dry weather.</li> <li>Prevention of spillages that have the potential to contaminate land.</li> <li>Toolbox talks on the various ecological sensitivities of the site and surrounding area.</li> <li>Adherence to the relevant Environment Agency Pollution Prevention Guidelines during construction will substantially reduce the risk of polluting surface waters during the works.</li> </ul>	In advance of, and concurrent with construction.	Monitoring of works to ensure compliance with requirements and standards.
BTE3	Prevent and reduce impacts on unimproved neutral grassland and wet meadow habitats	Design team/ Contractor	<ul style="list-style-type: none"> <li>The indicative site compound locations have been chosen to avoid areas of wet grassland and unimproved neutral grassland and will be located on areas of existing hard standing where possible.</li> <li>If wet grassland or unimproved neutral grassland will be directly affected (habitat potentially present at Ashgrove Road, Corcrain Mews, Woodside Green, Health Centre, Irwin's Mill, Annagh Hill Industrial Estate, Corcullentragh Road, Olde Golf Links &amp; Ripley Mews), access routes will be developed to avoid these areas. Habitats will be reinstated post construction.</li> </ul>	In advance of, and concurrent with construction.	Monitoring of works to ensure compliance with requirements and standards.

Mitigation item	Mitigation objective	Responsible for implementation	Mitigation measures	Potential timing of measure	Potential monitoring requirements
BT4	Prevent and reduce impacts on bats	Contractor	<ul style="list-style-type: none"> <li>Pre-construction surveys will be undertaken on those trees and buildings identified as having the potential to support roosting bats. Should surveys confirm roosts, a European Protected Species Mitigation Licence (EPSML) will be required from DAERA. Part of the licence requirements will be to design and implement suitable mitigation such as the installation of alternate roost provision such as bat boxes and any trees or hedges that are removed as part of construction works would be replaced on a like for like basis to ensure continued availability of foraging habitat.</li> <li>A Bat Lighting Mitigation Plan will detail how to avoid lighting sensitive habitats during construction and working hours. Night working should not be permitted at those sites that indicated a high level of bat foraging activity (Sites M, H, I, J, R and P) and night lighting will be installed on poles as low as possible to minimise light spread, luminaries shall be mounted horizontally and dark corridors with light spill of less than 1.0 lux must be preserved on all mature trees on site.</li> </ul>	In advance of, and concurrent with construction.	Monitoring of works to ensure compliance with requirements and standards.
BTE5	Prevent and reduce impacts on badgers	Contractor	<ul style="list-style-type: none"> <li>Resurveying of badger setts, including camera trapping to ascertain the level of activity and confirm that both setts are still active will take place. If setts are still active, a review of the proposed works and micro siting exercise will be undertaken to ascertain if potential impacts can be avoided. If not then a licence for the closure of both setts will likely be required from the DAERA, as the construction works will be within 30m of the setts.</li> <li>An artificial sett may need to be constructed as part of the licence requirements in close proximity to the outlier/subsidiary sett and will need to be constructed before badgers are excluded and the current sett closed.</li> <li>Badger fencing to prevent badgers entering sensitive work areas and any excavations left open overnight will have a plank or similar to allow badgers and other mammals an exit route if they accidentally fall in.</li> </ul>	In advance of, and concurrent with construction.	Monitoring of works to ensure compliance with requirements and standards.
BTE6	Prevent the spread of Invasive Non-Native Species (INNS)		<ul style="list-style-type: none"> <li>A treatment programme to eradicate known stands of non-native invasive plant species before construction works commence will be undertaken using licenced contractors and herbicides approved as safe to use near watercourses.</li> <li>The CEMP will provide details on preventing the spread of invasive non-native species across habitats with appropriate biosecurity measures e.g. washing boots and all equipment used in the vicinity of invasive</li> </ul>	In advance of, and concurrent with construction.	Monitoring of works to ensure compliance with requirements and standards.

Mitigation item	Mitigation objective	Responsible for implementation	Mitigation measures	Potential timing of measure	Potential monitoring requirements
			<p>species, and wastewater from wash facilities will be dealt with appropriately so as not to cause harm to the environment.</p> <ul style="list-style-type: none"> <li>Areas where invasive non-native species are present will be clearly fenced off with demarcation fencing and signposted to warn site personnel to prevent egress into these areas.</li> <li>Soil contaminated with roots and rhizomes of non-native invasive plant species will be disposed of appropriately in licenced hazardous landfill.</li> <li>Tracked vehicles should not be used within fenced demarcated areas.</li> <li>Site personnel will be given a toolbox talk before works commence to raise awareness of how to identify species and what to do and not do should they encounter them.</li> </ul>		
<b>Fisheries and Aquatic Ecology</b>					
FAE1	Sediment release and entrainment	Contractor	<ul style="list-style-type: none"> <li>For sites where sensitive fish are present (i.e. at least Medium sensitivity), in-channel construction or works within the channel edge (e.g. that may cause riverbed disturbance) will be avoided between 1st October to 30th April. This is the period for key fish migrations (e.g. adult salmonids/ lamprey, elvers; downstream migrations of silver eels, salmonid smolts) and when sensitive life-stages may be present within riverbed substrate (incubating eggs/ fry). Overlap across life-stage and species migration periods precludes a period when there is a zero risk. DAERA IFD require that any in-channel works should be conducted between 1st May and 30th September. This mitigation should apply to FAS option locations on the Ballybay/ Corcrain River where hard defences may be installed in or within close proximity to the river channel as follows: <ul style="list-style-type: none"> <li>Corcullentragh Road;</li> <li>Corcrain Mews;</li> <li>People's Park; and</li> <li>Woodside Green/ Ulster Carpets.</li> </ul> </li> <li>For the main channel River Bann (Very High sensitivity), which is a key river corridor for the migration of Atlantic salmon, dollaghan, brown trout, eel and lamprey, installation of hard defences in close proximity or within the channel edge, will be avoided between July and September, the main period for upstream migration of adult salmonids. In-channel works will also be avoided during the critical period for downstream migration of salmonid smolts, between April and May. This</li> </ul>	In advance of, and concurrent with construction.	Monitoring of works to ensure compliance with requirements and standards.



Mitigation item	Mitigation objective	Responsible for implementation	Mitigation measures	Potential timing of measure	Potential monitoring requirements
			<p>timing mitigation should be extended to account for potential spawning in marginal areas by coarse fish species such as roach, which would occur between May and June. Therefore, marginal channel works should be avoided in the River Bann between April and September at the following locations:</p> <ul style="list-style-type: none"> <li>o Foundry Street; and</li> <li>o Irwins Mill.</li> </ul>		
FAE2	Ensure construction drainage is in place throughout construction	Contractor	<ul style="list-style-type: none"> <li>▪ A temporary drainage scheme, for example, based on the principal of Sustainable Drainage (SuDS) should be developed by the contractor to manage surface water run-off from construction areas, including those distant from main river channels.</li> <li>▪ Any treated discharges should be consented through DAERA NIEA and so a design that includes measures such as ground infiltration, settlement ponds, and silt fencing will be important.</li> <li>▪ The contractor will prepare an emergency response plan based on the guidance outlined in GPP21 Pollution Incident Response Plan (<a href="https://www.netregs.org.uk/media/1436/gpp-21-final.pdf">https://www.netregs.org.uk/media/1436/gpp-21-final.pdf</a> ). The emergency response plan will outline how instances of the spillage/ discharge of sediment and other pollutants will be managed. The emergency response plan will be included as part of the Construction Environmental Management Plan (CEMP).</li> </ul>	In advance of, and concurrent with construction.	Monitoring of works to ensure compliance with requirements and standards.
FAE3	Prevent release of pollutants	Contractor	<ul style="list-style-type: none"> <li>▪ All precautions will be taken to avoid spillages of diesel, oil or other polluting substances during the construction phase. This will be achieved through implementation of good site practices as described in the Guidance for Pollution Prevention (GPP) notes (<a href="https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list/">https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list/</a> )</li> </ul>	In advance of, and concurrent with construction.	Monitoring of works to ensure compliance with requirements and standards.
FA4	Prevent the removal / loss of sensitive species	Contractor	<ul style="list-style-type: none"> <li>▪ Based on the requirements of DAERA IFD, in-stream works at sites where trout or other sensitive fish species may be present (e.g. lamprey and eels), will be conducted between 1st May and 30th September to avoid the more critical salmonid spawning migration and egg incubation phases (DCAL, undated).</li> </ul>	In advance of, and concurrent with construction.	Monitoring of works to ensure compliance with requirements and standards.
FA5	Ensure species rescue and translocation	Contractor	<ul style="list-style-type: none"> <li>▪ At all sites where fish are present and in-channel works are possible (e.g. Ballybay River and marginal areas of the main River Bann), fish recovery and translocation will be conducted prior to construction activity. The timing of translocations should occur as closely as possible</li> </ul>	In advance of, and concurrent with construction.	Monitoring of works to ensure compliance with

Mitigation item	Mitigation objective	Responsible for implementation	Mitigation measures	Potential timing of measure	Potential monitoring requirements
	(where applicable)		<p>to that of the specific construction activity to avoid fish returning to the area of in-channel works. This mitigation should be implemented if cofferdams or other in-channel works are required at any site of at least Medium sensitivity as follows;</p> <p>Ballybay River at the following locations:</p> <ul style="list-style-type: none"> <li>o Corcullentragh Road;</li> <li>o Corcrair Mews; and</li> <li>o People’s Park.</li> </ul> <p>River Bann at the following locations:</p> <ul style="list-style-type: none"> <li>o Foundry Street; and</li> <li>o Irwins Mill.</li> </ul> <ul style="list-style-type: none"> <li>▪ In the Ballybay River, sensitive fish species will be surveyed via electrofishing immediately upstream, within, and downstream of the proposed works area, and translocated much further downstream. Species removal should also be conducted upstream of any damming and fluming areas if water over-pumping is required so that the surveyed area encompasses the proposed flume / open-cut excavation and any upstream pump intake areas. In the main channel River Bann, if marginal areas are to be isolated prior to installation of sheet piling or embedded walls, the areas should first be surveyed for fish species using a combination of electrofishing (shallower areas) and seine netting (deeper areas). After installation of piles to isolate riverbed areas, further electrofishing of the area for water pumping would be required, followed by translocation of any fish species recovered.</li> <li>▪ A Section 14 Permit will be required from DAERA IFD to conduct fish surveys and translocations and should be applied for well in advance of any proposed works (up to 6 weeks prior). Where multiple locations require fish removal and translocation, all sites will be listed on the Section 14 Permit application. Generally, granting of Section 14 Permits will only allow fish removal works between July 1st and September 30th. Where there is the possibility of lamprey spp., including ammocoete larvae (e.g. Ballybay River and River Bann margins), a wildlife licence issued by DAERA NIEA will be required for survey and translocation and again would need to be applied for up to 6 weeks in advance of works commencement.</li> </ul>		requirements and standards.

Mitigation item	Mitigation objective	Responsible for implementation	Mitigation measures	Potential timing of measure	Potential monitoring requirements
FA6	Prevent the temporary obstruction of fish passage	Contractor	<ul style="list-style-type: none"> <li>▪ Temporary culverts/flumes/structures will be installed so that gradient, water depth and flow velocities are as similar as possible to the original channel. The contractor will be required to agree the design of any temporary in-channel structures with DAERA IFD via a Section 46 permit application.</li> <li>▪ For any piling works adjacent to or within the channel margins of the main River Bann (e.g. Castle Street, Bowling Green, Foundry St and Irwins Mill), works will be avoided during the following period; <ul style="list-style-type: none"> <li>o April to September (adult salmon migration, bream roach spawning, smolt downstream migration).</li> </ul> </li> <li>▪ For any piling works required at other sites of at least medium sensitivity (Ballybay River at Corcullentragh Rd, Corcrain Mews, Parkside), works will be avoided during the following period; <ul style="list-style-type: none"> <li>o October-April (trout spawning and egg incubation period).</li> </ul> </li> <li>▪ Outside of these sensitive periods, the use of vibrohammers, as opposed to percussive type impact drivers that are likely to cause greater shock, is recommended for any piling works adjacent to water.</li> </ul>	In advance of, and concurrent with construction.	Monitoring of works to ensure compliance with requirements and standards.
FA7	Prevent the movement/unintentional spread of Aquatic Invasive Species (AIS)	Contractor	<ul style="list-style-type: none"> <li>▪ At sites where non-native species are known to be present, on-site biosecurity measures will include: <ul style="list-style-type: none"> <li>o The use of designated machinery / equipment to prevent movement from one site or waterbody to another;</li> <li>o The inspection of vehicles before they are moved offsite or to another site;</li> <li>o Wash facilities suitable for both machinery (pressure-washing/ Virkon) and personnel (footbaths);</li> <li>o Spoil / soil generated at target sites and / or water left after vehicles have been pressure-washed will be contained, collected and disposed of appropriately. This would involve disposal at a landfill site that is licenced to accept non-native plant species; and</li> <li>o All chemicals used for the control of non-native species should be stored and used in a responsible manner.</li> </ul> </li> </ul>	In advance of, and concurrent with construction.	Monitoring of works to ensure compliance with requirements and standards.
<b>Soil and Land Contamination</b>					
SLC1	Additional investigation	Contractor	<ul style="list-style-type: none"> <li>▪ Additional investigation and sampling is recommended at the following locations prior to construction:</li> </ul>	In advance of, and concurrent with construction.	

Mitigation item	Mitigation objective	Responsible for implementation	Mitigation measures	Potential timing of measure	Potential monitoring requirements
			<ul style="list-style-type: none"> <li>o Corcrain Mews: further investigation at the centre and northern section of the site, with four additional boreholes to a depth of 5m with samples tested for metals, inorganics, hydrocarbons, PCBs and asbestos.</li> <li>o Woodside Green/Ulster Carpets: two boreholes to a depth of 5m in the northern section of the Ulster Carpets site where a former tank was located and samples tested for metals, inorganics, hydrocarbons and asbestos.</li> <li>o Parkside: further investigation at the north, east and west of the site with 3 boreholes up to 5m and samples tested for metals, inorganics, hydrocarbons and asbestos.</li> <li>o Foundry Street: further investigation with 4 boreholes to a depth of 5m and monitoring wells installed in the boreholes. Samples tested for metals and speciated TPHs.</li> <li>o Annagh Hill: further investigation across the site with an additional 7 boreholes to 5m with samples tested for metals, inorganics, hydrocarbons and asbestos.</li> </ul>		
SLC2	Prevent adverse impacts the health of construction workers	Contractor	<ul style="list-style-type: none"> <li>▪ Construction worker safety and the risks posed to health through potential exposure to contaminants will be minimised through adherence to the following health and safety guidance:               <ul style="list-style-type: none"> <li>o Management of Health and Safety at Work Regulations (NI) 1999;</li> <li>o Construction (Health, Safety and Welfare) Regulations (NI) 1999;</li> <li>o Protection of workers and the General Public during the Development of Contaminated Land (HSE 1991); and</li> <li>o A Guide to Safe Working on Contaminated Sites (R132) (CIRIA 1996).</li> </ul> </li> <li>▪ The contractor will implement a Health and Safety Plan which would include measures such as: provision of welfare facilities including collection of dirty PPE; and provision of appropriate PPE for working in potentially contaminated sites.</li> </ul> <p>As asbestos was identified on a number of sites, the contractor should be aware of the risk of encountering asbestos. A watching brief will be maintained during site works and protocols adhered to with reference to the CAR-SOIL Guidance (Control of Asbestos Regulations 2012: Interpretation for Managing and Working with asbestos in Soil and Construction and Demolition materials: Industry Guidance).</p>	In advance of, and concurrent with construction.	Monitoring of works to ensure compliance with requirements and standards. Asbestos watching brief.

Mitigation item	Mitigation objective	Responsible for implementation	Mitigation measures	Potential timing of measure	Potential monitoring requirements
SLC3	Prevent adverse impacts on surface water and groundwater as a result of mobilised contaminants	Contractor	<ul style="list-style-type: none"> <li>Where appropriate a Continuous Flight Auger (CFA) piling method has been proposed instead of driven sheet piling to mitigate the risk of creating preferential pathways for pollutants.</li> <li>Best practice measures will be implemented with regards to preventing pollution, with the contractor implementing and adhering to Guidance for Pollution Prevention</li> </ul>	During construction	Monitoring of works to ensure compliance with requirements and standards.
<b>Noise and Vibration</b>					
NV1	Ensure good community relations	Contractor	<ul style="list-style-type: none"> <li>The contractor will appoint a responsible person to liaise with the public in order to ensure community relations are maintained throughout the construction phase.</li> <li>Noise during construction works has the potential to be significant at the closest receptors. It is advisable to carry out works during the daytime period during weekdays in line with the requirements in the planning conditions, where it is practicable to do so.</li> </ul>	In advance of, and concurrent with construction.	Monitoring of works to ensure compliance with requirements and standards.
NV2	Control of noise at source	Contractor	<ul style="list-style-type: none"> <li>Control of noise at source measures will include:                             <ul style="list-style-type: none"> <li>Use of best practicable means and best practice methods.</li> <li>Reprogramming of concurrent activities.</li> <li>Enclosures.</li> </ul> </li> <li>The best practical methods for each activity are outlined below and will be adhered to wherever possible during the construction phase.</li> <li>Plant and machinery in intermittent use shall be shut down in intervening periods of non-use or, where this is impracticable, they shall be throttled down to a minimum.</li> <li>Unattended plant outside normal working hours should, if possible, be powered by electricity otherwise acoustic enclosures will be necessary to minimise noise levels.</li> <li>Where possible, plant with directional noise characteristics should be positioned in such a way as to minimise noise at adjacent properties.</li> <li>Static machines shall be sited as far away as practicable from inhabited buildings (or other noise sensitive premises) and/or behind temporary screens or enclosures.</li> <li>Plant should be well maintained and effectively silenced.</li> </ul>	In advance of, and concurrent with construction.	Monitoring of works to ensure compliance with requirements and standards.

Mitigation item	Mitigation objective	Responsible for implementation	Mitigation measures	Potential timing of measure	Potential monitoring requirements
NV3	Control spread of noise	Contractor	<ul style="list-style-type: none"> <li>If noise cannot be controlled at source, then alternative methods of reducing the noise impact will be introduced. These can include noise reducing screens and noise.</li> <li>For maximum benefit, screens will be positioned close to the source of noise or close to the receiver. In order for a barrier to be effective, care is needed in its design, siting and construction. For example, by reflecting sound a barrier can simply transfer a problem from one receiving position to another.</li> </ul>	In advance of, and concurrent with construction.	Monitoring of works to ensure compliance with requirements and standards.
NV4	Site specific measures	Contractor	<ul style="list-style-type: none"> <li>Should night works be required, mobile barrier screens will be placed surrounding works when works are taking place at night, at a height which obscures line of sight to noise sensitive receptors, and of an appropriate length. The barriers will be placed as close to works as practically possible and constructed before works begin. Where practicable, hoarding will be placed around the site to remove the line of site.</li> <li>Where possible, all noisy works will be completed during day-time hours to avoid significant impacts on sensitive receptors.</li> </ul>	In advance of, and concurrent with construction.	Monitoring of works to ensure compliance with requirements and standards.
<b>Population &amp; Human Health</b>					
PHH1	Minimise temporary land take and access disruption	Contractor	<ul style="list-style-type: none"> <li>The contractor will be required to establish and maintain effective liaison with the local community throughout the construction phase. This will include information about ongoing activities and the provision of contact details to report incidents or for further information. Residents and other users in the study area will benefit from an organised information campaign on temporary access arrangements and proposed constructions detail. Landowners will be consulted with extensively in the development of the scheme design and for those affected landowners which are involved in commercial activities. Ongoing consultation with other land users specifically affected by proposed construction works will be required.</li> <li>All residential properties, community assets, commercial assets, agricultural land and WCH assets will remain accessible throughout the construction phase. This will be achieved through careful liaison with landowners and the local council prior and throughout the construction programme.</li> <li>There will be land take from public areas and private gardens of residence to accommodate the schemes. Careful planning will be</li> </ul>	In advance of, and concurrent with construction.	

Mitigation item	Mitigation objective	Responsible for implementation	Mitigation measures	Potential timing of measure	Potential monitoring requirements
			required when considering suitable locations for site offices, stockpiles and compounds to minimise adverse effects of construction activities.		
<b>Hydrology and Drainage</b>					
HD1	Prevent surface water pollution and increased flood risk as a result of construction activities	Contractor	<ul style="list-style-type: none"> <li>For any construction work that requires discharge to a watercourse or where the work will impact the free flow of a watercourse, approval will be required from DfI Rivers. A schedule 6 application for consent to undertake works to a watercourse will be required.</li> <li>Spill kits will be present on site and located in areas where spillages may be likely to occur (e.g. fuel storage areas);</li> <li>Control of Substances Hazardous to Health (COSHH) stores on site will be bunded and locked when not in use;</li> <li>Drip trays and plant nappies will be placed under all stationary plant;</li> <li>Water quality monitoring will take place at the main watercourses within the study area in order to ensure no detrimental impacts on water quality are occurring;</li> <li>Dust suppression techniques will be implemented during activities likely to create high levels of dust (e.g excavations, cutting);</li> <li>Where required, filter drains will be covered in order to prevent contamination from construction entering the surface water drainage system;</li> <li>Haul roads and construction compounds will be designed and sited to minimise the potential for increased surface runoff;</li> <li>Where haul roads run within close proximity to watercourses and drainage channels, silt fencing and splash boards will be installed to ensure silty runoff is not entering the watercourses.</li> <li>Works will be suspended during out-of-bank river flows or during intense rainstorms.</li> <li>Measures will be detailed within the CEMP.</li> </ul>	In advance of, and concurrent with construction.	Monitoring of works to ensure compliance with requirements and standards.
<b>Climate</b>					
CC1	Prevent and reduce climate change risks to construction of the proposed scheme.	Design team/ Contractor	<ul style="list-style-type: none"> <li>Prior to construction, adverse weather procedures will be developed and included within the CEMP. This will include an incident response plan (including an evacuation procedure) and contingency plans in the event of extreme weather.</li> <li>During construction, the weather forecast and water levels will be monitored daily to identify adverse weather events. Upon identification</li> </ul>	In advance of, and concurrent with construction.	Monitoring of works to ensure compliance with requirements and standards.

Mitigation item	Mitigation objective	Responsible for implementation	Mitigation measures	Potential timing of measure	Potential monitoring requirements
			<p>of these, appropriate procedures will be followed, including those measures outlined in Table 17.15.</p> <ul style="list-style-type: none"> <li>Weather-relevant PPE will be provided to all on-site workers, including sun protection and loose light clothing.</li> <li>All equipment specifications will be observed, recorded, and adhered to with regard for weather-related specifications such as wind speed tolerance etc. Where deemed necessary by the site manager and/or the Clerk of Works, limit and/or cease construction activities until weather conditions re-stabilise.</li> <li>When not in use, all equipment will be stored in a secure location away from areas of potential risk (e.g., due to pluvial ponding, wind etc.).</li> <li>Where supply chains are used to source materials or construction plant from outside of the UK, investigate multiple suppliers and provide for sufficient delivery time ahead of construction to avoid project delays.</li> </ul>		
CC2	Minimise greenhouse gas emissions as a result of construction of the proposed scheme.	Design team/ Contractor	<ul style="list-style-type: none"> <li>Maximise opportunities for the reuse of excavated material and other materials which could be considered waste within the project or at a local donor site ensuring compliance to NIEA's Regulatory Position Statement on the Reuse of Material.</li> <li>Embed carbon reduction practices as a core principle for the design team. Where reduction ideas are suggested they should be recorded and potential impact quantified. Earlier engagement with carbon reduction allows for the greatest returns.</li> <li>Where technical specifications allow, maximise the recycled content of construction materials such as concrete and steel.</li> <li>Maximise the specification of materials with an environmental product declaration with the aim of reducing embodied carbon emissions.</li> <li>Incentivise use of local suppliers with a view to shorten project supply chains and environmental footprint.</li> <li>Encourage main contractor partners to obtain grid connections for construction office and welfare facilities, removing the need for generators. Where grid connections are not possible hybrid generators using solar power or HVO should be used to reduce consumption of fossil fuels.</li> <li>Onsite mobile and non-mobile plant should conform to the latest emissions standards, with mobile vehicles conforming to EURO 6</li> </ul>	In advance of, and concurrent with construction.	Monitoring of works to ensure compliance with requirements and standards.



Mitigation item	Mitigation objective	Responsible for implementation	Mitigation measures	Potential timing of measure	Potential monitoring requirements
			<p>standards as a minimum. All plant should investigate the option of using HVO fuels or electric versions where possible.</p> <ul style="list-style-type: none"> <li>Require main contractors to report on energy data, water usage and waste disposal and their GHG emissions as part of the scheme's Construction Environmental Management Plan (CEMP).</li> <li>Replant felled trees in viable local areas including People's Park where the Department wishes to encourage the planting of additional trees.</li> </ul>		

## 19.2. Operation

19.2.1 The environmental commitments for the operation phase are outlined in Table 19.2.

Table 19.2 Schedule of environmental commitments (operation)

Mitigation item	Mitigation objective	Responsible for implementation	Mitigation measures	Potential timing of measure	Potential monitoring requirements
<b>Cultural Heritage</b>					
CH3	Prevent permanent indirect effects on cultural heritage assets	Design Team	<ul style="list-style-type: none"> <li>Indirect effects upon the settings of The Shillington Building (CHS 33) and WWII Pillbox - DHP no.221 Scheduled Monument (CHS 71) will be dependent upon the design of the proposed flood alleviation scheme. In order to prevent or minimise adverse effects upon the setting of these designated cultural heritage sites, the design should not be overly intrusive upon the settings and should allow views to and across the structures to be maintained and, if possible, enhanced.</li> </ul>	Detailed design	N/A
<b>Landscape and Visual</b>					
LV2	Reduce permanent landscape and visual effects	Design Team	<ul style="list-style-type: none"> <li>Landscape mitigation for the project has sought to restore lost features where practicable and to restore or offset impacts on landscape character. Landscape mitigation may also function as visual screening when it has become established and reaches a reasonable height.</li> <li>Individual landscape mitigation strategies are shown on Drawings CO401635A-AMEY-A1&amp;S-XX-DR-R-3000-01 to CO401635A-AMEY-R-XX-DR-R-3000-01 and detailed in full in Section 8 of Chapter 10. The landscape planting design includes a range of measures including: <ul style="list-style-type: none"> <li>Woodland planting;</li> </ul> </li> </ul>	Detailed design	N/A

Mitigation item	Mitigation objective	Responsible for implementation	Mitigation measures	Potential timing of measure	Potential monitoring requirements
			<ul style="list-style-type: none"> <li>o Woodland edge;</li> <li>o Linear belts of trees;</li> <li>o Hedgerows;</li> <li>o Individual trees;</li> <li>o Wetland meadow grassland; and</li> <li>o Species rich grassland.</li> </ul>		
<b>Terrestrial Biodiversity</b>					
BTE7	Prevent permanent effects on statutory designated sites	Department for Infrastructure	<ul style="list-style-type: none"> <li>▪ A pollution prevention plan should be produced to ensure that during routine maintenance works, there are no spillages or polluted surface water runoff into the statutory sites or watercourses that may affect sites further downstream.</li> </ul>	Post construction	N/A
BTE8	Ensure successful establishment of unimproved neutral grassland and wet meadow habitats	Department for Infrastructure	<ul style="list-style-type: none"> <li>▪ Flood defences in areas where these habitats are present, are located on field boundaries or at the rear of properties to minimise any habitat loss. Wet grassland mixes will be sown post construction in suitable areas to allow reinstatement of this habitat.</li> </ul>	Post construction	N/A
BTE9	Prevent spread of invasive non-native species	Department for Infrastructure	<ul style="list-style-type: none"> <li>▪ An invasive species management plan will be produced to inform site personnel on biosecurity protocols when carrying out routine maintenance works to prevent the unlawful spread of species to additional areas.</li> </ul>	Post construction	N/A
<b>Fisheries and Aquatic Ecology</b>					
FAE8	Reinstatement /enhancement of Riparian zone	Design team/contractor	<ul style="list-style-type: none"> <li>▪ Reinstatement of riparian vegetation using a grass-seeded membrane will be implemented to facilitate rapid growth and stability of the bank.</li> <li>▪ Replanting of bank areas to provide shading/ cover (and a potential food source) should be undertaken where possible to offset any trees removed. For example, along the bank adjacent to Irwin’s Mill, clearance of any trees for hard defence construction should be followed by replanting of trees; preferred tree species are birch, alder and willow</li> </ul>	Detailed design	N/A

Mitigation item	Mitigation objective	Responsible for implementation	Mitigation measures	Potential timing of measure	Potential monitoring requirements
			given their native status, suitability as riparian zone trees, and their potential for rapid reestablishment and growth.		
FA9	Prevent permanent obstruction of fish passage	Design team / Contractor	<ul style="list-style-type: none"> <li>Permanent culverts or extensions should still be designed and installed according to CIRIA Guidelines for maintaining passage at culverts.</li> </ul>	Detailed design / Construction	N/A
FA10	Prevent permanent disruption to angler access	Design team/ Contractor	<ul style="list-style-type: none"> <li>Subsequent to the erection of hard defences and completion of all site works, embedded mitigation will include the installation of steps over flood walls at Foundry Street. Any stands removed to facilitate construction will be replaced on a like for like basis. As a result, there will be no impact or permanent obstruction to angler access.</li> </ul>	Detailed design / Construction	N/A
<b>Climate</b>					
CC3	Prevent and reduce climate change risks to the operation of the proposed scheme.	Design team / Department for Infrastructure	<ul style="list-style-type: none"> <li>Consideration will be given to the use of construction materials with enhanced tolerance to fluctuating temperatures.</li> <li>Climate change has been considered during the design phase and incorporated into design outputs.</li> <li>The condition and integrity of assets will be regularly and efficiently assessed, with the view to carrying out maintenance and repair operations as soon as possible.</li> <li>Signposting the risk of fire due to sparks (from cigarettes, barbeques etc.) will be considered as appropriate to help reduce the risk of fire during high heat events.</li> <li>Following extreme events, assessment of the condition of assets will be carried out with the view to maintaining or repairing assets as soon as possible.</li> </ul>	Detailed design / Post construction	N/A

## 20. Assessment Summary Table

### 20.1. Schedule of Effects

20.1.1 The previous technical chapters (8 to 17) of the ES, present the assessments for the individual EIA topics. Each individual chapter provides an assessment of the likely significant effects. This chapter provides a summary of the residual effects, as outlined within each technical chapter. Tables 20.1- 20.4 detail the significant and non-significant effects for the construction and operation phases.

20.1.2 A summary of the assessment set out in the ES can be found in the ES **Non-Technical Summary, Volume 1.**

#### Construction

20.1.3 The residual significance of effects during construction are summarised in Table 20.1.

Table 20.1 Summary of significant effects during construction

Topic	Potential impact description	Mitigation	Residual significance of effect
Landscape and visual: Visual	Upper Bann Recreational Routes	<ul style="list-style-type: none"> <li>Landscape design/mitigation planting.</li> </ul>	Major
	Walking Route 31: People's Park		Major
	NCNR 94: Loughshore Trail		Major
	Visual receptors at Site D People's Park; viewpoints 06, 11.		Moderate
	Visual receptors at Site E Parkside; viewpoint 11.		Moderate
	Visual receptors at Site H Castle Street; viewpoint 07.		Moderate
	Visual receptors at Site J Bowling Green; viewpoints 10, 20,21,22		Moderate
	Visual receptors at Site R Corcullentragh Road: viewpoint 16		Moderate
Noise and vibration	<ul style="list-style-type: none"> <li>Construction noise: exceedance in day thresholds for receptors up to 50m from construction.</li> </ul>	<ul style="list-style-type: none"> <li>Community relations</li> <li>Limitation of timing of works</li> <li>Measures to control noise at source and spread of noise.</li> </ul>	Significant (short term)
	<ul style="list-style-type: none"> <li>Construction noise: exceedance in evening/weekend thresholds at local receptors up to 100m from construction.</li> </ul>		

20.1.4 The residual non-significant effects during construction are summarised in Table 20.2.

Table 20.2 Summary of non significant effects during construction

Topic	Potential impact description	Mitigation	Residual
Air quality	Effects of dust and PM <sub>10</sub> generated by construction activities on air quality.	<ul style="list-style-type: none"> <li>Preparing and maintaining site</li> <li>Site management</li> <li>Monitoring</li> </ul>	Negligible adverse
	Effects of emissions to air from construction vehicles and plant on local air.	<ul style="list-style-type: none"> <li>Controls relating to earthworks, demolition and trackout.</li> </ul>	Negligible adverse
Cultural heritage	Brick hole (CHS2)	<ul style="list-style-type: none"> <li>Cultural heritage remains will be preserved in-situ through avoidance of direct effects.</li> </ul>	None
	Sawmill (CHS 34)		None
	The Shillington Building (CHS 33)	<ul style="list-style-type: none"> <li>A watching brief during ground-breaking work will be in place to allow any surviving remains to be recorded prior to their removal.</li> </ul>	None
	Charles Street Bridge (CHS 44),		None
	WWII Pillbox - DHP no.221 Scheduled Monument (CHS 71)	<ul style="list-style-type: none"> <li>The settings of any designated cultural heritage sites will be preserved through avoidance or mitigation of indirect effects.</li> </ul>	None
	People's Park Designed Landscape (CHS 73).		None
	Indirect impacts on the setting of cultural heritage assets	<ul style="list-style-type: none"> <li>Settings of any designated cultural heritage sites will be preserved through avoidance or mitigation of indirect effects.</li> </ul>	None
Landscape and visual: Visual	Visual receptors at Sites A, A1, F, I, S,	<ul style="list-style-type: none"> <li>Landscape design/ mitigation planting</li> </ul>	Minor adverse
	Visual receptors at Sites B, C, K, L, M, N, N2, P, Q		Negligible adverse
Terrestrial biodiversity	Unimproved and wet meadow habitat	<ul style="list-style-type: none"> <li>Finalisation of the scheme design and the location of the construction elements such as compounds and laydown areas will aim to avoid areas of wet grassland and unimproved neutral grassland.</li> </ul>	Minor adverse
	Bats- potential for disruption to foraging and commuting habitat	<ul style="list-style-type: none"> <li>Replacement of hedges and trees removed during construction.</li> </ul>	Negligible adverse
	Bats- potential loss of roosting features	<ul style="list-style-type: none"> <li>A Protected Species Plan (PSP) will be developed and implemented.</li> <li>Pre-construction surveys- should surveys confirm roosts, a European Protected Species Mitigation Licence (EPSML) will be required from DAERA.</li> <li>Installation of alternate roost provision, such as bat boxes.</li> </ul>	No change
	Badgers- loss of/damage to badger setts	<ul style="list-style-type: none"> <li>Resurveying of badger setts, including camera trapping to ascertain the level of activity and confirm that both setts are still active. If setts are still</li> </ul>	Negligible adverse

Topic	Potential impact description	Mitigation	Residual
		<p>active, a review of the proposed works and micro siting exercise will be undertaken to ascertain if potential impacts can be avoided. If not then a licence for the closure of both setts will likely be required from the DAERA, as the construction works will be within 30m of the setts.</p> <ul style="list-style-type: none"> <li>An artificial sett may need to be constructed as part of the licence requirements in close proximity to the outlier/subsidiary sett and will need to be constructed before badgers are excluded and the current sett closed.</li> <li>Badger fencing to prevent badgers entering sensitive work areas and any excavations left open overnight will have a plank or similar to allow badgers and other mammals an exit route if they accidentally fall in.</li> </ul>	
	Indirect impacts from construction work on Lough Neagh and Lough Neagh Bog SPA/Ramsar, Brackagh Bog and Derryvore ASSI.	<ul style="list-style-type: none"> <li>Assent obtained from DAERA for work adjacent to Brackagh Bog and Derryvore ASSI.</li> <li>Toolbox talks for site staff.</li> <li>Spillage and dust prevention.</li> <li>Measures outlined within CEMP.</li> </ul>	Negligible adverse
	The groundwater hydrological regime for Brackagh Bog and Derryvore ASSI could be changed by the ongoing construction works		Negligible adverse
Fisheries and Aquatic ecology	Sediment release and entrainment, impacting the habitat of Salmonids.	<ul style="list-style-type: none"> <li>Timing of works; in channel construction works should be avoided between 1st October and 30th April.</li> <li>A construction phase drainage design will be in place to manage surface water from construction areas.</li> </ul>	Neutral
	Release of other pollutants (e.g hydrocarbons) impacting fish and other aquatic species by reducing oxygen levels or causing direct mortality.	<ul style="list-style-type: none"> <li>Following industry best practice on pollution prevention.</li> </ul>	Neutral
	Removal/loss of species where excavation or disturbance of the riverbed to install culverts, conduct bridge works/ repairs, install walls/ sheet piling, and other hard defences.	<ul style="list-style-type: none"> <li>Timing of works; in-stream works at sites where trout or other sensitive fish species may be present (e.g. lamprey and eels), will be conducted between 1st May and 30th September.</li> <li>Species rescue and translocation.</li> </ul>	Neutral

Topic	Potential impact description	Mitigation	Residual
	Temporary obstruction of fish passage; poor management of works adjacent to watercourses or at crossing points may lead to obstruction of the channel during periods of fish migration and spawning	<ul style="list-style-type: none"> <li>Temporary culverts/flumes/structures will be installed so that gradient, water depth and flow velocities are as similar as possible to the original channel.</li> </ul>	Neutral
	Noise and vibration associated with percussive activities such as vibratory or impact hammers has the potential to disrupt migratory behaviour or cause injury to sensitive fish species.	<ul style="list-style-type: none"> <li>Timing of works; piling works adjacent to or within the channel margins of the main River Bann should be avoided April to September (adult salmon migration, bream roach spawning, smolt downstream migration).</li> <li>Piling works required at other sites of at least medium sensitivity should be avoid during October- April (trout spawning and egg incubation period).</li> </ul>	Neutral
	Movement/unintentional spread of AIS; potential for the accidental spread of Canadian Pondweed and Nuttall's Pondweed.	<ul style="list-style-type: none"> <li>Toolbox talks</li> <li>Biosecurity measures at sites where AIS are present.</li> </ul>	Neutral
Soil and land contamination	Construction workers; impacts on construction worker health could arise from exposure to made ground during excavations	<ul style="list-style-type: none"> <li>Construction worker safety and the risks posed to health through potential exposure to contaminants will be minimised through adherence to health and safety guidance.</li> <li>The contractor will implement a Health and Safety Plan</li> <li>The contractor will be made aware of the risk of encountering asbestos. A watching brief will be maintained during site works</li> </ul>	Not significant
	Groundwater; could be affected by piling, through creation of preferential pathways by piles through the ground, with a risk of contaminants leaching or migrating into groundwater.	<ul style="list-style-type: none"> <li>Where appropriate a Continuous Flight Auger (CFA) piling method has been proposed instead of driven sheet piling to mitigate the risk of creating preferential pathways for pollutants.</li> </ul>	Not significant
	River Bann: Excavations may expose contaminated sediments in the soils resulting in runoff of heavy metals, TPHs and PAHs into the River Bann.	<ul style="list-style-type: none"> <li>Best practice measures will be implemented with regards to preventing pollution, with the contractor implementing and adhering to Guidance for Pollution Prevention.</li> </ul>	Not significant

Topic	Potential impact description	Mitigation	Residual
	Ballybay/Corcrain River; excavations have potential to expose contaminants at surface level, and runoff could cause contaminated sediments to enter the Ballybay River.		Not significant
	Annagh River: excavations may expose shallow groundwater that may runoff into the surface waters.		Not significant
Population and human health	Temporary access disruption and land take for possible contractor compound sites, access routes and working corridors from private property, community assets, commercial assets and agricultural land.	<ul style="list-style-type: none"> <li>Contractor will be required to establish and maintain effective liaison with the local community throughout the construction phase.</li> <li>All residential properties, community assets, commercial assets, agricultural land and WCH assets will remain accessible throughout the construction phases.</li> </ul>	Slight adverse
	Temporary disruption to National Cycle Routes 9/94 and walking routes.	<ul style="list-style-type: none"> <li>All WCH routes to remain open during construction. Liaison with landowners and the local council prior and throughout the construction programme.</li> </ul>	Slight adverse
Hydrology and drainage	Surface Water: Potential for disruption to water quality as a result of polluted runoff and accidental spillages.	<ul style="list-style-type: none"> <li>Pollution control measures outlined within the CEMP.</li> </ul>	Slight adverse
	Hydromorphology: Potential for disruption to flow patterns as a result of increased runoff and changes to drainage patterns as a result of excavations.	<ul style="list-style-type: none"> <li>Pollution control measures outlined within the CEMP.</li> </ul>	Slight adverse
	Flood risk: Potential increase in flood risk as a result of construction activities and a temporary increase in impermeable surfaces (e.g construction compounds).	<ul style="list-style-type: none"> <li>Control measures as outlined within CEMP.</li> </ul>	Slight adverse
Climate	Greenhouse gas emissions	Measures to reduce the release of GHG during construction.	Minor adverse
	Vulnerability to climate change	<ul style="list-style-type: none"> <li>Monitor changing weather forecasts.</li> <li>Ensure safe access is always available to key assets with consideration given to ground conditions.</li> </ul>	Not significant



## Operation

20.1.5 During operation, there are no significant adverse residual effects. The assessment has concluded one significant beneficial effect as detailed in Table 20.3.

Table 20.3 Summary of significant effects during operation

Topic	Potential impact description	Mitigation	Significance
Hydrology and Drainage	Flood risk: Reduced flood risk for residential, commercial and community receptors located adjacent to the flood defences at each site.	N/A	Moderate beneficial

20.1.6 The residual non-significant effects during operation are summarised in Table 20.4.

Table 20.4 Summary of non-significant effects during operation

Topic	Potential impact description	Mitigation	Significance
Cultural heritage	Potential for indirect effects upon the settings of The Shillington Building (CHS 33), WWII Pillbox - DHP no.221 Scheduled Monument (CHS 71) and the People's Park Designed Landscape (CHS 73).	<ul style="list-style-type: none"> <li>Design should not be overly intrusive upon the settings and should allow views to and across the structures to be maintained and, if possible, enhanced</li> </ul>	None
Landscape and visual: Visual	Upper Bann Recreational Routes	<ul style="list-style-type: none"> <li>Landscape design/mitigation planting</li> </ul>	Minor adverse
	Walking Route 31: People's Park		Minor adverse
	NCNR 94: Loughshore Trail		Minor adverse
	Visual receptors at all sites		Negligible adverse
Terrestrial biodiversity	Statutory designated sites; potential for Brackagh Bog ASSI and NR and Derryvore ASSI to experience pollution run-off or accidental spillage from routine maintenance works.	<ul style="list-style-type: none"> <li>Creation and implementation of a Pollution Prevention Plan for routine maintenance.</li> </ul>	Negligible adverse
	Unimproved and wet meadow habitat	<ul style="list-style-type: none"> <li>Flood defences in areas where these habitats are present, are located on field boundaries or at the rear of properties to minimise any habitat loss. Wet grassland mixes will be sown post construction in suitable areas to allow reinstatement of this habitat.</li> </ul>	Minor beneficial
	Invasive Non-Native Species: Potential for the spread of INNS during routine maintenance.	<ul style="list-style-type: none"> <li>Invasive species management plan should be prepared to include measures for routine maintenance.</li> </ul>	Negligible

Topic	Potential impact description	Mitigation	Significance
Aquatic biodiversity	Loss or decline in habitat; main locations where habitat loss is likely to impact on fisheries and aquatic ecology is the Ballybay/ Corcraun and main River Bann.	<ul style="list-style-type: none"> <li>Reinstatement of riparian vegetation.</li> </ul>	Neutral
	Permanent obstruction of fish passage; potential for obstruction of roach movements within the Annagh River due to new culvert.	<ul style="list-style-type: none"> <li>Permanent culverts or extensions should still be designed and installed according to CIRIA Guidelines for maintaining passage at culverts</li> </ul>	Neutral
Population and human health	Minor land take from property and field boundaries.	<ul style="list-style-type: none"> <li>Private land agreements with the landowners currently exist and allow for the disturbance caused due to the installation of the new flood defence along their property.</li> </ul>	Slight adverse
	Reduction in amenity for a number of community facilities/assets located in close proximity to the sites, particularly along the River Lagan and near the People's Park.	<ul style="list-style-type: none"> <li>Scheme design</li> </ul>	Slight adverse
Climate	Vulnerability to climate change	<ul style="list-style-type: none"> <li>Climate change has been considered during the design phase and incorporated into design outputs.</li> <li>Regular monitoring and maintenance checks should be carried out and repairs delivered as early as possible.</li> </ul>	Not significant

## 21. References

### Chapter 1 Introduction

1.1 Department for Infrastructure (2017) The Drainage (Environmental Impact Assessment) Regulations (Northern Ireland ) 2017. Available from <https://www.infrastructure-ni.gov.uk/sites/default/files/publications/infrastructure/the-drainage-environmental-impact-assessment-regulations-northern-ireland-2017.pdf>

1.2 European Commission (EC) The EU Floods Directive. Available from [https://ec.europa.eu/environment/water/flood\\_risk/](https://ec.europa.eu/environment/water/flood_risk/)

1.3 UK Government, The Water Environment (Floods Directive) Regulations (Northern Ireland) 2009. Available from <https://www.legislation.gov.uk/nisr/2009/376/contents/made>, accessed November 2021.

1.4 Department for Infrastructure (2011) Preliminary Flood Risk Assessment for NI. Available from <https://www.infrastructure-ni.gov.uk/sites/default/files/publications/dard/final-pfra-report.pdf>

1.5 Department for Infrastructure (2018) Northern Ireland Flood Risk Assessment (NIFRA 2018). Available from <https://www.infrastructure-ni.gov.uk/sites/default/files/publications/infrastructure/northern-ireland-flood-risk-assessment-report-2018-updated-may2019.pdf>

1.6 RPS (2018) Portadown Feasibility Report, Available from [https://www.infrastructure-ni.gov.uk/sites/default/files/publications/infrastructure/portadown-feasibility-report\\_0.pdf](https://www.infrastructure-ni.gov.uk/sites/default/files/publications/infrastructure/portadown-feasibility-report_0.pdf)

1.7 RPS (2018) Portadown Feasibility Report: Modelling Report.

1.8 RPS (2018) Portadown Feasibility Report: Economic Appraisal Report.

### Chapter 2 Environmental Impact Assessment

2.1 European Commission (1985) Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment. Available from <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31985L0337>

2.2 Department for Infrastructure, The Drainage (Environmental Impact Assessment) Regulations (Northern Ireland) 2017. Available from <https://www.infrastructure-ni.gov.uk/publications/drainage-environmental-impact-assessment-regulations-northern-ireland-2017>.

2.3 Highways England, Design Manual for Roads and Bridges (DMRB) LA 104 Environmental Assessment and Monitoring, available from <https://www.standardsforhighways.co.uk/prod/attachments/0f6e0b6a-d08e-4673-8691-cab564d4a60a?inline=true>

2.4 National Infrastructure Planning, Advice Note Seventeen: Cumulative effects assessment relevant to nationally significant infrastructure projects, available from <https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-17/>

2.5 European Commission (2001). Assessment of plans and projects significantly affecting Natura 2000 sites. Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC. Available to view at [https://ec.europa.eu/environment/nature/natura2000/management/docs/art6/natura\\_2000\\_assess\\_en.pdf](https://ec.europa.eu/environment/nature/natura2000/management/docs/art6/natura_2000_assess_en.pdf)

## Chapter 3 Legislative and Policy Context

3.1 UK Government, The Water and Floods (Amendment) (Northern Ireland) (EU Exit) Regulations 2018 , available from <https://www.gov.uk/eu-withdrawal-act-2018-statutory-instruments/the-water-floods-amendment-northern-ireland-eu-exit-regulations-2018>

3.2 European Commission, The Water Framework Directive, available from [https://ec.europa.eu/environment/water/water-framework/index\\_en.html](https://ec.europa.eu/environment/water/water-framework/index_en.html)

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## Chapter 17 Climate

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**List of abbreviations**

AADT	Annual Average Daily Traffic
AAWT	Annual Average Weekly Traffic
ABCBC	Armagh, Banbridge and Craigavon Borough Council
AEP	Annual Exceedance Probability
AFBI	Agri-Food and Biosciences Institute
AIA	Archaeological Impact Assessment
AIS	Aquatic Invasive Species
AOD	Above Ordnance Datum
APSFR	Areas of Potential Significant Flood Risk
ASAI	Area of Significant Archaeological Interest
ASPT	Average Score Per Taxon
ASSI	Area of Special Scientific Interest
AQMA	Air Quality Management Area
AQS	Air Quality Standards
BA	Bachelor of Arts
BACID	Before-After-Control Impact Design
BAP	Biodiversity Action Plan
BCR	Benefit Cost Ratio
BH	Borehole
BS	British Standards
BSc	Bachelor of Science
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
Ca.	circa
CEDaR	Centre for Environmental Data and Recording
CEMP	Construction Environmental Management Plan
CIEEM	Chartered Institute of Ecology and Environmental Management
CifA	Chartered Institute for Archaeologists
CIRIA	Construction Industry Research and Information Association
CL	Conservation Limit

CL.AIRE Contaminated Land: Applications in Real Environments  
CCC Climate Change Committee  
CCRA Climate Change Risk Assessment  
CNCC Council for Nature Conservation and the Countryside  
CNMA Candidate Noise Management Area  
COSHH Control of Substances Hazardous to Health  
CSM Conceptual Site Model  
DAERA Department for Agriculture, Environment and Rural Affairs  
DAFOR Dominant, Abundant, Frequent, Occasional, Rare  
DANI Department for Agriculture Northern Ireland  
dB decibels  
DCAL Department for Culture, Arts and Leisure  
Defra Department for Environment, Food and Rural Affairs  
DfC Department for Communities  
DfI Department for Infrastructure  
DMRB Design Manual for Roads and Bridges  
DTM Digital Terrain Model  
DWS Drinking Water Standards  
EcIA Ecological Impact Assessment  
ECoW Ecological Clerk of Works  
EHO Environmental Health Officer  
EIA Environmental Impact Assessment  
ELC European Landscape Convention  
EPSML European Protected Species Management Licence  
ES Environmental Statement  
EU European Union  
EQS Environmental Quality Standards  
FAS Flood Alleviation Scheme  
FRMP Flood Risk Management Plan  
FWFD Freshwater Fish Directive  
GA General Arrangement  
GAC Generic Assessment Criteria



GHG Greenhouse gas  
GI Ground Investigation  
GIS Geographic Information System  
CLEA Contaminated Land Exposure Assessment  
GLVIA Guidelines for Landscape and Visual Impact Assessment  
GPP Guidance for Pollution Prevention  
GPS Global Positioning System  
GQRA Generic Quantitative Risk Assessment  
GWP Global Warming Potential  
ha hectares  
HED Historic Environment Division  
HEDHB Historic Environment Division Historic Buildings  
HEDHM Historic Environment Division Historic Monuments  
HGV Heavy Goods Vehicles  
Hz Hertz  
IAQM Institute of Air Quality Management  
IEMA Institute of Environmental Management and Assessment  
IFD Inland Fisheries Division  
IPCC Intergovernmental Panel on Climate Change  
IUCN International Union for Conservation of Nature  
km kilometres  
ktCO<sub>2</sub>e kilotons of carbon dioxide equivalent  
LBAP Local Biodiversity Action Plan  
LDP Local Development Plan  
LLPA Local Landscape Policy Area  
LMA Local Management Area  
LOAEL Lowest Observable Adverse Effect Level  
m metres  
mbgl metres below ground level  
mg/kg milligrams per kilogram  
mm millimetres  
MT Management Target

MSc Master of Science

NASCO North Atlantic Salmon Conservation Organization

NBN National Biodiversity Network

NCNR National Cycle Network Route

NI Northern Ireland

NIEA Northern Ireland Environment Agency

NIFRA Northern Ireland Flood Risk Assessment

NIMBM Northern Ireland Multiple Deprivation Measure

NISRA Northern Ireland Statistics and Research Agency

NO<sub>2</sub> Nitrogen dioxide

NR Nature Reserve

NRMM Non Road Mobile Machinery

NTS Non Technical Summary

OD Ordnance Datum

OSNI Ordnance Survey Northern Ireland

PAH Polycyclic Aromatic Hydrocarbons

PCB Polychlorinated Biphenyls

PFRA Preliminary Flood Risk Assessment

PM<sub>2.5</sub> Particulate matter with an aerodynamic diameter of less than 2.5 micrometres

PM<sub>10</sub> Particulate matter with an aerodynamic diameter of less than 10 micrometres

POP Preferred Options Paper

PPG Pollution Prevention Guidance

PPS Planning Policy Statement

PPV Peak Particle Velocity

PRA Preliminary Risk Assessment

PSP Protected Species Plan

RBMP River Basin Management Plan

RCPs Representative Concentration Pathways

RDS Regional Development Strategy

Ref. Reference

RSPB Royal Society for the Protection of Birds

RwP Residential with plant uptake

RwoP Residential without plant uptake  
SAC Special Area of Conservation  
SFRA Significant Flood Risk Areas  
SOA Super Output Area  
SOAEL Significant Observable Adverse Effect Level  
SPA Special Protection Area  
SPSS Strategic Planning Policy Statement  
SuDS Sustainable Urban Drainage Systems  
TPH Total Petroleum Hydrocarbons  
TPH CWG Total Petroleum Hydrocarbons Criteria Working Group  
TSVs Threshold Screening Values  
UK United Kingdom  
VOCs Volatile Organic Compounds  
WCH Walkers, cyclists and horse riders  
WFD Water Framework Directive  
WHO World Health Organisation  
ZoI Zone of Influence  
ZTV Zone of Theoretical Visibility  
 $\mu\text{m}$  micrometres  
 $\mu\text{g/l}$  micrograms per litre