Shimna River
Flood Alleviation Scheme

Environmental Statement

Department for Infrastructure (DfI) Rivers

August 2018

49 Tullywiggan Road
Loughry
Cookstown
BT80 8SG

Quality information

Prepared by	Checked by	Approved by
Glenn McKay BSc MSc MCIWEM C.WEM CEnv CSci Principal Environmental Consultant	Gareth Coughlin BSc (Hons), MPhil, C.WEM, CEnv, CSci, FCIWEM Environmental Team Leader	Karol McCusker BEng CEng MICE Project Manager
Ruth Osborne BSc (Hons) Environmental Scientist	Glenn McKay BSc MSc MCIWEM C.WEM CEnv CSci Principal Environmental Consultant	Gareth Coughlin BSc (Hons), MPhil, C.WEM, CEnv, CSci, FCIWEM Environmental Team Leader
Maciej Skiba CMLI MILI MLA Eng. Senior Landscape Architect	Joerg Schulze Dipl.- Ing. (FH) LA, MILI Principal Landscape Architect	
Jenny Jones BSc (Hons), MSc, AMRSB Consultant Ecologist	Dr Paul Lynas BSc(Hons) MRes CEnv MCIEEM Principal Ecologist	
David Kilner BA (Hons), PG Dip, MSc, MIAI Archaeological Consultant	Annette Roe, BA MA MCIfA Regional Director Head of Heritage	
Michael Gillespie BSc MSc Environmental Scientist	Karol McCusker BEng CEng MICE Project Manager	
David Pentland EIA Industrial Placement	Paul Johnston BSc, PhD, CEnv Fisheries Consultant	
Paul Johnston BSc, PhD, CEnv Fisheries Consultant		
David W. Kelly Ph.D. MCIEEM, MIFM Fisheries Consultant		
Edward Mason MEng (Hons) GMICE Graduate Civil Engineer		

Prepared for:

Department for Infrastructure (DfI) Rivers
49 Tullywiggan Road
Loughry
Cookstown
BT80 8SG

Prepared by:

AECOM Infrastructure & Environment UK Limited
The Studio,
Cleaver House,
1-3 Donegall Square North,
Belfast,
BT1 5YE, United Kingdom
aecom.com

Limitations

No specific constraints have limited the assessment of likely significant effects on the environment detailed in this Environmental Statement. Where data limitations have been encountered, these are described within respective technical sections detailed throughout this report. It has been necessary in respect of a number of design and construction details to make a number of assumptions. In these cases, the worst case scenario has been assessed in order to ensure all potential and likely impacts of the proposed scheme have been considered and to deliver a robust assessment.

Table of Contents

Appendices

- **Appendix 1:Introduction**
  - Annex A: '*Shimna River, Newcastle Feasibility Study for Flood Risk Investigation*' (2015);
  - Annex B: EIA Screening Report (February 2018); and
  - Annex C: Belfast Gazette Advertisement.
- **Appendix 8: Cultural Heritage -** Annex A: Gazetteer of Heritage Assets
- **Appendix 9: Biodiversity – Terrestrial Ecology**
  - Annex A: Zone of Influence (ZoI) informing the assessment
  - Annex B: Site Photographs
  - Annex C: Species Lists
  - Annex D: CEDaR data request results
- **Appendix 14: Geology & Soils -** Annex A: Ground Investigation Report (2018)

1. Introduction

AECOM was commissioned by the Department for Infrastructure (DfI) – Rivers (the Department) to provide a range of engineering and environmental design services in relation to the Shimna Flood Alleviation Scheme, which is a project intended to provide relief from future flooding along a stretch of the Shimna River within Newcastle, County Down. As shown on **Figure 1.1**, this would be achieved by way of providing a range of flood alleviation measures (the Proposed Scheme) to reduce the risk of flooding from the Shimna River in order to protect existing properties.

Part of this commission required the preparation of an Environmental Impact Assessment (EIA) Screening to determine whether a full EIA and subsequent Environmental Statement (ES) would be necessary. An EIA Screening Report was prepared for the Department in February 2018 and concluded that the likelihood of significant environmental effects associated with the Proposed Scheme could not be ruled out in light of the physical characteristics of the whole project and the environmental sensitivity of the geographical area likely to be affected. In particular, it was concluded on the basis that the works area would be located within the Shimna River Area of Special Scientific Interest (ASSI) and Mourne Area of Outstanding Natural Beauty (AONB), and although would not directly affect Murlough Special Area of Conservation (SAC)/ASSI, it would be hydrologically connected to it. Whilst a robust and prescriptive mitigation strategy would minimise the risk of adverse effects within this environmentally sensitive area, 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.

As set out in Sub-Section 1.3.7, an Appropriate Assessment Screening Statement was also undertaken for the Proposed Scheme in order to fulfil the requirements of the Habitats Directive (92/43/EEC) as transposed by The Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995 [as amended].

1.1 Scheme Background

Following severe flooding in August 2008, the Department (formerly DARD Rivers Agency) appointed RPS to carry out a post flood investigation of the Burren and Shimna rivers in Newcastle, County Down, the aims of which were to:

- investigate the source, causes and flooding mechanism of the fluvial flood event of 16th and 17th August 2008;
- identify the properties affected by that flood and the extent of fluvial flooding at each river;
- identify possible outline solutions to reduce future fluvial flood risk and to provide outline cost estimates of each; and
- assess the performance of the Burren Flood Alleviation Scheme during the flood event.

As detailed within the '*Burren & Shimna Rivers Flood Investigation Report*' (RPS 2009) "*through a data collection process and a computational model constructed for this report it was shown that areas protected by the Burren Flood Alleviation Scheme could still be flooded from the Shimna River (this could only be prevented by raising the level of the Bryansford Avenue road bridge). The main source of flooding in these areas is water from the Shimna River flooding through Islands Park then over and along Bryansford Avenue. Flood water can then flow over the Bryansford Avenue Road bridge and flood properties within the Burren catchment, along the Shimna Road and in Shimna Vale*". A copy of this report is included with Appendix 1 – Annex A of this ES.

Subsequent to this, RPS prepared the *Shimna River, Newcastle Feasibility Study for Flood Risk Investigation*' (2015), in which a computer model was constructed to assess the risk of flooding from the Shimna River. The calibrated river model was run to determine water levels for a range of storm events for both the present day and future scenarios. The flood levels generated from the model simulations were plotted onto maps of the area in order to show the floodplains created from the various events.

The flood maps created were:

- Q_{10} (10% Annual Exceedance Probability (AEP));
- Q_{100} (1% AEP);
- Q_{1000} (0.1% AEP); and
- Q_{100} with climate change (2030 scenario).

These flood maps depict the 'Do-Nothing or Do-Minimum' scenario, where it is assumed that regular routine maintenance is carried out on watercourses only. They also form the basis for the outline design of a flood protection scheme and the economic assessment of flood risk and the benefits of such a scheme. Copies of these maps are included within the '*Shimna River, Newcastle Feasibility Study for Flood Risk Investigation*' (2015), which is included within Appendix 1 – Annex B of this ES.

1.1.1 Flood Mechanisms & Flood Risk

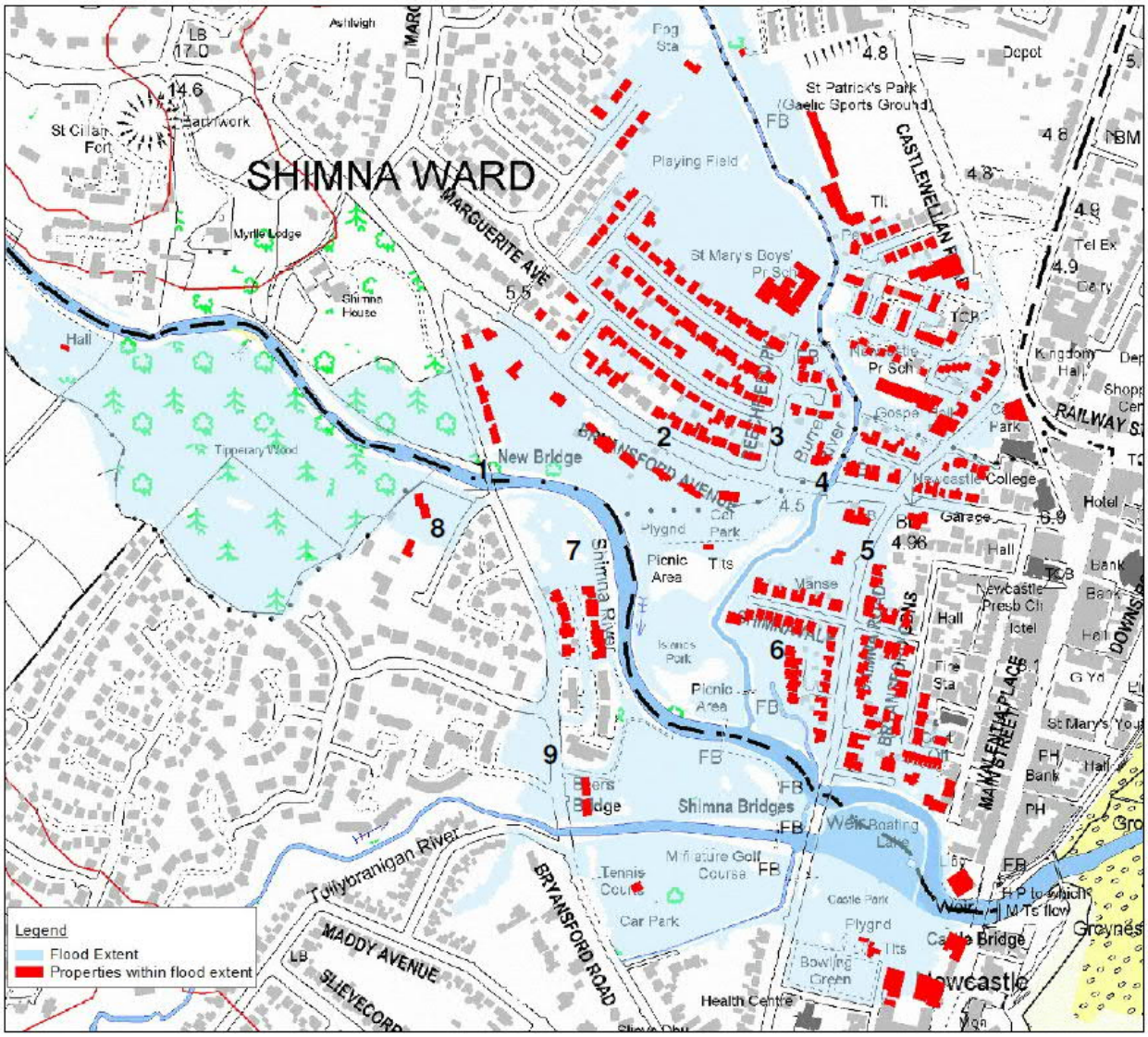


Plate 1.1: Shimna River, Newcastle 1% AEP Flood Extents

Source: 'Shimna River, Newcastle Feasibility Study for Flood Risk Investigation' (RPS 2015).

Key Map Locations

(1) Bryansford Road Bridge

(2) Bryansford Avenue

(3) Beechfield Avenue

(4) Bryansford Avenue Bridge

(5) Shimna Road

(6) Shimna Vale

(7) Shimna Mile

(8) Riverside Park

(9) Bryansford Road

Plate 1.1 illustrates the predicted flood risk in Newcastle posed by the 1% AEP flood event on the Shimna River, which indicates that at least 312 properties would be at risk of inundation by a 1% AEP flood event. The majority of properties at risk are on the left (north) bank of the river. Initial flooding begins around Bryansford Road Bridge. The flood water then flows across Bryansford Avenue into Beechfield Park and towards the Bryansford Avenue Bridge. The Bryansford Avenue Bridge acts as an aqueduct and conveys water over the Burren River to the eastern part of Newcastle causing flooding along Shimna Road and Shimna Vale. These mechanisms were seen during the August 2008 flood event. The Burren River flood defences do not get overtopped from the 1% AEP event in the Shimna River.

A smaller number of properties on the right (south) bank of the Shimna River are also at risk from flooding. These are in Shimna Mile, Riverside Park and Bryansford Road.

It is on this basis the current Scheme is being proposed, which will require the construction of flood alleviation measures to reduce the risk of flooding from the Shimna River to protect existing properties in the town. The works would extend both upstream (into Tipperary Wood) and downstream (into Islands Park) from New Bridge on the Bryansford Road. The proposed works would include:

- demolition of a number of property boundary walls and fences;
- felling of a number of mature trees;
- relocation of one drainage ditch;
- 1430m of brick/concrete clad sheet piles or sheet pile core embankments;
- construction of a new pathway;
- realignment of an existing pathway; and
- erection of one floodgate.

Further detail regarding the Proposed Scheme is provided in Section 4 of this ES.

1.2 Proposed Scheme Objectives

The overall objective of the Proposed Scheme is for the Department to reduce the risk of flooding to over 300 properties from the Shimna River. The main objectives, based on the Specific, Measurable, Attainable, Relevant and Timely (SMART) principles, are to:

- provide flood protection to the 312 properties at risk of flooding within Newcastle, by January 2020. The protection provided should prevent inundation in the event of a 1% AEP water level. This is the standard that the Department uses for the design of their defences. The flood protection measures should not increase the flood risk elsewhere in the catchment;
- deliver the project within the budget approved within the economic appraisal;
- complete a Post-Project Evaluation (PPE) for the scheme which will be scheduled for one year after the completion date of the scheme works;
- provide a sustainable and environmentally acceptable solution by January 2020;
- carry out the works within the required timescales as outlined in the Contract Data Part 1 and accepted programmes. All works to be completed by January 2020;

- carry out the works in an environmentally sensitive manner in conjunction with the Department's Conservation Officer, and in accordance with relevant European Directives (EIA Directive, Water Framework Directive, Floods Directive, Habitats Directive etc.) and transposing National legislation;
- minimise disruption to residents/public during and post works through regular liaison with residents and statutory stakeholders;
- achieve value for money for whole-life costs;
- undertake works with full regard for health and safety; and
- Post-works regular inspection and maintenance of the flood defence infrastructure.

These objectives are achievable and will be met by programming the Proposed Scheme components using existing and future programmes and work schedules.

1.3 The Environmental Statement

The ES is a detailed report of the findings of the EIA process. In particular, it predicts the environmental effects that the Proposed Scheme would have, and details the measures proposed to reduce or eliminate those effects. It is a statement that includes such of the information referred to in Schedule 2A to the Drainage Order 1973, as substituted by The Drainage (Environmental Impact Assessment) Regulations (Northern Ireland) 2017, that is reasonably required to assess the environmental effects of any proposed drainage works and which the Department can, having regard in particular to current knowledge and methods of assessment, reasonably be required to compile.

Pursuant to Regulation 10 of the Drainage (Environmental Impact Assessment) Regulations (Northern Ireland) 2017, the ES must:

a. be prepared by persons who have sufficient expertise to ensure the completeness and quality of the statement;

b. contain a statement setting out how the requirement of (a) has been complied with (this is included within Sub-section 1.3.5 of this ES);

c. be prepared, taking into account other environmental assessments with a view to avoiding duplication of assessment; and

d. where an opinion is issued in accordance with Regulation 11, be based on that opinion.

1.3.1 Legal basis for the Environmental Statement (including Screening)

The requirement to carry out a statutory EIA and publish a formal ES only applies to certain projects that are deemed to exceed certain thresholds and are predicted to have a significant effect on the environment.

The Planning Reform (Northern Ireland) Order 2006 ended the Crown's immunity from planning control. Crown bodies have to apply for planning permission like any other developer, unless a scheme is classified as 'permitted development' as defined by the Planning (General Development) Order (Northern Ireland) 1993 (as amended by the Planning (Application of Subordinate Legislation to the Crown) Order (Northern Ireland) 2006).

Part 24 of the Schedule to the Planning (Application of Subordinate Legislation to the Crown) Order (Northern Ireland) 2006 describes permitted development rights exercisable by the Department for the purposes of drainage works. The Proposed Scheme qualifies as a Class A 'permitted development' under this schedule, as it would require carrying out drainage works by or on behalf of the Department, as per the meaning assigned to it by Schedule 2 of the Drainage (Northern Ireland) Order 1973 [as amended]. This includes new construction works such as:

- *the building of embankments and walls for the prevention of flooding or erosion.*

1.3.2 Screening

Under the provisions of the Drainage (Northern Ireland) Order 1973 [as amended], in determination of whether a drainage scheme has significant effects on the environment, the Department shall determine before the date of publication of details of the scheme whether or not it falls within Annex I or Annex II to Directive 2011/92/EU of the European Parliament and of the Council on the assessment of the effects of certain public and private projects on the environment, as amended by Directive 2014/52/EU of the European Parliament and of the Council (hereafter referred to as the EIA Directive).

The process for determining whether it is necessary to carry out an EIA and publish an ES is termed Screening. The Screening process establishes:

1. whether the project falls within Annex I or Annex II to the EIA Directive;
2. whether an Annex II project represents a 'relevant project';
3. the 'determination' for the purposes of The Drainage (Environmental Impact Assessment) Regulations (Northern Ireland) 2017 and whether the project should be subject to an EIA; and
4. reporting the determination.

As noted previously, the screening to determine whether a full EIA and subsequent ES would be required was undertaken and documented in an EIA Screening Report (February 2018) and included within Appendix 1 – Annex C of this ES.

Pursuant to Regulation 7 of the Drainage (Environmental Impact Assessment) Regulations (Northern Ireland) 2017, the Department having taken into account, so far as relevant, the criteria set out in Schedule 2B to the Drainage Order and the available results of other environmental assessments required under Union legislation (other than legislation implementing the requirements of the Directive), shall determine that the proposed drainage works are likely to have significant effects on the environment. Pursuant to Regulation 9, the notification of determination that the Proposed Scheme is likely to have significant effects on the environment was published in the Belfast Gazette on 25th May 2018 and a copy of this notice included in Appendix 1 – Annex D of this ES.

The EIA Directive (Directive 85/337/EEC) on "*The assessment of the effects of certain public and private projects on the environment*" came into effect in Europe in July 1988 and initiated a formal approach to environmental assessment throughout the European Community. The Directive requires an environmental assessment to be carried out, prior to a development consent being granted, for certain types of major projects judged likely to have significant impacts on the environment.

The EIA Directive of 1985 has been amended three times; in 1997, in 2003 and in 2009. The initial Directive of 1985 and its three amendments have been codified by Directive 2011/92/EU of 13th December 2011. Directive 2011/92/EU was amended in 2014 by Directive 2014/52/EU which entered into force on 15th May 2014 and transposed in national legislation by The Drainage (Environmental Impact Assessment) Regulations (Northern Ireland) 2017, becoming operational on 16th May 2017.

These Regulations implement, for Northern Ireland, Council Directive 2011/92/EU (as amended by Council Directive 2014/52/EU) on the assessment of the effects of certain public and private projects on the environment, in respect of drainage schemes and drainage works. They also revoke and re-enact, with amendments, the Drainage (Environmental Impact Assessment) Regulations (Northern Ireland) 2006. 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.

1.3.3 Matters for inclusion in the Environmental Statement

As noted previously, the ES includes such information referred to in Schedule 2A to the Drainage Order, as is reasonably required to assess the environmental effects of any proposed drainage works and which the Department can, having regard in particular to current knowledge and methods of assessment, reasonably be required to compile. This includes:

1. a description of the drainage works or drainage scheme ('the Proposed Scheme'), including in particular;
    a. a description of the location of the works;
    b. 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;
    c. a description of the main characteristics of the operational phase of the works, for instance, energy demand and energy used, nature and quantity of the materials and natural resources (including water, land, soil, and biodiversity) used;
    d. an estimate, by type and quantity, of expected residues and emissions (such as water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation etc.) resulting from the operation of the proposed works.
2. A description of the reasonable alternatives (for example in terms of design, technology, location, size and scale) studied by the Department, which are relevant to the proposed works and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.
3. A description of the relevant aspects of the current state of the environment and an outline of the likely evolution thereof without implementation of the works (the do-nothing scenario) as far as natural changes from the current state can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge.
4. A description of the factors specified in Article 3(1) of the EIA Directive likely to be significantly affected by the development: population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage including architectural and archaeological aspects, and landscape.
5. A description of the likely significant effects of the works on the environment resulting from, inter alia;
    a. the construction and existence of the works, including, where relevant, demolition works;
    b. the use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources;
    c. the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste;
    d. the risks to human health, cultural heritage or the environment (for example due to accidents or disasters);
    e. the accumulation of effects with other existing or approved works, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources;
    f. the impact of the works on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the works to climate change;
    g. the technologies and the substances used.
6. The description of the likely significant effects on the factors specified in Article 3(1) of the EIA Directive should cover the direct effects and any indirect, secondary, cumulative, transboundary, short, medium and long-term, permanent and temporary, positive and negative effects of the works. This description should take into account the environmental protection objectives

established at EU or Member State level which are relevant to the works, including in particular those established under Council Directive 92/43/EEC(15) and Directive 2009/147/EC(16) of the European Parliament and of the Council.

7. A description of the forecasting methods or evidence used to identify and assess the significant effects on the environment including details of the difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information and the main uncertainties involved.

8. A description of the measures envisaged to avoid, prevent, reduce and where possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparation of a post-works analysis). That description should explain the extent to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and should cover both the construction and operational phases.

9. A description of the expected significant adverse effects of the works on the environment deriving from the vulnerability of the works to risks of major accidents or disasters which are relevant to the works concerned. Relevant information available and obtained through risk assessments pursuant to EU legislation, such as Directive 2012/18/EU of the European Parliament and of the Council or Council Directive 2009/71/Euratom or relevant assessments carried out pursuant to national legislation, may be used for this purpose provided that the requirements of the Directive are met. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies.

10. A non-technical summary of the information provided under points 1 to 9 above.

11. A reference list detailing the sources used for the descriptions and assessments included in the ES.

1.3.4 Scoping

EIA Scoping is the process of determining the scope and extent of issues that should be covered as part of the EIA and contained within the ES. A formal scoping exercise was not carried out for the Proposed Scheme as it is not a mandatory requirement for projects proceeding under the Drainage Order 1973, as substituted by The Drainage (Environmental Impact Assessment) Regulations (Northern Ireland) 2017.

Nevertheless, an informal scoping exercise was undertaken to focus the EIA upon only those topics and matters that potentially significant impacts may arise as a result of the Proposed Scheme. As a consequence of this exercise, certain environmental disciplines or 'topics' were excluded from the environmental assessment ("scoped out" of the EIA) for the reasons as set out below.

1.3.4.1 Traffic and Transportation

No assessment of traffic induced noise or air quality effects was undertaken from an operational perspective as the Proposed Scheme would have no impact upon long-term traffic movements through the study area. Furthermore, as there would be no change to the local road network or traffic levels during the operational phase, no further assessment was carried out for this topic.

The construction traffic shall utilise the existing road network, the majority of which is two-lane carriageway with footways. The volume of construction traffic is expected to be minimal and not result in a perceptible loading of the local road network. The standard the road network and access points are also fit for purpose to accommodate any plant and machinery that would need to use them. The park site would be accessed using existing access points and entrances. To minimise potential for adverse impact upon construction operatives, the local community, and residents directly affected by the works and associated traffic, travel management and vehicle usage, the Contractor shall be required to establish a traffic management system for:

- planning and controlling the movement of vehicles, plant and non-motorised users that are present within the site, access to and egress from the site and on the adjacent road network;

- ensure that safety of construction operatives, motorised and non-motorised users are not compromised. This shall be achieved by effective implementation of a Traffic Management Plan (TMP) to be prepared and initiated by the Contractor and agreed with the Employer. The TMP shall be included as part of the Construction Environmental Management Plan (CEMP). The objective of this plan shall be to: minimise journeys to and from the site by the workforce, sub-contractors, suppliers and anyone else who is likely to visit the site regularly;
- provide protection from traffic hazards that may arise as a result of the construction activities and journeys to and from the site;
- manage potential adverse impacts on the public road network and ensure network performance is maintained at an acceptable level;
- minimise adverse impacts on users (motorised and non-motorised) of the public road network and adjacent properties and community facilities;
- plan deliveries to the site; and
- ensure that the roads and footways at the site access are kept clear of debris, soil and other material.

1.3.5 Structure of the Environmental Statement

The ES comprises two parts, of different levels of detail:

- the ES - a comprehensive and concise document drawing together all the relevant information about the Proposed Scheme; and
- a Non-Technical Summary (NTS) – a brief report summarising the principal sections of the Statement in non-technical language.

1.3.5.1 The Environmental Statement

The ES is presented in four parts and 18 sections.

Part I – Introduction (Sections 1 to 6) encompasses the overall introduction to the scheme, which is as follows:

- **Section 1: Introduction**;
- **Section 2: Strategic Need for the Proposed Scheme**;
- **Section 3: Alternatives Considered**, including:
  - a description of the reasonable alternatives (for example in terms of design, technology, location, size and scale) studied by the Department, which are relevant to the Proposed Scheme and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects);
- **Section 4: Scheme Description**, including;
  - 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;
  - characteristics of the Proposed Scheme including operational phase of the works (in particular any production processes), for instance, energy demand and energy used, nature and quantity of the materials and natural resources; and
  - Construction Activities.
- **Section 5: Existing Conditions**, including;
  - details on site description, location and context of the works (with a focus on the catchment). This includes a description of the relevant aspects of the current state of the environment and an outline of the likely evolution thereof without implementation of the works as far as natural changes from the current state can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge; and

  - details on existing land use within the catchment (a description of the study area in which the Proposed Scheme would be located).
- **Section 6: Consultations**, including:
  - details of the level of consultation taken place to date in relation to the Proposed Scheme and with whom).

Part II - Environmental Assessment (Sections 7 to 15)

- **Section 7: Air Quality & Climate**, which assesses the impact to air quality and climate associated with the Proposed Scheme;
- **Section 8: Cultural Heritage**, which assesses the impact of the Proposed Scheme upon archaeological and built heritage resources within the study area;
- **Section 9: Biodiversity – Terrestrial Ecology**, which addresses the terrestrial ecological impacts of the Proposed Scheme on habitats and protected flora & fauna. As part of the consideration of wider biodiversity impacts, this section does consider impacts upon the aquatic environment, however a specific section has been prepared which addresses fisheries and aquatic ecology ;
- **Section 10: Landscape & Visual**, which describes the potential impacts on the landscape resource and visual amenity associated with the Proposed Scheme;
- **Section 11: Population & Human Health**, which describes the potential impacts on people and communities (including human health and socioeconomic effects) associated with the Proposed Scheme;
- **Section 12: Noise & Vibration**, which describes how the Proposed Scheme would influence the noise environment in the study area;
- **Section 13: Drainage & the Water Environment** assessment describes the impacts of the Proposed Scheme in relation to the existing water environment;
- **Section 14: Geology & Soils** describes how the Proposed Scheme would impact on the geological resources in the study area; and
- **Section 15: Biodiversity – Fisheries & Aquatic Ecology** which provides an environmental assessment of impacts of the Proposed Scheme upon fish migration, in addition to potential effects on spawning and nursery habitat.

Part III – Conclusions (Section 16**)**

- **Section 16: Conclusions** details the cumulative effects associated with the Proposed Scheme on the surrounding area from a single project perspective (i.e. Interaction of Impacts); and cumulative impacts from different projects (in combination with the Proposed Scheme being assessed). A Summary of the Environmental Effects is also given, which provides a brief summary of the overall environmental effects described throughout each of the Technical Sections (7-15), taking into account the effectiveness of measures (where appropriate) to mitigate adverse impacts, thus allowing for the overall significance of effect to be rated. At the end of the Section, a Schedule of Environmental Commitments is given, which provides a collective summary of the proposed mitigation to ensure compliance during and beyond the construction contract period.

Part IV - References and Glossary of Terms (Sections 17 & 18**):**

- **Section 17:** References used in the ES; and
- **Section 18:** Glossary of Terms used in the ES.

The appendices include information that is not essential to explaining the findings of the EIA, but support the analysis and validates conclusions. The appendices are ordered in accordance with the Section of the ES to which they relate.

1.3.5.2 Non-Technical Summary

The NTS is provided at the beginning of the ES, and presents a concise overview of the contents of the ES and the key environmental issues associated with the Proposed Scheme. The NTS is also available as a separate report.

1.3.6 Environmental Impact Assessment - Approach & Methods

Details of the approach and methods used in the assessment of each environmental topic have been included in the individual technical sections. Each technical section follows the same general format, as detailed below:

- **Introduction**: a brief summary of what is considered/assessed in the section;
- **Methodology**: describing the methodology that has been used in the assessment of the environmental topic;
- **Regulatory & Policy Framework**: short summary of legislation and planning policy pertinent to the assessment of the environmental topic;
- **Baseline Conditions**: a description of the existing environmental conditions against which the predicted environmental impacts have been assessed, including an assessment of value/sensitivity of environmental receptors/assets;
- **Predicted Impacts**: identification of predicted impacts resulting from the operation and construction of the Proposed Scheme, and assessment of impact magnitude;
- **Mitigation & Enhancement Measures**: recommendations for measures to avoid, offset or reduce the identified adverse impacts associated with the Proposed Scheme;
- **Residual Effects**: assessment of significance of effects after consideration of mitigation measures; and
- **Summary & Conclusions**: a summation of main effects associated with the Proposed Scheme.

1.3.6.1 Assessment of Predicted Impacts and Residual Effects (Significance of Effects)

Predicted impacts arising from the Proposed Scheme have been identified, magnitude of impact described, and an assessment of the level of significance for each effect determined, within the assessment of each environmental topic. Impacts associated with the Proposed Scheme may or may not result in significant effects on the environment, depending on the sensitivity of the resource or receptor and potentially other factors.

The determination of the significance of effects is a key stage in the EIA process. In general, impact 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.

1.3.6.1.1 Sensitivity (or Value)

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).

The typical criteria for assessing the sensitivity of an environmental receptor are described in Table 1.1. 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 1.1: Environmental Sensitivity and Typical Descriptions

Value (Sensitivity)	Typical descriptors
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	High or medium importance and rarity, regional scale, limited potential for substitution.
Low (or Lower)	Low or medium importance and rarity, local scale.
Negligible	Very low importance and rarity, local scale.

1.3.6.1.2 Magnitude of Impact

Typical descriptions and criteria for defining Magnitude of Impact are described in Table 1.2. It must be noted that not all of the magnitude of impact and typical descriptions have necessarily been adopted within each of the technical sections.

Table 1.2: Magnitude of Impact and Typical Descriptions

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

1.3.6.1.3 Assessing Significance

The approach to assigning significance of effect relies on reasoned argument, professional judgement, and taking on board the advice and views 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. These five significance categories are set out in Table 1.3. It must be noted that not all of the significance categories and typical descriptions have necessarily been adopted within each of the technical sections.

Table 1.3: Significance Categories and Typical Descriptors

Significance category	Typical descriptors of effect
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 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.

It is important to note that significance categories are required for positive (beneficial) as well as negative (adverse) effects. The five significance categories give rise to eight potential outcomes. Applying the formula, 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 1.4.

Table 1.4: Example matrix for determining Significance of Effects

		MAGNITUDE OF IMPACT (Degree of Change)				
		No change	**Negligible**	**Minor**	**Moderate**	**Major**
SENSITIVITY	**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	Neutral or Slight	Slight	Moderate	Moderate or Large
	Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
	Negligible	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight

Change can be either beneficial or adverse, and effects can also, therefore, be either beneficial or adverse. In some cases above, the significance is shown as being one of two alternatives. In these cases, a single description should be decided upon with reasoned professional judgement for that level of significance chosen.

The significance is assigned after consideration of the effectiveness of the design and committed mitigation measures, allowing for the positive contribution of all mitigation that is deliverable and committed.

1.3.7 The Environmental Impact Assessment Team

As stated previously, pursuant to Regulation 10 of the Drainage (Environmental Impact Assessment) Regulations (Northern Ireland) 2017, the ES must:

a. be prepared by persons who have sufficient expertise to ensure the completeness and quality of the statement; and

b. contain a statement setting out how the requirement of (a) has been complied with;

This ES has been prepared entirely by AECOM on behalf of the Department, including all specialist inputs to the assessment. AECOM is a global provider of professional technical and management support services. With over 100 EIA practitioners in the UK, EIA management is provided from 10 offices and makes use of our in-house resource of over 300 environmental specialists from over 22 offices. AECOM's specialists cover the whole spectrum of environmental skills including air quality, ecology, geo-environmental sciences, hydrology, landscape architecture, socio-economics, land use planning and acoustics.

In terms of quality, AECOM is an EIA Quality Mark Registrant, which is a scheme operated by the Institute of Environmental Management & Assessment (IEMA) that allows organisations (both developers and consultancies) that lead the co-ordination of statutory EIAs in the UK to make a commitment to excellence in their EIA activities and have this commitment independently reviewed.

EIA Quality Mark registrants must adhere to seven key commitments of this scheme which underpin and maintain its high standards. These are:

- EIA Management – commitment to using effective project control and management processes to deliver quality in EIA and the ES's produced;
- EIA Team Capabilities – commitment to ensuring that all EIA practitioners have the opportunity to undertake regular and relevant continuing professional development;
- EIA Regulatory Compliance – commitment to delivering Environmental Statements that meet the requirements established within the appropriate UK EIA Regulations;
- EIA Context & Influence – commitment to ensuring that all coordinated EIAs are effectively scoped and that it is transparently indicated how the EIA process, and any consultation undertaken, influenced the development proposed and any alternatives considered;
- EIA Content – commitment to undertaking assessments that include: a robust analysis of the relevant baseline; assessment and transparent evaluation of impact significance; and an effective description of measures designed to monitor and manage significant effects;
- EIA Presentation – commitment to deliver ES's that set out environmental information in a transparent and understandable manner; and
- Improving EIA practice – commitment to enhance the profile of good quality EIA by working with IEMA to deliver a mutually agreed set of activities, on an annual basis, and by making appropriate examples of our work available to the wider EIA community.

1.3.8 Review and Comment

Pursuant to 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 (1) and (2) below:

12. The advertisement shall state:
    a. that the ES has been prepared and give details of the places where and times at which copies, together with details of the proposed drainage works to which the Environmental Statement relates, may be inspected;
    b. that any person wishing to make representations in relation to the likely environmental effects of the Proposed Scheme 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
    c. that where no objection in relation to the likely environmental effects of the Proposed Scheme is made and the Drainage Council, having undertaken the examination specified in Regulation 16(1) of the Drainage (Environmental Impact Assessment) Regulations (Northern Ireland) 2017, considers that the drainage works Proposed Scheme should be approved, it may so determine.
13. On or before the date of publication in the Belfast Gazette of the notice described above, the Department shall:
    a. send a copy of the ES 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;
    b. 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 Scheme and the ES relating to the drainage works;
    c. ensure that a reasonable number of copies of the ES are made available and, if a charge is to be made for any such copy, the amount of the charge; and
    d. place the notice and a copy of the ES on a website maintained by the Department.

Where the Department sends any person a copy of the ES, it shall consult that person about the assessment and the likely environmental effects of the Proposed Scheme to which it relates.

Copies of the ES may be inspected free of charge during office hours at the following deposit locations from 14th August to 30th September 2018:

- Newry, Mourne and Down District Council, District Council Offices, O'Hagan House, Monaghan Row, Newry, BT35 8DJ;
- Newcastle Centre, 10-14 Central Promenade, Newcastle, Co Down, BT33 0AA; and
- DfI - Rivers HQ, 49 Tullywiggan Road, Loughry, Cookstown, BT80 8SG.

The ES can also be viewed on the Department's website at www.infrastructure-ni.gov.uk/publications

A bound paper copy of the ES may be purchased at a cost of £200; and is also available on CD free of charge, by writing to the address provided below. The NTS is available free of charge from the same address.

Mr Ian Coulter
DFI - Rivers
49 Tullywiggan Road
Loughry,
COOKSTOWN
Co. Tyrone
BT80 8SG

Or email ian.coulter@infrastructure-ni.gov.uk by no later than 30th September 2018.

Information provided in response, including personal information, could be published or disclosed under the Freedom of Information Act 2000. For further information on confidentiality and this Act, please refer to www.ico.gov.uk.

1.3.9 Assessment of Implications on European Sites

Further to the mandatory requirement to undertake an EIA and publication of an ES for the Proposed Scheme, an Assessment of Implications on European Sites (otherwise known as a Habitats Regulations Assessment (HRA)) is also required. The HRA is a distinct and separate assessment required by law to inform the decision making process when the Proposed Scheme may have a significant effect on a Natura 2000 site.

Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive) and its amendments have been implemented in Northern Ireland by The Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995 [as amended]. The Directive requires Member States to protect over 200 habitats listed in Annex I to the Directive and approximately 1000 species listed in Annex II (not including birds), by means of a network of sites. Once adopted, these sites are designated by Member States as Special Areas of Conservation (SACs). Special Protection Areas (SPAs) are designated under Directive 2009/147/EC on the conservation of wild birds (the codified version of Council Directive 79/409/EEC [as amended]) (the Birds Directive). SPAs form a network of protected areas, together with SACs, known as Natura 2000 sites. The species listed in Annex I to the Directive are the subject of special conservation measures to ensure their survival and reproduction in their area of distribution. Each Natura 2000 site is subject to full legal protection under at least one of the Directives.

Development on or adjacent to Natura 2000 sites is strictly regulated. The Habitats Directive stipulates that where a policy, project or plan, either in isolation or combination with others, is likely to have a significant effect upon a designated SPA or SAC, an 'Appropriate Assessment' must be made under Article 6(3) of the Habitats Directive. The HRA applies to designated sites and candidate/proposed sites.

The HRA takes the form of four sequential stages. Firstly, Stage 1 (Screening) assesses if a significant effect will impact the site. If significant effects cannot be ruled out, then the process proceeds to Stage 2 (Appropriate Assessment). At this stage, an assessment of all the potential effects and their impacts on the interest features of the site is made. Mitigation measures to minimise the impacts are considered at this stage. If there is still deemed to be a significant negative impact, then Stage 3 (Consideration of Alternatives), examines the possibilities of alternative solutions or choices for the Proposed Scheme. Finally, if Stage 4 (Consideration of Imperative Reasons of Overriding Public Interest) is considered necessary, the overriding health and safety concerns or public interest are examined, prior to requesting permission from the EU for the Proposed Scheme. The EU may still choose to reject it at this stage. If at any of the stages the Proposed Scheme is considered not to have any significant impacts on the interest features of the site, then the assessment process can halt at the end of that stage.

An HRA is required even if the plan or project is outside the boundary of a Natura 2000 site, if it might have an effect upon an SPA or SAC. The assessment is concerned only with the ecological features and the processes which support them, for which the site has been designated. The assessment needs to determine whether the Proposed Scheme will have a significant adverse effect on the integrity of the features for which the site has been designated. Integrity 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 assessment must be conducted by the 'Competent Authority' (i.e. the organisation that gives permission for the scheme to proceed, in this instance DfI - Rivers). If the Competent Authority concludes that there are no significant adverse effects on integrity, then the Proposed Scheme can proceed. The Competent Authority may conclude that there might be adverse effects, unless certain methods/procedures are used – in which case it may apply conditions or similar to ensure that these methods/procedures are implemented.

If it concludes that there are adverse significant effects on the site integrity, then it must refuse the scheme until further investigation is undertaken. Imperative Reasons of Overriding Public Interest (IROPI) can enable a Competent Authority to agree to a scheme, even with likely significant adverse effects. Reasons include:

- Where the scheme is required to remove a serious risk to human health and public safety;
- For reasons of national security and defence, such as safeguarding human life or property; or
- If the scheme can demonstrate a clear public or direct environmental benefit on a national or international scale.

In these circumstances, compensation habitat must be provided for that lost. If the Competent Authority is minded to allow the project to proceed at this stage, the European Commission will need to be informed about the committed compensation measures via written submission issued through Northern Ireland Ministers under the advisement of the Department. In other, more limited circumstances, it is possible to consent an application for economic reasons but not where the SPA/SAC includes Priority Habitats or Species.

Therefore, drainage works projects occurring close to Natura 2000 sites should be subject to HRA Screening at the very least, if they could potentially cause adverse impacts upon the key interest features of the sites, either in isolation, or in combination with other projects.

Within the immediate study area, there are no European designated sites. It is however hydrologically connected to National and European designated sites:

- Murlough ASSI which is declared under the Environment Order (Northern Ireland) 2002; and
- Murlough SAC designated under the EC Habitats Directive (92/43/EEC) on the conservation of natural habitats and of wild flora and fauna.

The Proposed Scheme is also in close proximity to a proposed European designated site:

- East Coast Marine proposed Special Protection Area (pSPA) which is designated under the EC Birds Directive (2009/147/EC on the conservation of wild birds).

Recent advice, relating to SACs which have seals as a site selection feature, recommends the following ranges should be used when screening for either Harbour or Grey seals:

- all SACs within 135km of the project should be screened for Grey Seals (*Halichoerus grypus*); and
- all SACs within 50km should be screened for Harbour seals (*Phoca vitulina*).

Taking these ranges into consideration, Murlough SAC and Strangford SAC are both designated for Harbour seals and within 50km. There is one SAC site which has Grey seals as a site selection feature within 135km of the Proposed Scheme – The Maidens SAC. All these SACs should be screened in the HRA.

While there is minimal risk of Harbour porpoise being present in the vicinity of the works, there is a newly proposed SAC, The North Channel SAC, approximately 30km away, which has Harbour porpoise as a site selection feature. This site should also be considered in the HRA.

As such, an HRA has been completed to ascertain if there would be a detrimental effect to these sites and summarised within Section 9 (Biodiversity – Terrestrial Ecology).

2. Strategic Need for the Proposed Scheme

2.1 What are the effects of flooding?

The effects of flooding are wide ranging, impacting on the economy, social wellbeing and the environment. For individuals and communities, the impact can be significant in terms of personal suffering and financial loss and, even where flooding has natural causes, it can have damaging effects on the environment.

Essential services such as mains water, electricity and transport can be disrupted. Property and possessions can be damaged and most seriously, flooding can result in injury and death.

2.2 Managing Flood Risk

Flooding is a natural phenomenon and can have a devastating impact on communities. Whilst flooding cannot be entirely prevented, as per the requirements of the European Floods Directive (2007/60/EC), the Department manages 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; and
- **preparedness**: informing the public about flood risk and what to do in the event of a flood.

To achieve these objectives, the Floods Directive addresses flood risk in Northern Ireland on a catchment-wide scale. This is because flooding problems may be affected by the characteristics of the catchment. The Floods Directive requires consideration of flooding by sea, rivers and lakes, surface water and reservoirs. By assessing the 'bigger picture', the Department can ensure that the flood risk is fully understood which will help make sustainable, long-term decisions.

Flood risk management through the Floods Directive takes place alongside government's ongoing programme of drainage and flood alleviation measures.

The Northern Ireland legislation to transpose the Floods Directive was introduced in 2009 and is The Water Environment (Floods Directive) Regulations (Northern Ireland) 2009. This legislation required the completion of a Preliminary Flood Risk Assessment by December 2011, Flood Risk and Flood Hazard Maps for significant risk areas by December 2013, and Flood Risk Management Plans by 2015. The plans set out the Departmental objectives, measures and an action plan for managing flood risk.

2.3 Significant Flood Risk Areas

Table 2.1 lists areas which have been identified as Significant Flood Risk Areas (SFRA) and additional Areas for Further Investigation (AFI) within the North East Flood Risk Management Plan (FRMP) District. This is a critical milestone in the implementation of the Floods Directive as it identifies areas for which the Department is required to produce FRMPs.

Flood risk is a measure of the statistical probability that flooding will occur, combined with the adverse consequences of the flooding. The assessment of future flood risk therefore requires a detailed understanding of the flood mechanisms for each source of flooding, the magnitude and statistical probability of flood events, and the scale of potential adverse consequences arising from these events.

The extent of potential future flood hazards for each source of flooding for a range of return periods has been determined using predictive flood inundation models developed by the Department for rivers, sea and surface water. Although strategic in nature, these models have been developed using best practice methodologies that utilise the available topographical and land use data. For each area,

the Department has provided details of the flood source and the impact it could potentially have on the people, places, infrastructure and activities in that area.

Table 2.1: Areas of study in the North East FRMP District

Significant Flood Risk Areas	Areas for Further Investigation	
Belfast	Larne	Ballynahinch
Newtownards	Comber	Lisburn
Carrickfergus & Kilroot Power Station	Ballygowan	Saintfield
Bangor	Holywood	Ballygally
NEWCASTLE	Dromore	Drumaness
Newtownabbey	Bushmills	Carryduff
Downpatrick	Whitehouse	Cushendall
Dundonald	Ballycastle	Portush

Source: https://www.infrastructure-ni.gov.uk/articles/managing-risk-flooding

As detailed within Table 2.1, Newcastle has been identified as a SFRA, and as such requires a FRMP. These plans highlight the flood hazards and risks in the twenty most significant flood risk areas in Northern Ireland from flooding from rivers, the sea, surface water and reservoirs. The plans identify the measures that will be undertaken over the next 6 years and set out how the relevant authorities will work together and with communities to reduce flood risks. The plans also include an associated Environmental Report, Strategic Environmental Assessment (SEA), Habitats Regulations Assessment (HRA) and a summary of measures.

2.4 North East Flood Risk Management Plan

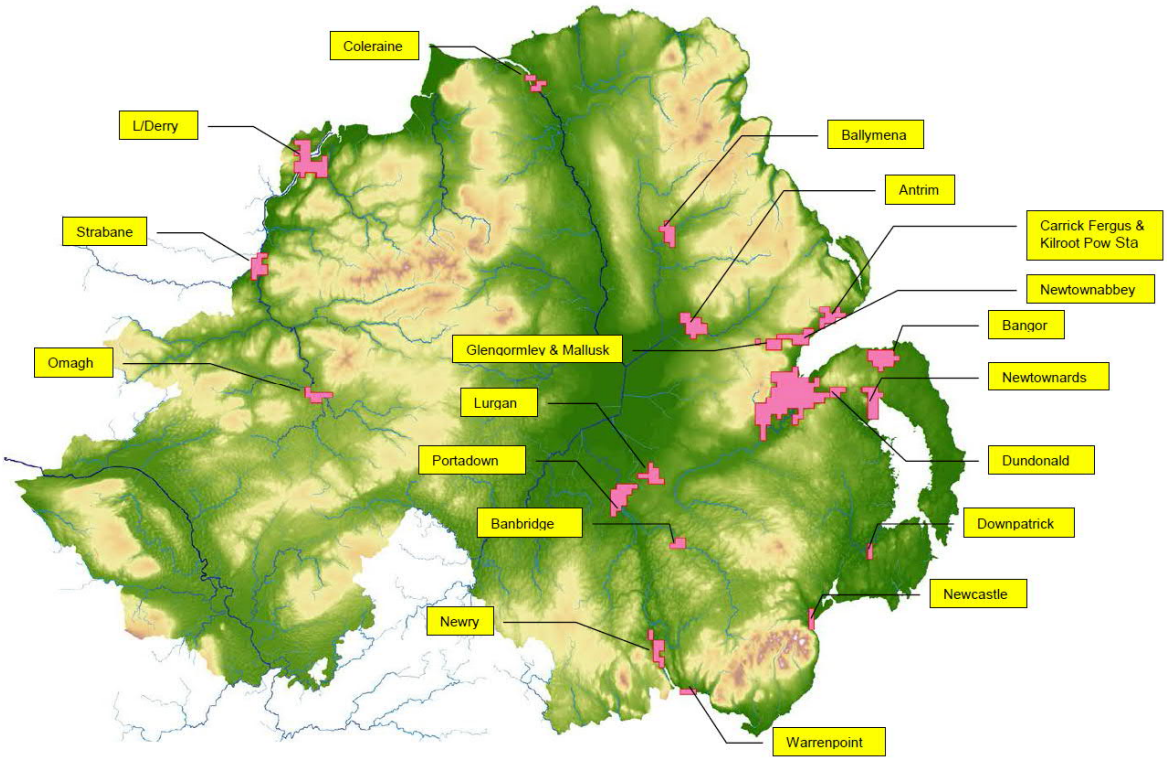


Plate 2.1: Map of Northern Ireland's 20 Significant Flood Risk Areas

Source: North East Flood Risk Management Plan (2015)

Flood Risk Management Plans are a key requirement of the Floods Directive and are aimed at reducing potential adverse consequences of significant floods on human health, economic activity, cultural heritage and the environment. The FRMPs are coordinated at the River Basin District level to

align with the Water Framework Directive's River Basin Management Plans (RBMPs) and focus on managing flood risk in twenty SFRAs identified through the Preliminary Flood Risk Assessment (PFRA) for Northern Ireland that was completed by the Department in December 2011. The twenty SFRAs (including Newcastle) are illustrated on Plate 2.1.

In practice, the North East FRMP provides the information and evidence necessary to support risk management decision making. The Plan also helps promote greater awareness and understanding of the risks of flooding amongst the public, Government Departments, local authorities and other organisations within the District. This creates the opportunity for a more proactive and co-operative approach to flood risk management.

The North East FRMP addresses all aspects of flood risk management, focusing on prevention, protection and preparedness and takes into account the characteristics of the particular river catchments in which the SFRAs are located. Key elements contained within the FRMP include:

- A description of the objectives set for the management of flood risk;
- Identification of structural and non-structural measures for achieving those objectives within each SFRA and their priority; and
- A summary of the information and consultation measures taken in connection with the preparation of the FRMP and a description of the coordination process with the Republic of Ireland's Office of Public Works in relation to shared International River Basin Districts.

2.4.1 Newcastle Significant Flood Risk Area

The core boundary of the Newcastle SFRA, which has been determined through the PFRA, is located within the South Down Local Flood Management Area and is illustrated in Plate 2.2 below.

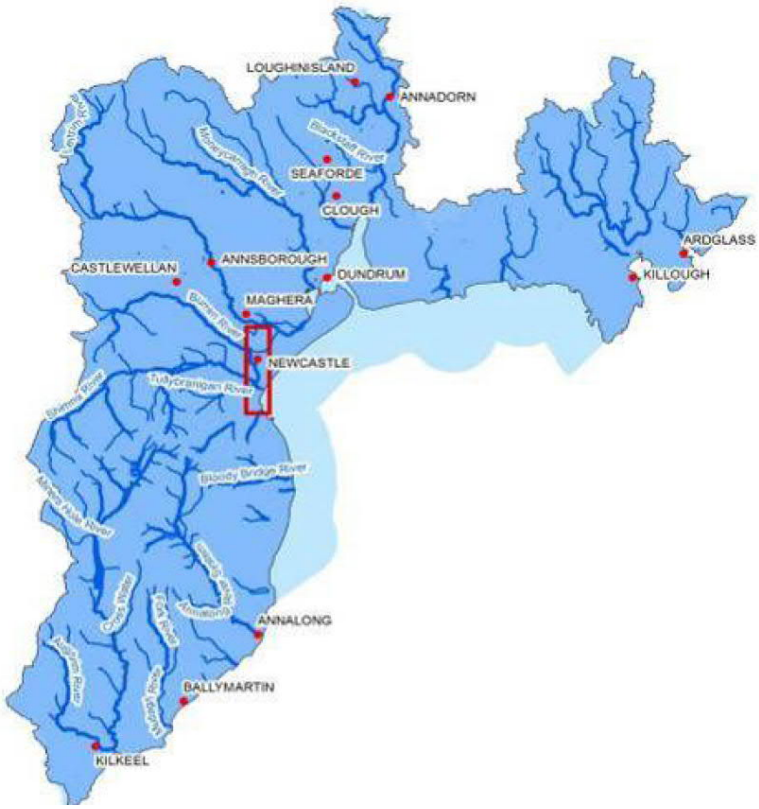


Plate 2.2: South Down Local Flood Management Area and Newcastle SFRA

Source: North East Flood Risk Management Plan (2015)

2.4.1.1 Flooding History

As detailed within the North East FRMP (2015), flooding to Newcastle from both the Shimna River and Burren River has happened on many occasions in the past. A report produced by Rivers Agency

in 2003 titled '*Newcastle Urban Area Assessment of the Flood Levels'* contains references to newspaper reports of flood events in 1968, 1978, 1978, 1987, 1988 and 1994 and in addition, other significant events are known to have occurred in 1982, 1986, 1990 and 1997. Much of this historical flooding has emanated from the Burren River and, as a consequence, the Department undertook the Burren Flood Alleviation Scheme in 2007. The scheme involved the construction of flood walls along both sides of the lower reach of the river which extend from its confluence with the Shimna River for a distance 2km upstream (as shown on Plate 2.3).

Plate 2.3: Newcastle, Burren River flood defences.

Source: North East Flood Risk Management Plan (2015)

Following completion of the Burren Flood Alleviation Scheme, another major flood event occurred in Newcastle on 16th August 2008. On this occasion, the flooding largely emanated from the Shimna River and caused flood damage to approximately 40 properties mostly located in and around Bryansford Avenue and Shimna Road. Unfortunately, on this occasion floodwater from the Shimna River 'jumped its catchment' and spilled into an area behind the recently constructed flood defences on the Burren River. This was a particular disappointment to the owners of flooded properties in Shimna Road and Shimna Vale who, understandably, believed that they would be protected from flooding by the Burren River defences.

Since the introduction of the Flooding Hardship Payment Scheme in 2007, there have been in excess of 70 payments issued to homeowners in the Newcastle SFRA. The majority of the payments (53) relate to properties that flooded during the August 2008 event described above. A further 13 of the payments relate to an extreme rainfall flood event in June 2012 which overwhelmed the urban drainage systems and led to the flooding of properties in and around the Mourneview housing development. Many similar flood events have occurred in this area prior to the introduction of the 2007 scheme and this area is listed in the interagency Flood Liaison Group's 'Flooding Hotspots' register. The cause of this repeated flooding is due to the ineffectiveness of the existing sewerage systems that were laid by the developer of the housing estates in the 1970s.

2.4.1.2 Preliminary Flood Risk Assessment – Identification of Potentially Significant Flood Sources

As detailed within the North East FRMP (2015), according to the Preliminary Flood Risk Assessment (Dec 2011), the town of Newcastle in terms of the potential adverse consequences of flooding, is ranked eighth of the twenty SFRAs within Northern Ireland. On the basis of this initial assessment, which was undertaken using the Strategic Flood Maps, the flood risk to the town was considered to arise almost exclusively from fluvial flooding with in excess of 1300 properties estimated to fall within the predicted 1-in-100 year strategic floodplain outlines. Although Newcastle is a seaside town, it is not considered to be at significant risk from tidal inundation as there is nothing more than the toilet block in Castle Park exposed to flooding at a 1-in-200 year event.

To facilitate a more robust assessment of the fluvial flood risk to Newcastle, the Department developed detailed predictive flood models for the Shimna River and its tributaries; the Leitrim River and its tributaries and the Glen River. The Flood Hazard Maps, produced using the detailed flood models, are more accurate than the strategic maps which may be over estimating or under estimating the number of properties at risk of flooding. Details of the models and their output that have been prepared specifically for this scheme are described in Section 3 (Alternatives Considered) of this ES.

2.4.1.3 Proposed Fluvial Flood Mitigation Measures

2.4.1.3.1 Protection

As detailed within the North East FRMP (2015), structural measures are still one of the main options in providing flood protection to people and property impacted by the effects of extensive flooding. It is therefore important that the Department continues to target investment by providing flood defences, culvert alleviation schemes and infrastructure upgrade works to those communities at greatest need.

The alleviation of surface water flooding, in particular, requires input from a number of bodies. The Flood Investment and Planning Group (FIPG) provides a coordinated approach across Government in relation to the investigation of flooding, agreeing responsibilities and identifying collaborative solutions. The group is represented by the Department, NI Water and DfI-Roads, amongst others, with flood risk management responsibilities.

There are a number of stages to follow when procuring a flood alleviation scheme. As detailed within Section 3 (Alternatives Considered) of this ES, the potential scheme needs to be first subjected to a feasibility study that will also include an economic appraisal. From the detailed Hazard and Risk Maps, a Flood Risk Metric tool (FRISM) is used in urbanised flooded areas to get an estimate of the likely property damages as a result of a range of flood events. The estimated cost of a scheme is then compared to the total ‘damage avoidance benefits’ that the scheme will provide to property over the scheme’s design life. If the benefit/cost ratio is greater than 1, then the potential scheme will be referred to the Department’s Capital Procurement Unit for a feasibility study to be undertaken.

If the flooding issue identified is not solely the Department’s responsibility, or is the responsibility of NI Water or DfI-Roads such as a local drainage or road infrastructure issue, then it will be referred either to FIPG or directly to the responsible body, for their further consideration.

If a cost benefit analysis identifies a viable scheme, it will be placed on a prioritisation list and progressed alongside other competing schemes. The position on the list will depend on set marking criteria, such as the benefit/cost ratio and the overall scheme costs. Depending on the availability of resources, it may take anything from between 2 – 5 years for the scheme to progress from the start of the feasibility study to construction works commencing on the ground.

2.4.1.3.1.1 Fluvial mitigation

Having conducted a detailed assessment of the fluvial flood risk from all of the rivers in the Newcastle SFRA, the Department has determined that the level of flood risk from the Shimna River is sufficient to justify investment in a flood alleviation scheme.

The Department has recently completed a detailed feasibility study and economic appraisal of the options (as detailed below and in Section 3 (Alternatives Considered) of this ES) to provide flood defences at the Shimna River. This study has demonstrated that a publicly funded scheme is economically viable. The preferred option from the feasibility study is for the provision of hard defences (flood walls and embankments) along both banks of the river, upstream and downstream of Bryansford Road Bridge.

2.4.2 Shimna River, Newcastle Flood Risk Assessment Economic Appraisal

In October 2016, RPS prepared the '*Shimna River, Newcastle Flood Risk Assessment Economic Appraisal*'. As detailed within this report, a hydraulic analysis of the Shimna River identified that 292 residential and 20 commercial buildings would be affected during a 1% AEP flood event. The areas identified as being at risk of flooding include Bryansford Road, Bryansford Avenue, Beechfield Park, Shimna Vale, Shimna Road, Castlewellan Road, Shimna Mile and Riverside Park.

A range of flood alleviation options were considered for preventing flooding in Newcastle from the Shimna River during high return period events. The most feasible option was the provision of hard defences to prevent water from leaving the Shimna River, both upstream and downstream of the Bryansford Road Bridge. Details of the options considered are described in detail within Section 3 (Alternatives Considered) of this ES.

2.5 Legislative & Policy Context

2.5.1 The Floods Directive

The FRMPs have been produced as a key requirement of Directive 2007/60/EC on the assessment and management of flood risks which was brought into force on 23 October 2007. This Directive, known as the Floods Directive, was introduced in response to recent catastrophic floods that occurred across Europe. It is estimated that over 213 major floods occurred in the European Union between 1998 and 2009, and that these have caused some 2016 deaths, displaced about half a million people and cost at least £52 billion in insured losses. The Floods Directive is designed to help Member States establish a framework for managing flood risk and aims to reduce the adverse consequences of flooding on human health, the environment, cultural heritage and economic activity.

In August 2009, the Department consulted with the public on its proposed legislation for implementing the Floods Directive in Northern Ireland and in November 2009 the legislation was introduced and is known as the Water Environment (Floods Directive) Regulations (Northern Ireland) 2009.

The main requirements of the legislation and the dates for their completion are as follows:

- Carry out a Preliminary Flood Risk Assessment (PFRA) for each River Basin District and on the basis of this assessment, identify areas for which potential significant flood risks exist or might be considered likely to occur (December 2011);
- Prepare flood hazard maps and flood risk maps for each SFRA identified (December 2013);
- Consult the public on draft FRMPs that contain objectives and measures to reduce the flood risk within the SFRA and focus on prevention, protection and preparedness (December 2014); and
- Produce final FRMPs that take account of the views and representations received through the publication (December 2015).

The Directive requires these deliverables to be reviewed, and if necessary updated, on a six-yearly cycle.

2.5.2 The Water Framework Directive

The Water Framework Directive 2000/60/EC, which was introduced in 2000, has a number of links with the EU Floods Directive. Its primary focus, however, is improvement in water quality, rather than flooding. Its approach is based around the same River Basin Districts as the Floods Directive and this provides a number of opportunities for Government to dovetail the activities of both Directives.

2.5.2.1 Synergies between Flood Risk Management Plans and River Basin Management Plans

In December 2009, the then Department of Environment (now Department of Agriculture, Environment and Rural Affairs (DAERA)), as Competent Authority for the EU Water Framework Directive (WFD), published the first River Basin Management Plans (RBMPs) for Northern Ireland under the WFD. The Northern Ireland Environment Agency (NIEA) was responsible for delivery of these first RBMPs in conjunction with a number of Northern Ireland Executive Departments, including

the then Department of Agriculture and Rural Development (DARD). This recognised the important roles DARD and the Department had in managing aspects of the water environment and in implementing WFD requirements.

The RBMPs identified the condition of the water environment and set out objectives for the improvement, or the prevention of deterioration, of individual water bodies for the next three river basin planning cycles ending in 2015, 2021 and 2027. A Programme of Measures was published in the RBMPs, setting out actions required to meet the objectives of improving the status of all water bodies. An interim update on the measures was published in 2012. The WFD requires that RBMPs are reviewed and updated every 6 years.

Consequently, the Department of Environment published its 2nd cycle draft Plans for public consultation between December 2014 and June 2015, publishing the new Plans in December 2015. In parallel with this timescale, the Department published its first draft FRMPs for public consultation, publishing the final FRMPs in December 2015.

The importance of coordination of FRMPs with the RBMPs is recognised by, and is a requirement of, the EU Floods Directive. To this end, the geographical coverage of the FRMPs in Northern Ireland is directly aligned with WFD's River Basin Districts of Neagh Bann, North Western and North Eastern, two of which (North Western and Neagh Bann) are International River Basins shared with the Republic of Ireland.

There is continued engagement between the Department (the Competent Authority for the Floods Directive) and NIEA (the Competent Authority for the WFD) through the interdepartmental Floods Directive Steering Group and the local Flood Forums. The Department is reciprocally engaged on the corresponding groups for WFD at interdepartmental, interagency and catchment stakeholder group level; this engagement has been on-going for many years and pre-dates the preparatory phase of the first cycle of RBMPs. In particular, the work of the Inter-agency group on River Restoration and Continuity (now the Catchment Oversight Group) provides a sound basis for developing catchment-based projects in future. This group aims to develop projects at the catchment and local level, through partnership working. In this way, both funding and benefits can be shared, providing better value for money, and developing the idea of adapting and delivering measures that have a number of drivers. Membership of the Catchment Oversight Group includes statutory fisheries groups, and DARD (now DAERA) Countryside Management Division, thus providing excellent opportunities to develop partnership working and synergies in the long-term.

The FRMPs focus primarily on areas which have been identified as being at potential significant flood risk. As these are predominantly urban areas, any reduction in flooding as a result of implementing measures, may also reduce the risk of pollution incidents given the fact that flooding often results in pollution problems from oil tanks, sewerage overflows, etc. The development and implementation of measures proposed under the FRMPs also provides potential opportunities for more natural flood risk management (e.g. improving floodplain storage, re-establishing connectivity, fish passage, sediment continuity, morphological and other enhancement of watercourses etc. during capital works). Collaborative working by personnel and stakeholders implementing the FRMPs could potentially both reduce flood risk and help to manage the adverse consequences that flooding has on the environment, human health, cultural heritage and economic activity, thus satisfying the requirements of both Directives. Where the sites of such measures overlap with 'Natura 2000' sites (under the Habitats and Birds Directives), or are hydrologically connected, there are opportunities to seek benefits through liaison and information sharing.

Measures within the RBMPs highlight the need for multi-agency working at a catchment level to deliver benefits for water status, morphology, flooding and fisheries through a coordinated, joined-up approach.

Similarly, the FRMPs identify the need to achieve the objectives of the WFD in terms of "Good" status through the Environmental Objectives as set out in Section 3.1 of the FRMPs. The coordination of river basin planning and flood risk management planning is therefore important in delivering the objectives and measures of both Directives.

2.5.3 Regional Strategies

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

The RDS (2035) provides an overarching strategic planning framework to facilitate and guide the public and private sectors. It does not redefine the other Government Departments' strategies but complements them with a spatial perspective. It revises the original RDS 2025 strategy published in 2001 and amended in 2008, and whilst many of the objectives of the previous strategy are still valid, this document now replaces it.

The RDS influences various government strategies, including:

- the Programme for Government (PfG); and
- the Investment Strategy for Northern Ireland (ISNI).

The Strategy takes account of key driving forces such as population growth and movement, demographic change, the increasing number of households, transportation needs, climate change and the spatial implications of divisions that still exist in our society. It is a framework which provides the strategic context for where development should happen, however it does not contain operational planning policy.

The RDS has a statutory basis under the Strategic Planning (Northern Ireland) Order 1999, which requires Government Departments to "*have regard to the Regional Development Strategy*" in exercising any functions in relation to development.

2.5.3.1.1 Key Elements

The Strategy has four key elements:

- a Spatial Framework which divides the region into 5 components based on functions and geography;
- Guidance at two levels:
  - Regional level that is to be applied to all parts of the region; and
  - Specific guidance for each element of the Spatial Framework.
- a Regionally Significant Economic Infrastructure section which identifies the need to consider strategic infrastructure projects; and
- Implementation which sets out how the strategy will be implemented.

2.5.3.1.2 Aims

The eight aims of the revised RDS are to:

1. Support strong, sustainable growth for the benefit of all parts of Northern Ireland;
2. Strengthen Belfast as the regional economic driver and Londonderry as the principal city of the North West;
3. Support our towns, villages and rural communities to maximise their potential;
4. Promote development which improves the health and wellbeing of communities;
5. Improve connectivity to enhance the movement of people, goods, energy and information between places;
6. Protect and enhance the environment for its own sake;
7. Take actions to reduce our carbon footprint and facilitate adaption to climate change; and
8. Strengthen links between north and south, east and west, with Europe and the rest of the world.

2.5.3.1.3 The Spatial Framework

Implementation of the vision and aims of the RDS requires a Spatial Framework to enable strategic choices to be made in relation to development and infrastructure investment. The key issues which influenced the Spatial Framework within the RDS are the:

- importance of Belfast City, at the heart of a Metropolitan area, as the major driver for regional economic growth; its population has declined but it remains the regional focus for administration, commerce, specialised services and cultural amenities;
- significant role which Londonderry has to play as the principal city of an expanding North West region; its recognition as the UK City of Culture 2013, added impetus to the integrated approach to regeneration being taken forward in the 'One Plan' (One City One Plan One Voice: Regeneration Plan for Derry~Londonderry);
- importance of Main Hubs and Clusters well placed to benefit from and add value to regional economic growth; and that critical mass to attract growth can be created by the identification of clusters;
- need to build on the approach to urban renaissance of developing compact urban form by further integrating key land uses with transportation measures. The focus should be on the use of land within existing urban footprints, particularly within the hubs;
- new emphasis on how to reduce dependence on the car and change travel behaviour; and
- importance in all aspects of forward planning to address the consequences of climate change; this means an even greater focus on where people live and work and how transport and energy needs are planned.

Chapter 3 of the RDS sets out the strategic guidance specific to these areas, focusing on the key principles of the economy, society and the environment. The guidance is also split into Regional Guidance (RG) and Spatial Framework Guidance (SFG), some of which is specifically applicable to the Proposed Scheme, as described below.

2.5.3.1.4 Regional Guidance

2.5.3.1.4.1 Environment

RG12: *Promote a more sustainable approach to the provision of water and sewerage services and flood risk management* – this guidance focuses on changes in population distribution, household formation, urban development, and lifestyles which continue to put increased pressure on water resources and drainage systems. It notes that climate change will also have an impact on the water environment.

Without action, there are expected to be discrepancies between water demand and availability leading to the potential for water stress in some areas, more water quality problems in the natural environment, and increased flood events from drainage systems, rivers, the sea and surface water run-off. The planning for the provision of water and sewerage infrastructure and treatment facilities is both a practical and environmental necessity for regional development.

2.5.4 Development Plan

2.5.4.1 Ards Down Area Plan 2015

The Ards Down Area Plan 2015 is the extant development plan for the area and comprises three volumes:

- Volume 1: Plan Strategy, Policy Framework and Countryside Proposals;
- Volume 2: Ards Borough Settlement Proposals; and
- Volume 3: Down District Settlement Proposals (which includes Newcastle).

The purpose of the Plan is to inform the general public, statutory authorities, developers and other interested bodies, of the policy framework and land use proposals that are used to guide development decisions within the Ards Borough and Down District over the Plan period 2000 - 2015.

The Plan is prepared within the context of the priorities of the Northern Ireland Executive as set out in the Programme for Government, taking into account European, National and Regional policies which have implications for the future pattern of development within the Ards Borough and Down District. The Plan establishes policy guidelines within which more detailed development proposals can be determined. It assists public agencies (i.e. DfI - Rivers) in decisions concerning infrastructure

improvements and also assists private developers in reaching their land use based decisions over the Plan period.

Adopted in March 2009, the Area Plan was the first development plan considered at a public inquiry in which the requirement to be in general conformity with the RDS applied (the 2025 version). The strategies and policies in the RDS are, of course, material considerations which may take precedence over existing development plans. The weight to be afforded to the RDS, the development plan, and to any other material considerations will be a matter for judgement and may vary from case to case. In some cases, it may be appropriate to give more weight to new policy directions set out in the RDS. In other instances, it may be judged more appropriate to give greater weight to the existing Area Plan until new development plans are prepared.

2.5.5 Broader Legislative and Policy Context

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

- **Long-Term Water Strategy**: this is led by the Department and extends beyond flooding issues. However, it highlights the need to manage flood risk in relation to integrated drainage systems, including funding and delivery arrangements.
- **Floods Bill**: work needs to commence on a Floods Bill to enable the effective delivery of all components of Flood Risk Management. This will add clarity to organisational roles and responsibility, and encompass broader Flood Risk Management approaches.
- **Reservoirs Act**: as indicated in the Preliminary Flood Risk Assessment and Identification of Areas of Potential Significant Flood Risk report, legislation to regulate reservoirs was required. This legislation was enacted in July 2015 as the Reservoirs Act (Northern Ireland) 2015. The Act places a legal responsibility on the managers of controlled reservoirs (i.e. 10,000 cubic meters or more capacity above the natural level of the surrounding land) to effectively manage controlled reservoirs and therefore any associated flood risk. Detailed inundation maps for each controlled reservoir have been published by the Department in 2016. These maps show the areas that could be flooded if controlled reservoirs were to fail and release the water they hold. The maps will be used by reservoir managers, government bodies, organisations and others dealing with flood risk from reservoirs, particularly those engaged in planning and emergency response.
- **Water Bill**: The Department is seeking to introduce a Water Bill to improve how water and sewerage services are delivered. One strand of this is to consider reducing the volume of surface water entering the public combined sewerage system by placing restrictions on the right to connect to public sewers and promoting the use of Sustainable urban Drainage Systems (SuDS).
- **Northern Ireland Climate Change Adaptation Programme**: As a result of the first Northern Ireland Climate Change Adaptation Programme, published early in 2014, a range of adaptation activities and actions has been identified for each Government Department with a role in flood risk management.
- **Building Regulations** Engagement with the Department of Finance is necessary for the inclusion in the Building Regulations of flood resistance/resilience construction techniques for those properties within flood risk areas.
- **Countryside Management Strategy Opportunities** need to be identified to build on the links between sustainable agricultural land use and managing flood risk. A catchment-based approach, and practical linkages will be sought over the life cycle of these Plans. Other opportunities in relation to fishing measures and afforestation will be explored as appropriate.

3. Alternatives Considered

3.1 Introduction

As detailed in Sub-Section 1.3.3, the ES should include such information referred to in Schedule 2A to the Drainage Order 1973, as substituted by The Drainage (Environmental Impact Assessment) Regulations (Northern Ireland) 2017, that is reasonably required to assess the environmental effects of any proposed drainage works and which the Department can, having regard in particular to current knowledge and methods of assessment, reasonably be required to compile. This includes a description of the reasonable alternatives (for example in terms of design, technology, location, size and scale) studied by the Department, which are relevant to the proposed works and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.

As detailed within the '*Shimna River, Newcastle Feasibility Study for Flood Risk Investigation*' (RPS 2015), various methods for managing flood risk were considered and could generally be grouped into four areas:

- **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.

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 from the Shimna River. This entailed providing 'protect' methods over 'prepare' methods, and avoiding 'permit' methods where possible.

3.2 Screening of Flood Risk Management Options

As detailed within the '*Shimna River, Newcastle Feasibility Study for Flood Risk Investigation*' (RPS 2015), a broad range of potential flood risk management options were subject to screening, as detailed in Table 3.1.

Table 3.1: EIA Screening Checklist in relation to the characteristics of the Proposed Scheme

Option	Method Type	Description
Do-Nothing	Permit	Implement no new flood risk management measures and abandon any existing practices.
Maintain Existing Regime	Permit	Continue any existing flood risk management practices. Maintenance regime to remain as currently undertaken.
Do-Minimum	Permit	Implement additional minimal measures to reduce the flood risk in specific problem areas without introducing a comprehensive strategy.
Planning and Development Control	Prevent	Zoning of land for flood risk appropriate development, prevention of inappropriate incremental development, review of existing planning policies.
Building Regulations	Prevent	Regulation relating to floor levels, flood proofing, flood resilience, sustainable drainage systems, prevention of reconstruction, or redevelopment in flood risk areas.
Catchment Wide SuDS	Prevent	Implement attenuating infrastructure to the

Option	Method Type	Description
		existing drainage system in order to reduce the flow entering the river network. This may consist of swales, french drains, soakaways, larger culverts, underground storage tanks, ponds, green roofs, etc.
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 in channel, perpendicular hedges or ditches in the floodplain, tree rows and planting in floodplain to either slow 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.
Strategic Development Management	Prevent	Management of necessary floodplain development (proactive integration of structural measures into development designs and zoning, regulation on developer funded communal retention, drainage and/or protection systems).
Watercourse Maintenance	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/Storage	Protect	Large scale dam and reservoir, offline washlands (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 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.
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.
Culverting	Protect	Routing the watercourse underground through culvert to prevent out of bank flooding along a specific stretch.
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. This may consist of a culvert or an open channel.
Overland Flood Routing	Protect	Using topographical features of the floodplain to convey out of bank flow and discharge to other suitable rivers, the coast line, further downstream on the same river or to an open area for storage. This may consist of fields, park land, roads, etc.
Sealing Manholes	Protect	Preventing pressurised culverts from surcharging through manholes and flooding the surrounding area.
Rehabilitation of Existing Defences	Protect	Improvement of existing flood defences.

Option	Method Type	Description
Localised Protection Works	Protect	Minor raising of existing defences/levels, infilling gaps in defences, etc.
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 a flood risk area on risks of flooding and how to prepare for flooding.
Individual Property Protection	Prepare	Flood protection and resilience measures such as flood gates, vent covers, use of flood resilient materials, raising electrical power points, etc.

Source: Shimna River, Newcastle Feasibility Study for Flood Risk Investigation (RPS 2015)

3.3 Applicability Review of Options

Each of the potential flood risk management options were reviewed against its applicability for the Shimna River catchment and those which were obviously unsuitable were removed. Table 3.2 indicates those measures which were included and excluded.

Table 3.2: Applicable list of potential flood risk management options to Shimna River catchment

Option	Review Comment	Applicable?
Do-Nothing	Baseline condition, consider further	✓
Maintain Existing Regime	Consider further	✓
Do-Minimum	Consider further	✓
Planning and Development Control	Consider further	✓
Building Regulations	Consider further	✓
Catchment Wide SuDS	Consider further	✓
Land Use Management	Consider further	✓
Strategic Development Management	Consider further	✓
Watercourse Maintenance	Consider further	✓
Upstream Storage/Storage	Consider further	✓
Tidal Barrage	Not applicable – principal source of flooding is fluvial	×
Improvement of Channel Conveyance	Consider further	✓
Hard Defences	Consider further	✓
Relocation of Properties	Consider further	✓
Culverting	Consider further	✓
Diversion of Flow	Consider further	✓
Overland Flood Routing	Consider further	✓
Sealing Manholes	Not applicable – principal source of flooding is fluvial	×
Rehabilitation of Existing Defences	No flood defences currently exist. Measure unacceptable	×
Localised Protection Works	No existing defence infrastructure exists which	×

Option	Review Comment	Applicable?
	could be altered by minor works to alleviate flooding. Measure unacceptable.	
Flood Warning/Forecasting	Consider further	✓
Public Awareness Campaign	Consider further	✓
Individual Property Protection	Consider further	✓

Source: Shimna River, Newcastle Feasibility Study for Flood Risk Investigation (RPS 2015)

3.4 Technical review of Options

All potential flood risk management options considered applicable were then reviewed on their technical merits and their ability to alleviate the specific mechanisms of flooding that exist in the Shimna River catchment. This was based on engineering judgement, information from Departmental staff, flood mapping and reviewing animations of model output. Table 3.3 details the technical review of the applicable measures.

Table 3.3: Technical Review of Applicable Potential Flood Risk Management Options

Option	Review Comment	Feasible?
Do-Nothing	Baseline Condition Measure can continue through screening process	✓
Maintain Existing Regime	May limit damage, however it will not resolve all flooding.	×
Do-Minimum	Will not solve all flooding issues. Not considered further	×
Planning and Development Control	Area already extensively developed. Not considered further	×
Building Regulations	Area already extensively developed. Not considered further	×
Retro-fitted SuDS	Not technically possible to introduce across all of Newcastle. Not considered further	×
Land Use Management	Area already extensively developed Not considered further	×
Strategic Development Management	No Strategic Development envisaged for Newcastle that would require this measure	×
Watercourse Maintenance	May limit damage, however will not resolve all flooding issues and proactive maintenance programme must be developed Measure can continue through screening process	✓
Upstream Storage/Storage	No appropriate areas of land can be identified upstream. Not considered further	×
Improvement of Channel Conveyance	No improvements could be made that would have a significant effect on water levels. Not considered further	×
Hard Defences	Hard defences would consist of flood walls and embankments. Approximately 1km of flood defence would be required. Measure can continue through screening process	✓
Relocation of Properties	312 properties would be required to be relocated. While technically feasible, this would be a socially complex measure to implement in practice Not considered further	×
Culverting	Existing watercourses are open within the study area. No possible culvert routes identified Not considered further.	×

Option	Review Comment	Feasible?
Diversion of Flow	No possible diversion routes readily identified Not considered further	×
Overland Flood Routing	Due to the area being extensively developed, no floodways can be identified Not considered further.	×
Flood Warning/Forecasting	May limit damage, however will not resolve all flooding issues Measure can continue through screening process	✓
Public Awareness Campaign	This would have limited impact on reducing the flood risk Measure can continue through screening process	✓
Individual Property Protection	May limit damage, however will not resolve all flooding issues Measure can continue through screening process	✓

Source: Shimna River, Newcastle Feasibility Study for Flood Risk Investigation (RPS 2015)

3.5 Developing Potential Options

The options that progressed through the screening were divided into two categories; primary and secondary options. Primary options were those considered as having a reasonable likelihood of providing the required standard of protection to the majority of properties at risk from a 1% AEP event. Secondary options were considered to have some technical merit and may solve some localised flooding issues but would not resolve all the identified flooding issues. It was intended to develop a solution for flooding from the Shimna River which would be a combination of both primary and secondary options.

The Do-Nothing Scenario was considered as the base case against which other options were compared. The base case should generally be the 'status quo' option, which should represent the genuine minimum input necessary to maintain services at, or as close as possible to, their current level. In this scenario no action is taken to sustain, maintain or improve existing flood defences. If no works were undertaken, the threat of overtopping of the banks of the Shimna River would remain, resulting in the possibility of frequent flooding damage to property in addition to causing considerable anxiety to local residents. This was taken forward as **Option 1**.

As described above, RPS considered a wide range of potential flood risk management options for preventing flooding in Newcastle from the Shimna River during high return period events. However, given the geography of the catchment and the extensively developed urban areas, the most feasible option was the provision of hard defences to prevent water from leaving the Shimna River, both upstream and downstream of the Bryansford Road Bridge. This was taken forward as **Option 2**.

Hard defences include the construction of new flood walls or embankments. Where possible, hard defences should be set back from the channel banks to allow space for flood waters and reduce the impact of the flood defence scheme on water levels upstream and downstream of the proposed defence location. Setting defences back from the channel also improves access to rivers and helps minimise the visual impact of a flood defence scheme. The choice of flood defence structure (i.e. flood wall, flood embankment, etc.) along with the alignment of defences is based on space constraints, visual impact and the results of the hydraulic modelling of options.

The locations of where flood defence structures are required are presented in **Figure 4.1**. There were a range of alternative methods of construction considered for flood defences which depended on various factors including the ground conditions. Flood walls would generally be constructed from reinforced concrete, but where ground conditions are poor, sheet piles or bored piles may be required below ground. Where space permits, flood embankments can be constructed from clay, but again where ground conditions are poor, a sheet pile core may be required. Various methods of construction were costed at the feasibility stage as ground conditions were unknown. The options costed were:

- **Option 2A**: reinforced concrete flood walls at all locations;
- **Option 2B**: reinforced concrete flood walls on right bank, reinforced concrete flood walls on left bank upstream of bridge, clay embankments on left bank downstream of bridge (within Islands Park);

- **Option 2C**: reinforced concrete flood walls with sheet pile below ground level at all locations; and
- **Option 2D**: reinforced concrete flood walls with sheet pile below ground on right bank, reinforced concrete flood walls with sheet pile below ground on left bank upstream of bridge, sheet pile core embankments on left bank downstream of bridge (within Islands Park).

In addition to construction of the flood defences, amendments would be required to the internal drainage. Any drainage pipes that currently outlet to the Shimna River would need to be retained through the defences. Where several pipes outlet to the river in close proximity to each other, these pipes can be collected together by an interceptor pipe and outlet to the river at one point. If flood defences are constructed, it will be necessary to drain the hinterlands to reinstate the natural drainage to the river. Land drains can be installed where necessary that will discharge to the river. All new and remaining unflapped outlets to the river should have flap valves installed.

In addition to the primary options above, there are a number of secondary options that could also be implemented. These options may reduce the impact of flooding, or may be required in order to comply with National or Regional Policies. The actions required for each option are detailed in Table 3.4. Some of these options, such as individual property protection and watercourse maintenance, can be progressed as Interim Measures.

Table 3.4: Secondary Options

Option	Action
Watercourse Maintenance	Regular maintenance of the Shimna River will ensure that there are no obstructions in the river channel that may cause an increased risk of flooding.
Flood warning/forecasting	The Department could consider the installation of a flood forecast and warning system on the Shimna River upstream of Newcastle.
Public Awareness Campaign	Rivers Agency is currently completing a Pilot project in another area that if successful could be applied to the Newcastle area.
Individual Property protection	The Department can provide advice on precautions that residents can take to protect their property. Sandbags may be provided to houses that are in imminent danger of flooding.

Source: Source: Shimna River, Newcastle Feasibility Study for Flood Risk Investigation (RPS 2015)

3.6 Modelling and Mapping of the Options

The location and heights of the flood defences were incorporated into a revised model. The height of the embankments and walls in the model included a 600mm freeboard above the predicted 1% AEP flood levels for the undefended model. The defended model was run to ensure that the proposed options would deliver the required reduction in flood risk to the relevant properties (to at least a 1% AEP event) and would not increase the risk of flooding elsewhere in the catchment.

The model run showed that the flood defence works prevented flooding of properties for a 1% AEP event. Two properties to the south of the Tullybrannigan River were identified on the flood maps as being at increased risk of flooding due to the construction of the proposed flood defences (Spelga Avenue and Shimna Road). However, when the floor levels of these properties were checked, they were found to be above the 1% AEP flood level by greater than 300mm, and therefore not at risk of flooding.

3.7 Environmental Scoping of the Proposed Option

The proposed option of hard defences was reviewed by the Department's Environment Section. They indicated that the proposed works may have an impact on three mature Scots pines along the river banks downstream of Bryansford Road Bridge. To allow these mature trees to remain, the embankment was changed to a flood wall for a section. In addition, they indicated that trees should not be removed between 1st March and 31st August, in line with the bird nesting guidance provided by DAERA - NIEA.

3.8 Liaison with Newry, Mourne and Down District Council

A meeting was held on-site with a representative of Newry, Mourne and Down District Council (Down District Council at that time) to discuss the proposed option, in particular what requirements the council may have for maintenance. The following points were noted following the discussion:

- there is a mature oak tree on the river bank downstream of Bryansford Road bridge, so the line of the embankment has been amended to avoid this;
- an existing path runs along the river bank and this will be replaced by a 2m wide path on top of the flood defences;
- the slope of the embankments will be 1-in-2.5 to allow for maintenance;
- a 1m level area will be maintained between the base of the embankment and the natural barrier;
- at least one manhole is required to be raised;
- a hand rail may be required along the floodwall section that passes the Scots pines.

All of the above points were included in the modelling and costing of the proposed option.

3.9 Economic Analysis

RPS undertook a preliminary benefit-cost analysis to demonstrate the economic case for the identified option. This involved an assessment of the benefits (i.e. reducing flood impact) and the costs of the proposed option over a 100-year design life span. This approach ensures that the Department had a robust economic argument which showed that the preferred option provided value for money. This approach ensured a clearly identified audit trail which transparently showed how the preferred option would be cost-effective and deliver real value for the community of Newcastle.

Full details of the Economic Appraisal can be found in the '*Shimna River, Newcastle Flood Risk Assessment Economic Appraisal*' (October 2016). Table 3.5 below summarises the results of the Economic Appraisal.

Table 3.5: Summary of Economic Appraisal

	Costs (£)				
	Option 1	**Option 2A**	**Option 2B**	**Option 2C**	**Option 2D**
Construction costs from estimates	0	1,631,275	1,537,645	3,110,304	3,266,557
OPTIMISM Bias Adjustment	0	841,738	793,425	1,604,917	1,685,543
Maintenance Costs (NPV over 100 years)	0	47,402	63,694	47,402	63,694
Total Present Value Costs	0	2,520,415	2,394,764	4,762,623	5,015,794
	Benefits (£)				
	Option 1	**Option 2A**	**Option 2B**	**Option 2C**	**Option 2D**
Present Value Damage (including emergency services)	6,089,649	580,901	580,901	580,901	580,901
Present Value Damage Avoided	0	5,508,748	5,508,748	5,508,748	5,508,748
Intangible Benefits	0	1,547,862	1,547,862	1,547,862	1,547,862
Total Present Value Damage Avoided	0	7,056,610	7,056,610	7,056,610	7,056,610
	Benefits Cost Ratio				
	Option 1	**Option 2A**	**Option 2B**	**Option 2C**	**Option 2D**
Average benefit/cost ratio	-	2.80	2.95	1.48	1.41

Source: Source: Shimna River, Newcastle Feasibility Study for Flood Risk Investigation (RPS 2015)

The results from the economic appraisal indicated that the economic viability of the scheme varies with the method of construction used for the hard defences. If ground conditions allow reinforced concrete walls to be used, then the scheme has a high benefit/cost ratio, whereas if sheet piles are required, the benefit/cost ratio decreases closer to 1.

3.10 Ground Investigation

As there was such a variation in the economic viability of the scheme depending on the method of construction required, the Department instructed RPS to procure a ground investigation. Geotechnical and Environmental Services (GES) completed the ground investigation in November 2014, which comprised 5No. boreholes with associated in-situ testing and sampling, as assessment to the permeability of the strata encountered, geotechnical and laboratory testing, and factual and interpretative geotechnical reporting. The following general ground conditions were encountered:

- TOPSOIL;
- MADE GROUND: Soft grey brown slightly sandy slightly gravely SILT with roots and rootlets;
- Occasional crockery and red brick remnants/ Grey brown silty sandy fine to coarse GRAVEL/ gravely fine to coarse SAND;
- Very loose to very dense grey brown silty gravelly fine to coarse SAND/ sandy fine to coarse;
- GRAVEL;
- Very soft grey sandy SILT; and
- Stiff to very stiff grey brown slightly sandy gravely SILT with cobble content.

The results of the ground investigation showed that sand and gravel is found in shallow strata. If a flood wall or embankment were to be constructed without sheet piles, there is likely to be a massive amount of piping and water flow beneath the defences which can cause flooding. This would be the

case with Options 2A and 2B, and these therefore would not provide adequate protection. Options 2C and 2D allowed for 4m deep piles, and this depth of pile seemed a reasonable maximum assumption from a preliminary consideration of the site investigation. Detailed design would be required to confirm the depth of piles, but it is unlikely to be deeper than 4m.

3.11 Preferred Option

Following the site investigation, either Option 2C or 2D would be required as these allow for sheet piles below the defences. Option 2C (reinforced concrete flood walls with sheet piles below ground level at all locations) would be the preferred option as it has a slightly higher benefit/cost ratio of 1.48.

4. Scheme Description

4.1 Introduction

As detailed in Sub-Section 1.3.3, the ES should include the information referred to in Schedule 2A to the Drainage Order 1973, as substituted by The Drainage (Environmental Impact Assessment) Regulations (Northern Ireland) 2017, that is reasonably required to assess the environmental effects of any proposed drainage works and which the Department can, having regard in particular to current knowledge and methods of assessment, reasonably be required to compile. This includes a description of the Proposed Scheme, including:

- 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;

This section therefore provides a description of the Proposed Scheme in terms of design and key features and characteristics. The information provided is of sufficient detail to allow for a fit-for-purpose and proportionate assessment to predict the environmental effects that the Proposed Scheme would have. Whilst it is addressed within each of the technical sections throughout this ES, this section also details the measures proposed to reduce or eliminate those effects as necessary.

It should however be noted that this section presents an outline design which may still be subject to refinement. It is not expected that any changes would result in a change to the findings of the assessment; in particular as a precautionary principle has been adopted, the assessment has generally been based on a worst case scenario. The Department nevertheless shall commit to review the findings of the ES in light of any changes to the Proposed Scheme that may take place during the detailed design.

4.2 Proposed Scheme Overview

4.2.1 Objective of the Scheme

The primary objective of the scheme is to provide flood protection, to the 312 properties 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), under the EU Directive on managing floods (2007). The Scheme would be designed to provide protection to properties for the 1% AEP flood event, with allowance for climate change.

4.2.2 Summary of the Proposed Scheme

The Proposed Scheme would require the construction of flood alleviation measures to reduce the risk of flooding from the Shimna River to protect existing properties in the town. The works would extend both upstream (into Tipperary Wood) and downstream (into Islands Park) from New Bridge on the Bryansford Road, as indicated on **Figure 4.1.** The proposed works would include:

- Demolition of a number of property boundary walls and fences;
- Felling of a number of mature trees;
- Relocation of one drainage ditch;
- 1430m of brick/concrete clad sheet piles or sheet pile core embankments;
- Construction of a new pathway;
- Realignment of existing pathways; and
- Erection of one floodgate.

The road bridge on the Bryansford Road (New Bridge) is the hub point of the scheme. The scheme proposes construction of four separate flood defences, each starting at the bridge (**Figure 4.1** and **Plate 4.1**). On the north bank of the Shimna River, there would be construction of a flood defence from Bryansford Road Bridge (New Bridge), running parallel to the Bryansford Road for approximately

115m, then turning and running perpendicular to the road, for approximately 70m. Also on the north bank of the Shimna River, there would be construction of a flood defence from New Bridge, running downstream and parallel to the Shimna River within Islands Park over approximately 250m. On the south bank of the Shimna River, there would be construction of a flood defence from New Bridge, running downstream and parallel to Shimna River over approximately 645m across to Beers Bridge. Also, on the south bank of the Shimna River, there would be construction of a flood defence from New Bridge, running upstream, parallel, then perpendicular to the Shimna River for approximately 290m.

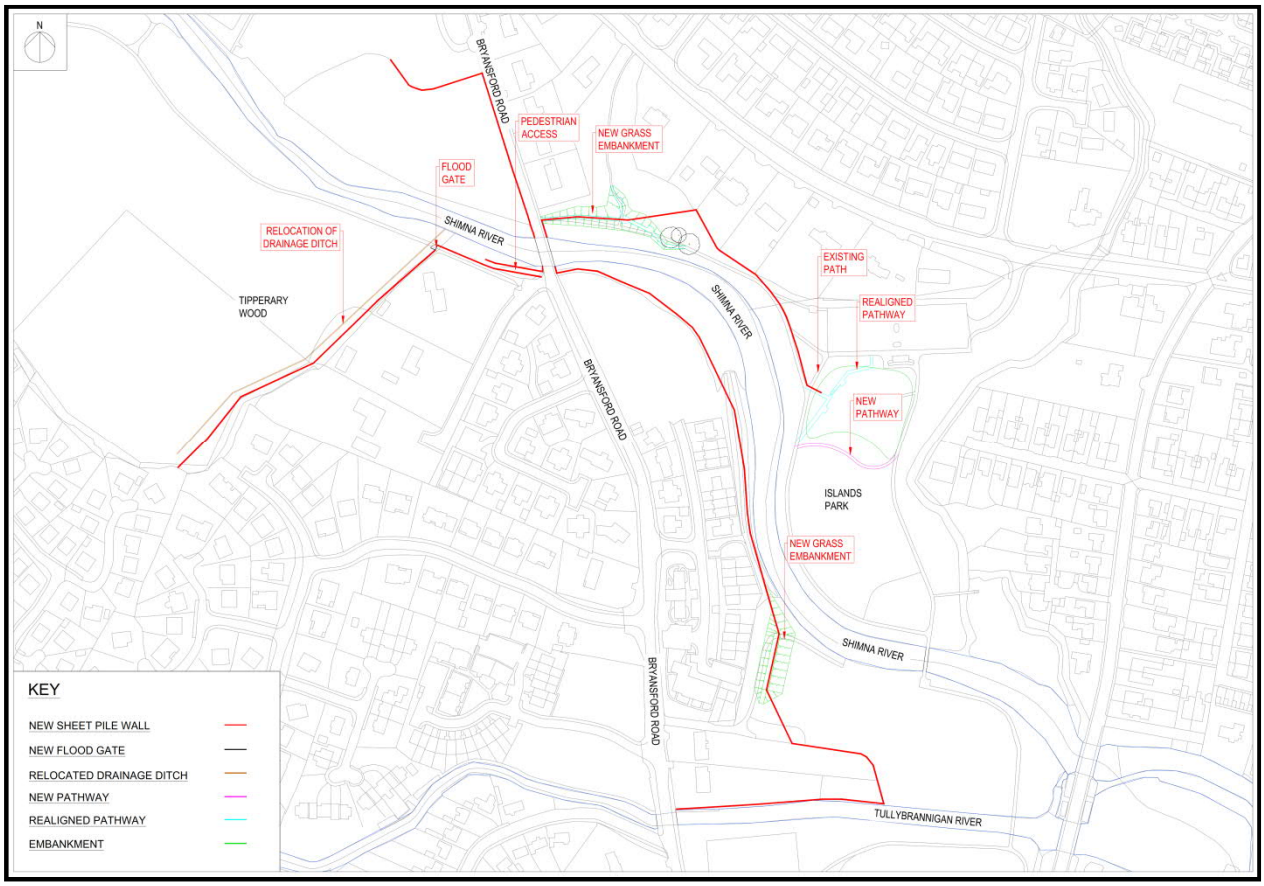


Plate 4.1: Proposed Scheme Layout

4.3 Operational Phase

4.3.1 Construction of new flood walls

The flood walls for the proposed scheme would be steel sheet piles. The sheet piles would vary in length depending on the location, due to differing required heights above ground and underground soil conditions. It is expected the sheet piles would vary between 4 - 8m in length. Sheet piles are proposed in locations where embankments are not feasible; in general, the wall follows existing boundaries, so as to not create dead land areas. The wall would vary in height from 2.5m down to 0.8m. Landowners would have the option to raise this in some form to protect privacy.

The finish to the wall varies throughout the scheme. Where the walls tie into the 'New' Bridge, a stone clad would be utilised to match the existing bridge stone. On the wall upstream of the bridge, heading north along Bryansford Road, it is proposed to have a random rubble stone finish similar to the existing wall. Within the Parks area, a slate clad would be used, with resemblance to the Burren scheme; this would be capped with an anti-climb concrete coping. Along the track into Tipperary Wood, the wall would be clad, rendered and painted with an anti-climb concrete coping. The sheet pile wall within Tipperary wood would be bare sheet pile painted with an anti-climb concrete coping; the colour would be selected so as to integrate with the surrounding environment.

4.3.2 Construction of new flood embankments

The flood defence scheme shall include a number of earth embankments, utilising existing earth embankments and construction of new earth embankments. The existing earth embankments would have a steel sheet pile driven along its centreline/top to provide a core. The sheet pile shall project circa 600 to 1000mm on the landward side. This “exposed” section of pile would be cladded and finished with a precast concrete coping.

In order to tie into existing ground level, the sheet piles would be covered with earth. This would be seeded out and have the visual appearance of a grassed earth bank. The banks would vary in height from 1.7m to 2.2m. The amount of earth fill would vary as the existing park is naturally undulating in level. It is proposed that the areas shown in **Figure 4.1** are the maximum footprint for the embankment.

The embankment would serve two key design concepts. Firstly, the embankment would cover the steel sheet pile so that the pile is not visible. The second is to provide access over the sheet piles in the form of pathways along the grass embankments. The embankments are designed to allow grass cutting vehicles to pass over the sheet piles and not impede grass cutting.

4.3.3 Vegetation & Tree Removal

Tree removal and vegetation clearance has been taken into account during the design. The flood walls have been pulled back from the Shimna River banks so as to maintain existing floodplain (where possible) and also to protect the riparian vegetation. All trees with a Tree Preservation Order have been identified and no such trees are planned to be removed as part of the works. The contractor would be given a specific working corridor in which he would have to remove trees to complete the construction of the flood defence; this has been constrained where possible. The majority of the tree removal would take place within the Tipperary Wood section of the works, and would be agreed with the Department of Agriculture, Environment and Rural Affairs (DAERA) - Forest Service. The removal of these trees may be as part of planned harvesting, subject to timing of the works.

4.3.4 Drainage Design

Any local drainage discharging to the Shimna River would be fitted with a flap valve to prevent back water flooding. The discharge points or locations would not be altered as part of the scheme.

To the rear of the sheet pile wall, a small (150mm) perforated pipe would be installed for groundwater drainage. This would be taken to a single location and discharge to the Shimna River via a flapped outfall pipe.

4.3.5 Landscape Planting

Any trees removed as part of the works shall be replaced with native species, as selected by the landowner. The sheet pile wall facing the park areas would be clad and have some low-level planting to prevent antisocial behaviour. The selection of the species would be in agreement with the Council’s Parks Department.

4.3.6 Amenities and Services

The scheme would include installation of picnic tables at Islands Park Carpark. The scheme would also include two new re-graded paths over the grass mound at Islands Park Carpark. These new paths have been incorporated into the Park to maintain public access similar to the current situation. All pathways have been designed taking into account the Disability Discrimination Act and guidance from the Sensory Trust. Similarly, the pathway incorporated to maintain pedestrian access into Tipperary Wood, would meet the same requirements. No permanent lighting would be installed as part of the works.

4.3.7 Inspection and Maintenance

The scheme once constructed, would require yearly visual inspection by a Chartered Civil Engineer. The inspection would involve an engineer walking the length of the defences. Due to the embankment being in areas of open space with grass, the embankment would have a visual inspection with no need for excessive vegetation clearance. The maintenance of the scheme would be largely limited to checking the flap valves and the flood gate. The remainder of the scheme would entail very little yearly maintenance.

4.3.8 Vulnerability to major accident or disaster

The scheme is designed to protect against a 1-in-100 year flood event and includes an element of freeboard. This freeboard is 600mm above the design flood water level to offer additional resiliency against unknowns and climate change. In the occurrence of an extreme flood event (over the design event and freeboard), the flood walls are largely constructed of sheet piles and so can overtop. The water overtopping (depending on rate/volume) would take a considerable time to flood to the same level as an undefended scheme. After such an event, the flood water would retreat via drainage networks and local land drainage into the river. An extreme event of this magnitude (over the 1-in-100 plus freeboard) would likely overpower local road and domestic drainage system long before it caused the scheme to overtop.

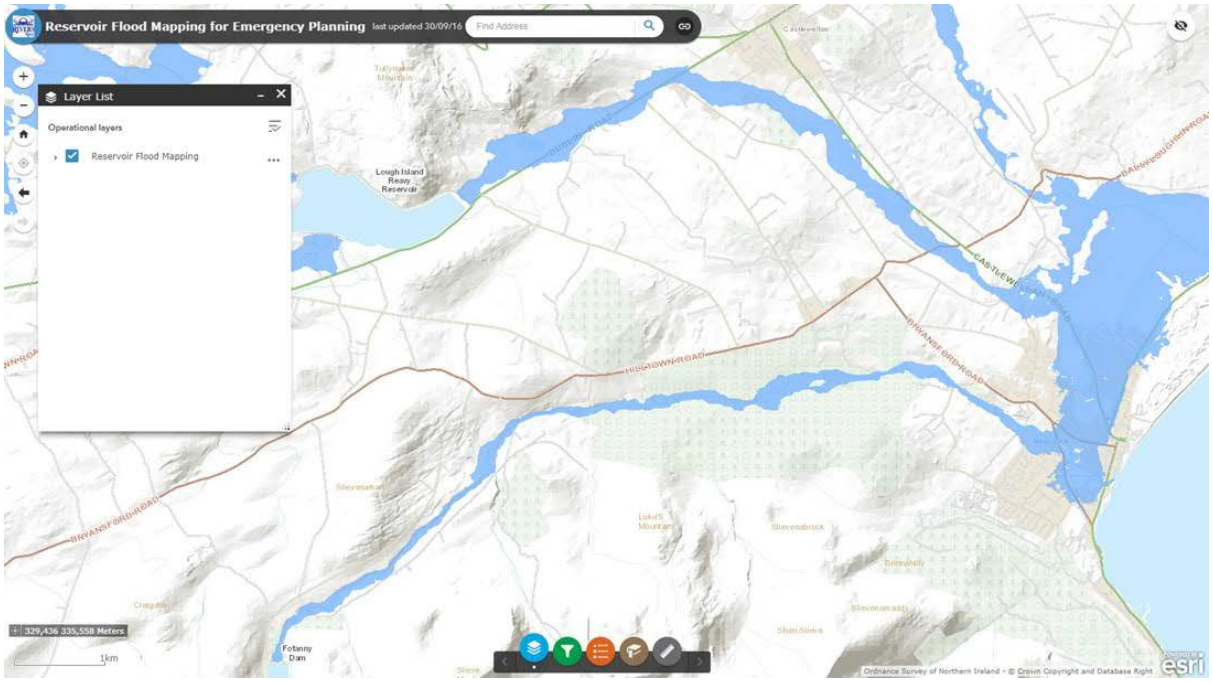


Plate 4.2: Reservoir Flood Mapping for Emergency Planning

Source: http://riversagency.maps.arcgis.com

As shown on Plate 4.2, the scheme is within the breach envelope of Fofanny and Lough Island Reavy reservoirs. Both of the reservoirs are maintained by NI Water and have valid Section 10 Reports as required under the Reservoirs Act 1975. The dams are subject to frequent inspection by an appropriately qualified Civil Engineer and are fitted with scour valves to provide drawdown of water level and so minimise the risk of a breach.

Northern Ireland has the lowest seismic hazard in the UK and thus the scheme is of limited vulnerability to an earthquake event. With reference to the BGS/GSNI GeoIndex map viewer [on-line], there has only been one known historical earthquake epicentre in relative close proximity to the study area. An earthquake with magnitude 2.5 on the Richter Scale, based just to the north of Carrickfergus, occurred in October 1990.

The risk of a tsunami affecting the study area is extremely unlikely. However, if such an event were to occur, it is expected that the flood defences would provide a similar level of protection to a Q_{100} flood

event that would be experienced on the Shimna. This would however be entirely dependent upon the magnitude of such an event.

During construction, the EMP and subsequent CEMP shall be critical to managing environmental risk, particularly in the event of a major accident or disaster. During the construction works, the Contractor shall maintain the existing level of flood protection within the scheme extents. The Contractor shall also consider the protection of his own plant and materials during the works.

As the scheme is adjacent to a river and within/adjacent to a known floodplain, the Contractor shall register with the Met Office to receive Weather Warnings and take advanced steps to protect site, personnel, plant and materials from any flooding.

There is a risk of construction accidents if there is poor management and implementation of control systems such as injury or fatality due to construction traffic, or release of pollutants into the Shimna River for example. Working near or within a watercourse also poses risks to humans and the water environment itself, particularly in light of the extent to which the public (including vulnerable users) utilise this area recreationally and the ecological sensitivity of the watercourse itself.

There is a particularly high risk of accidental root damage for existing vegetation to be retained within the site. Disruption or destruction of important mature trees should be avoided where possible. The EMP shall include site-specific method statements for all operations where there is a risk of environmental damage. These shall show how the proposed methods of construction shall restrict impacts on the environment, and how contingency plans and emergency procedures shall limit damage caused by accidents, spillage or any other unforeseen events. The method statements shall include notification procedures to the relevant authorities/environmental bodies. The Contractor shall liaise with the local community during the Contract and the Council to facilitate ongoing usage of the area as much as is practicably possible during construction.

The Contractor shall ensure that any trees or vegetation to be retained are afforded suitable protection for the nature of the site work being undertaken in that area.

4.4 Construction Phase

4.4.1 Construction Programme

It is envisaged that the construction programme would last 12 months, with the Contractor beginning on-site works in early 2019. The proposed working area is shown on **Figure 4.2**.

4.4.2 Phasing of Works

The phasing of the works is subject to permissions from a number of public bodies, including Forest Service, Council Parks and DfI-Roads. However, it is envisaged that works within the Park/Public areas would be restricted to the winter months.

The works would largely involve the site in question being, secured, vegetation removed and the protection of any structures, services or trees. The Contractor would then set out the line of the sheet pile flood wall using a GPS system. A piling rig would be used to drive the sheet pile to the required depth. The piles would then be cut to the required height above ground. The sheet piles would be covered in earth to form an embankment or clad with stone to form a flood protection wall. Both these operations would involve small dumpers moving materials. Where cladding is selected to cover the pile, this is built in front of the sheet pile (much the same as a blockwork wall) and infilled to the rear with concrete. This operation would therefore require concrete lorries transporting and delivering concrete to site.

In general, it is envisaged that construction work would take place during normal working hours (7.00am to 7.00pm Monday to Friday, 7.00am to 2.00pm on Saturdays). However, the Contractor may need to work outside these hours, particularly for setting-up traffic management arrangements.

4.4.3 Advanced Works (Statutory Undertakers & Archaeology)

There is potential for statutory undertaker diversions to take place in advance of the main construction contract, normally at the request of the statutory undertaker provider. Such works would typically take place in order to protect public supply or if there is potential for the diversion of existing services / utilities to delay or interfere with the construction process (e.g. obstruct haulage routes or have programme implications).

There is also potential for archaeological works to take place in advance of the main construction contract to excavate known or suspected sites of archaeological interest, which may have the potential to affect or delay the construction programme, due to prolonged excavation/investigation time or location. Advanced archaeological works would typically consist of site evaluation, whereby identified sites would be subject to investigation (i.e. in the form of trial trenching). The method of advanced works would be agreed in consultation with DfC Historic Environment Division – Built Heritage during the detailed design stage. It is important to note however that advanced archaeological works do not guarantee that the site would be archeologically sterile, irrespective of the investigative techniques employed. During the main works, discovery of unknown archaeological remains works would remain a risk.

4.4.4 Preliminary Works

Preliminary works would primarily involve community consultation and liaison, establishing the site (i.e. materials/plant compounds), site clearance works, erection of fencing, installation of pollution control/pre-earthworks drainage, and setting-up of traffic management measures.

4.4.5 Community Consultation and Liaison

The Contractor would be required to establish and maintain effective liaison with the local community throughout the construction phase. This would include information about ongoing activities and provision of contact details to report incidents or for further information.

4.4.6 Site Compounds, Materials & Plant

The use of natural resources would be minimal apart from the constitute elements of manufactured products (e.g. concrete, steel sheet piles, stone cladding, etc.) to facilitate construction of the flood walls. Different grades of aggregate would likely be required for foundations and drainage. Appropriately classed fill material would be required for formation of flood embankments (in particular clay), which may be sourced locally. Timber will be used for formwork during the construction phase.

There will be land take from public areas (i.e. parkland, forestry, public amenity space) and private gardens of residences which back onto the river corridor to accommodate the flood walls and embankments.

Energy will be expended during the construction phase due to plant and machinery operation, though there would be no operational phase energy requirements. The appointed contractor shall be required to operate under an accredited Environmental Management System (EMS). It shall be developed to avoid wherever possible environmental accidents and pollution, to encourage reduced consumption of resources, to restrict the production of waste, and to promote good relationships with the relevant authorities / environmental bodies. An Environmental Management Plan (EMP) shall be prepared to manage this process.

Careful planning when considering suitable locations for site offices, stores, workshops, stockpiles of materials and plant yards would help minimise adverse effects of construction activities. Factors affecting the decision would include the noise, traffic and visual intrusion impacts on adjacent properties and they would not be located in areas of ecological value, within 50m of a surface watercourse, or where a loss of amenity is perceived. Whilst the location of site compounds is normally a matter for the Contractor to consider, two indicative locations have been shown on **Figure 4.2.** The contract would include a prescriptive requirement that these aspects are fully considered when compound locations are selected, including obtaining all necessary approvals.

The land required for the Proposed Scheme, including the works area, shall be acquired by private land agreements. If the Contractor chooses to use additional areas of land outwith the land made available, he would need to make all necessary arrangements, including obtaining permissions and licences as appropriate, including consultation and agreement with the relevant authorities. Accordingly, the location and operation of site compounds would be subject to consultation with and the approval of various statutory bodies.

In general, the following requirements would apply. Compounds would not be located in the vicinity of any sensitive receptors, such as schools or residential homes. Where possible, they should be located in areas that would minimise the visual impact of the compounds (i.e. they shall not be located on ridges or on hills, so that they would be widely visible). The compounds would be located in close proximity to the construction area to minimise construction traffic on public roads. The compounds would not be located in areas of unresolved archaeological potential and / or any site of ecological importance. Any storage of hydrocarbons or any liquid chemicals within the compounds would not be within 50m of a watercourse. All fuel storage areas shall be bunded to 110% of capacity to contain the effects of any spills. The compounds would also have an appropriate level of security to minimise the risk of damage, such as chemical spills caused by vandalism. Following construction, these areas shall be cleared and re-instated.

The appointed contractor shall ensure that all areas of land which have been occupied to provide the site or carry out accommodation works are reinstated to the satisfaction of the affected landowner, occupier and the Employer.

Working areas would need to be clearly defined to prevent access to the river channel and riverbank vegetation. The site should be fenced and access for plant, vehicles and workers to banks outside the site should be prohibited. Following construction, any disturbed bankside vegetation outside the crossing footprint should be restored. A “no access” buffer shall be implemented along the Shimna River, to prevent damage to banks and to prevent disturbance of riparian habitats.

4.4.7 Pre-earthworks Drainage

As detailed in CIRIA guidance document C532 (Control of Water Pollution from Construction Sites), the proposed site layout and design should ensure that stockpiling areas, storage areas, fuel stores, waste disposal points, and refuelling areas for example, are located where they are least likely to affect surface waters. Pollution prevention measures would be implemented to minimise the risk of contamination to surface watercourses with the appropriate statutory body consulted to ensure they are fit-for-purpose. Haul routes would be set up in such a way as to avoid pollution to water and lengths minimised, possibly with bunded ditches on either side to prevent runoff of silt and oil. Appropriately located wheel washes with dedicated drainage and pollution collection sumps and interceptors would be installed and all licences and consents would need to be in place before starting work.

Sufficient land would be made available on the landside of the Shimna River to enable the Contractor to better manage runoff from the site during construction and reduce risk. The Contractor shall be required to undertake due care and attention when working in the vicinity of the Shimna River and associated tributaries and where necessary, a wide range of prescriptive mitigation measures shall be implemented to ensure protection of the water environment. Being in a very sensitive water environment, it will be necessary for the Contractor to undertake all works in a precautionary manner, specifically targeted to avoid pollution of the water environment. On this basis, the Contractor shall be required to prepare a Pollution Control and Contingency Plan (incorporating a Silt Management Plan) to appropriately manage the works.

4.4.8 Site Clearance

The appropriately timed site clearance would primarily involve removal of woodland copses and stands of trees, shrubs, hedgerows, and a number of property boundaries. There would be a requirement placed upon the Contractor to minimise tree loss within the works area.

No retained tree shall be cut down, uprooted or destroyed, or have its roots damaged within the crown spread, nor shall arboricultural work or tree surgery take place on any retained tree be topped or lopped other than in accordance with the approved plans and particulars without the written approval

of the Department. Any arboricultural work or tree surgery approved shall be carried out in accordance with British Standard 3998 2010 Recommendations for Tree Work.

The scheme would impact boundaries of four private properties. The current boundary wall would be replaced with a steel sheet pile wall and clad on the private boundary with a finish agreed with the respective landowner.

4.4.9 Fencing

Temporary site boundary fencing (typically timber post & wire) or permanent fencing would be installed on the boundary of the works area to contain the site and restrict access (i.e. animals, general public). As deemed appropriate by the contractor, other forms of fencing (i.e. palisade) would be installed where necessary to provide increased levels of security (i.e. at site compounds).

The erection of fencing for the protection of any retained tree shall be undertaken in accordance with the approved plans and particulars before any equipment machinery or materials are brought on to the site for the purposes of the scheme and shall be maintained until all equipment machinery and surplus materials have been removed from the site. Nothing shall be stored or placed in any area fenced in accordance with this condition and the ground levels within those areas shall not be altered, nor shall any excavation be made or any other works carried out or fires lit without the written consent of the Department.

4.4.10 Traffic Management

Construction traffic shall utilise the existing road network, the majority of which is two-lane carriageway with footpaths. The park site would be accessed using existing access points and entrances. The Contractor would also be required to prepare a Traffic Management Plan, and in particular a Green Travel Plan.

4.4.11 Construction Site Management

Minimal physical waste would be generated from the Proposed Scheme, as it will be procured and managed to ensure it is developed as sustainably as is reasonably practicable. Typical scheme waste would include sheet pile off cuts for recycling (possible re-use), emissions from plant and machinery (e.g. cranes, excavators, lorries). Unsuitable fill material encountered on-site will be re-used (e.g. for landscaping purpose) where possible.

The scheme would be constructed by an appointed Contractor who would manage the site on a day-to-day basis. The Contractor would develop a Site Waste Management Plan and a Health, Safety and Welfare Management Plan. This would implement where possible cost-effective methods of good practice waste minimisation during the design of the project and thereafter during construction. The Contractor would be required to make every effort to re-use as much of the material as possible within the area of the construction site. Any material to be re-used, which is wet, should be stockpiled to allow it to dry out. Stockpiling should be well away from any sensitive areas of ecological or archaeological interest, or watercourses where pollution could occur. The contractor would also be required to meet the requirements set by the Environmental Management Plan (EMP) developed by an environmental specialist team.

The main works would primarily involve continued community consultation and liaison, topsoil stripping and earthworks, further drainage and utilities/services works, flood wall and embankment construction, accommodation works, site reinstatement and landscape planting.

The earthworks for the Proposed Scheme would follow the topsoil strip. Scheme construction would involve activities which would result in the requirement for fill (primarily sourced from site), excavations and generation of soils and rock which if not utilised on-site, would require off-site disposal. Every effort shall be made to re-use excavated material within structural embankments. This may involve a degree of treatment to render some material suitable for re-use. Disposal of unsuitable material off-site would incur haulage costs as well as landfill tax and gate fees.

4.4.12 General Mitigation

The Contractor would manage all works in accordance with any recommendations of this Environmental Statement and mitigation measures suggested by other public bodies and Council. The line of the flood wall/embankments has been kept back from the top of the Shimna River bank to mitigate working near/over water from both a safety and environmental view point.

4.4.13 Environmental Management Plan

The preparation and implementation of an Environmental Management Plan (EMP) is widely considered to be best practice (by statutory and non-statutory bodies) to manage the environmental effects of their projects and to demonstrate compliance with environmental legislation.

The EMP provides the framework for recording environmental risks, commitments and other environmental constraints, and clearly identifies the structures and processes that will be used to manage and control these aspects. The EMP also seeks to ensure compliance with relevant environmental legislation, government policy objectives and scheme-specific environmental objectives. It also provides the mechanism for monitoring, reviewing and auditing environmental performance and compliance.

4.4.13.1 Purpose of an Environmental Management Plan

The key aims of an EMP are to:

- act as a continuous link and main reference document for environmental issues between the design, construction and the maintenance and operation stages of the Proposed Scheme;
- demonstrate how construction activities and supporting design shall properly integrate the requirements of environmental legislation, policy, good practice, and those of the environmental regulatory authorities and third parties;
- record environmental risks and identify how they will be managed during the construction period;
- record the objectives, commitments and mitigation measures to be implemented, together with programme and date of achievement;
- identify the key staff structures and responsibilities associated with the delivery of the project and environmental control and communication and training requirements as necessary;
- describe the contractor's proposals for ensuring that the requirements of the environmental design are achieved, or are in the process of being achieved, during the Contract Period;
- act as a vehicle for transferring key environmental information at handover to the body responsible for operational management. This shall include details of the asset, short and long-term management requirements, and any monitoring or other environmental commitments; and
- provide a review, monitoring and audit mechanism to determine effectiveness of, and compliance with, environmental control measures and how any necessary corrective action shall take place.

4.4.13.2 Scope of an Environmental Management Plan

An EMP considers the following subject areas, as appropriate:

- Environmental Management Procedures;
- Working Hours;
- Water;
- Air Quality;
- Noise and Vibration;
- Materials;
- Geology and Soils;
- Landscape;

- Nature Conservation;
- Cultural Heritage;
- Waste; and
- People and Communities.

An EMP shall be prepared for this scheme, based upon the findings and commitments contained within this ES. The EMP shall then be further refined and expanded by the appointed Contractor into a Construction Environmental Management Plan (CEMP) as more information becomes available and there is more certainty in terms of the proposed layout, construction methods, programme and the likely environmental effects.

Towards the end of the construction phase, the CEMP shall be further refined by the appointed Contractor into a Handover Environmental Management Plan (HEMP), which shall contain essential environmental information needed by the bodies responsible for the future maintenance and operation of the asset.

With this purpose in mind, it therefore follows that the EMP for the Proposed Scheme should be treated as a “live” document throughout the project lifecycle, requiring regular review and update as necessary.

5. Existing Conditions

5.1 Introduction

As detailed in Sub-Section 1.3.3, the ES should include such information referred to in Schedule 2A to the Drainage Order 1973, as substituted by The Drainage (Environmental Impact Assessment) Regulations (Northern Ireland) 2017, that is reasonably required to assess the environmental effects of any proposed drainage works and which the Department can, having regard in particular to current knowledge and methods of assessment, reasonably be required to compile. This includes a description of the relevant aspects of the current state of the environment, including:

- an outline of the likely evolution thereof without implementation of the works as far as natural changes from the current state can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge.

5.2 The Shimna River Catchment

As shown on **Figure 5.1**, the Shimna River rises in the Mourne Mountains and flows to Newcastle through Tollymore Forest Park. Within the town of Newcastle, the Shimna River meets the Burren River in Islands Park. Further downstream of the confluence with the Burren River, the Shimna River is joined by the Tullybrannigan River in the vicinity of the boating lake in Castle Park, before discharging into the Irish Sea (as shown on **Plate 5.1**).

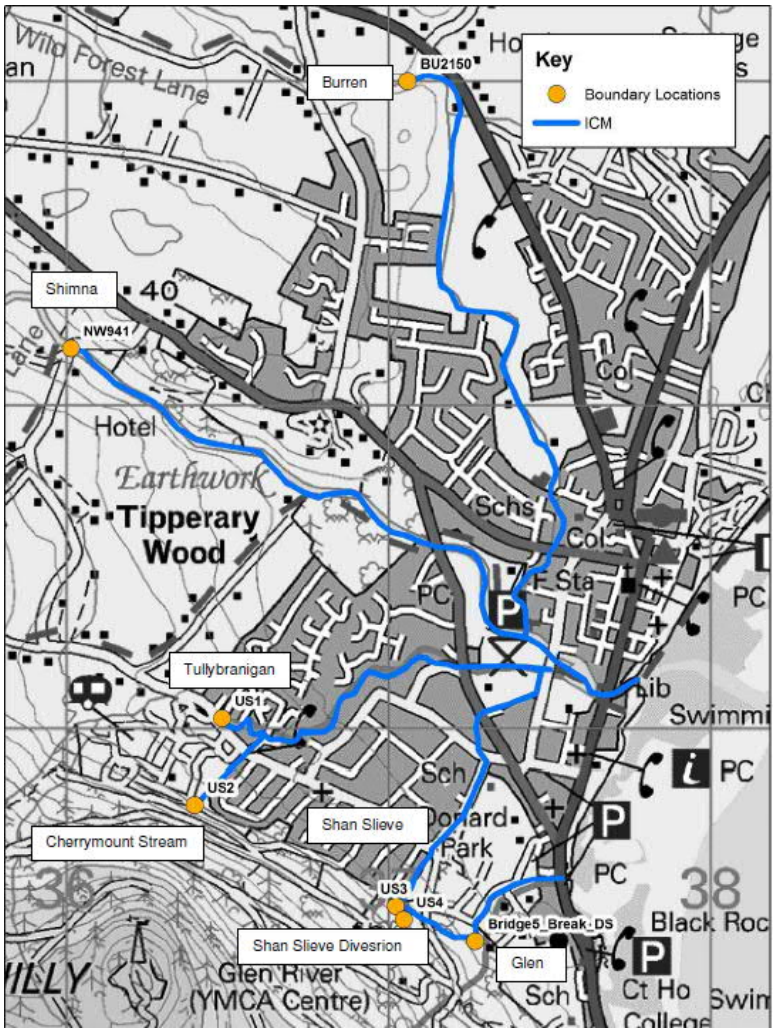


Plate 5.1: Newcastle Urban River Boundary Locations

Source: 'Shimna River, Newcastle Feasibility Study for Flood Risk Investigation' (RPS 2015).

The source of the Shimna River is in the Mourne Mountains, rising on the slopes of Ott Mountain. The river then flows in a northerly direction into Fofanny Dam, before flowing in a north-easterly direction through Tollymore Forest Park where it has its confluence with the Spinkwee River and Trassey River.

From Tollymore, the Shimna River flows in a south-easterly direction towards Newcastle, flowing through Tipperary Wood before entering the settlement limit of the town. As noted above, the final tributaries to join the river prior to it reaching the sea are the Burren River and the Tullybrannigan River, at Islands Park/Castle Park. Near the mouth, as it flows through Castle Park, it widens quite considerably to create a shallow boating pond.

The river's diverse geology, flora and fauna have made the river corridor an Area of Special Scientific Interest (ASSI). As detailed on the DAERA webpage [www.daera-ni.gov.uk/protected-areas/shimna-river-assi], the Shimna River (and Trassey River) is one of the best examples in Northern Ireland of an upland, oligotrophic (base-poor) river. Apart from the presence of Fofanny Dam, the river is in a highly natural state due to limited human impact. It is of particular note for the naturalness of the river channel, which exhibits all the physical attributes of in-channel features, flow and riverbed types typical of unaltered upland rivers. A short, fast-flowing spate river, the Shimna River is characterised by sequences of riffles, runs and pools where its gradient is shallow and the river beds are composed of cobbles, with scattered boulders and sandy margins but where the gradient is steep and the bed composed of bedrock and boulder, the flow is more dramatic with rapids, cascades and water falls.

The aquatic plants reflect the nutrient-poor and highly acidic character of the water and are dominated by mosses and liverworts. In the upper reaches of the Shimna River and its tributary (the Trassey River) compressed flapwort and filamentous green algae dominate the channel, with water earwort, flagellate feather-moss and bulbous rush appearing in the channel further downstream. As the Trassey meets the Shimna, there is a marked increase in diversity but again mosses and liverworts predominate. Here, and as far down river as the outskirts of Newcastle, long-beaked water feather-moss, Alpine water-moss, greater water-moss and claw brook-moss dominate the channel, and rusty feather-moss, fox-tail feather-moss, yellow fringe-moss and the liverwort overleaf pellia dominate the boulder tops and wet margins.

The Shimna River provides excellent habitat for spawning salmonids, with populations of Atlantic salmon, brown trout and sea trout present. Other species inhabiting the system include minnow, stone loach, 3-spined stickleback and eel. On this basis, it is also a very popular river for angling under the control and operation of the Shimna Angling Club.

Marginal semi-natural vegetation along the Shimna River is limited, except at its headwater, and is generally confined to a narrow belt of woodland. This woodland is mainly confined to the riverbank and adjacent slopes. The woodland is generally acidic (calcifugous) in type with a variable structure and composition. Some of the commoner trees and shrubs include downy birch, hazel, goat willow and hawthorn. However, in a few locations, impressive mature sessile oak line the river. The field layer is a mixture of bramble and ferns while the ground cover supports carpets of bluebell, wood anemone and greater wood-rush.

5.3 Existing Land Use

Within the study area, the Shimna River corridor and the area that surrounds it has many existing land uses and is very much representative of the convergence and tension between the natural and human environment with the meeting of the riparian corridors of the converging Shimna, Tullybrannigan and Burren rivers (and associated wetlands) with the residential and amenity areas of Newcastle Town.

As noted previously, the study area centres on the Shimna River which serves as a valuable and diverse area of landscape and ecological importance. The study area forms a locally distinctive landscape within the town and includes the Shimna valley, Tipperary Wood and the river corridors associated with the Tullybrannigan and Burren rivers. The Shimna River is significant for salmon fishing and breeding and is of local nature conservation interest, with the river and trees supporting a range of habitats and species.

As shown on **Plate 5.2**, the main existing land uses that surround the riparian corridors of the three rivers are amenity and residential.

Islands Park (as indicated in dark green on **Plate 5.2**) is the predominant land use which is considered a valuable area of active open space and recreation for Newcastle, as designated within the Ards and Down Area Plan 2015. It includes grassed open space areas, children's playground, parking area, toilet block, wildflower meadow, numerous footways (which facilitate long distance walking routes such as the Ulster Way, Mourne Way and the Newcastle Way), pedestrian bridges, footgolf (currently closed), and tennis courts. The walking routes along the river are a valuable tourism asset within the Newcastle area, which forms a hub point for services and hospitality on a range of rambling and walking routes through the Mourne Mountains.

Plate 5.2: Existing Land Use Display Panel

As shown on **Plate 5.2**, the riparian corridor of the Shimna River and amenity area is backed onto by a number of low density residential areas (shown in grey). These include private residences along Bryansford Avenue, Bryansford Road, River Side Park and more modern housing developments within Shimnamile and Alfred Crescent (located off Bryansford Road).

Not shown on **Plate 5.2** is the area upstream of Bryansford Road Bridge which includes Tipperary Wood on the south bank of the Shimna River and a new housing development within the grounds of the former Shimna House on the north bank.

Tipperary Wood is a DAERA – Forest Service plantation woodland heavily utilised by the community for walking (with direct links to Tollymore Forest), biking, etc. It is also utilised as a scout camp.

The housing development within the grounds of the former Shimna House has been approved for residential and associated development comprising the erection of 7 detached houses, 20 semi-detached houses, 7 terraced houses, 30 apartments, and conversion of an existing house to 4 apartments.

5.4 History of Flooding

As noted in the preceding sections, historical flooding has occurred regularly over the last 40-50 years in Newcastle. Local newspapers have carried reports of storms during 1968, 1978/79, 1987, 1988 and 1994. Other significant flood events are known to have occurred during 1982, 1986, 1990 and 1997. The extreme flood event of 16th/17th August 2008 caused significant flooding in the Bryansford Avenue and Shimna Road areas, where flood water from the Shimna River crossed catchments, to pond within the Burren catchment, behind the recently constructed Burren River flood defences. This area comprises primarily residential properties, schools and Islands Park. Many properties were flooded badly during this event.

It was apparent from this event and previous analysis that at the lower end of the Burren and Shimna catchments, the interaction of the two rivers needed to be considered carefully when assessing the flood risk in this area. The August 2008 flooding was severe, and subsequently water from the Shimna

effectively flowed out of the catchment into the Burren catchment and ponded behind the defences, thus highlighting the relationship between the two rivers. All of these factors contributed to some degree to the flooding over the lower reaches of the Shimna.

The upper reaches of the Shimna River are relatively steep and there are limited properties at risk as the river flows predominantly through a steep-sided ravine and woodland. On this basis, the majority of the risk is at the lower downstream end.

Flooding in Newcastle is a major issue for those residents and business owners directly affected by it, the local Councillors and Politicians who represent them, and the various government agencies who deal with the aftermath of many of the flood events. The formation of the Newcastle Flood Forum is another reflection of the concern there is locally for flooding.

5.5 Flooding (Do-Nothing Scenario)

As noted previously, RPS prepared the *Shimna River, Newcastle Feasibility Study for Flood Risk Investigation*' (2015), in which a computer model was constructed to assess the risk of flooding from the Shimna River. The calibrated river model was run to determine water levels for a range of storm events for both the present day and future scenarios. The flood levels generated from the model simulations were plotted onto maps of the area in order to show the floodplains created from the various events.

The flood maps created were:

- Q_{10} (10% Annual Exceedance Probability (AEP);
- Q_{100} (1% AEP);
- Q_{1000} (0.1% AEP); and
- Q_{100} with climate change (2030 scenario).

These flood maps depict the 'Do-Nothing' or 'Do-Minimum' scenario, where it is assumed that regular routine maintenance is carried out on watercourses only. These maps therefore form the outline of the likely evolution thereof without implementation of the works as far as natural changes from the current state can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge.

5.5.1 Flood Mechanisms & Flood Risk

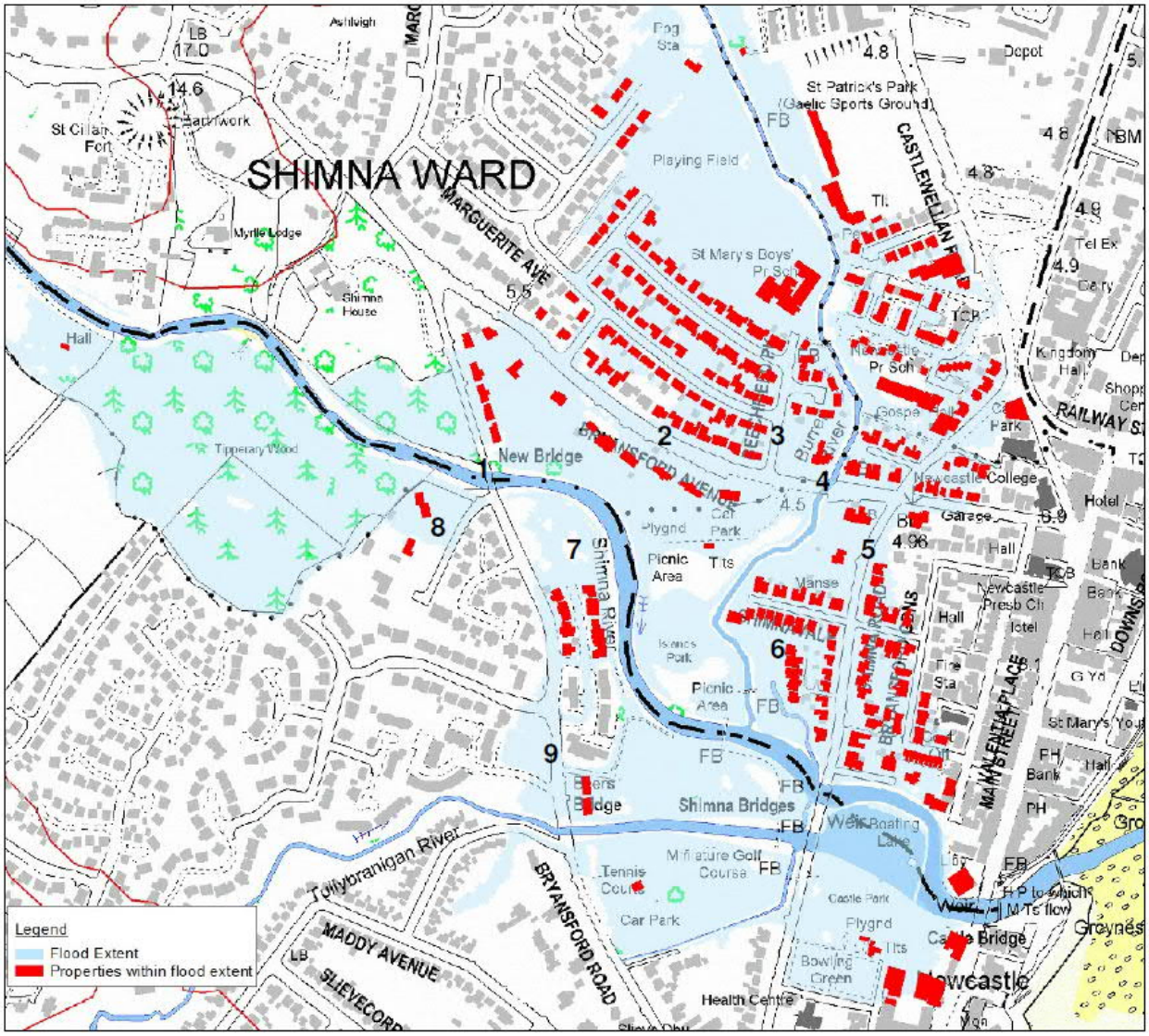


Plate 5.3: Shimna River, Newcastle 1% AEP Flood Extents

Source: 'Shimna River, Newcastle Feasibility Study for Flood Risk Investigation' (RPS 2015).

Key Map Locations

(1) Bryansford Road Bridge

(2) Bryansford Avenue

(3) Beechfield Avenue

(4) Bryansford Avenue Bridge

(5) Shimna Road

(6) Shimna Vale

(7) Shimna Mile

(8) Riverside Park

(9) Bryansford Road

Plate 5.3 illustrates the predicted flood risk in Newcastle posed by the 1% AEP flood event on the Shimna River, which indicates that at least 312 properties would beat risk of inundation by a 1% AEP

flood event. The majority of properties at risk are on the left bank of the river. Initial flooding begins around Bryansford Road Bridge. The flood water then flows across Bryansford Avenue into Beechfield Park and towards the Bryansford Avenue Bridge. The Bryansford Avenue Bridge acts as an aqueduct and conveys water over the Burren River to the eastern part of Newcastle causing flooding along Shimna Road and Shimna Vale. These mechanisms were seen during the August 2008 flood event. The Burren River flood defences do not get overtopped from the 1% AEP event in the Shimna River.

A smaller number of properties on the right (south) bank of the Shimna River are also at risk from flooding. These are in Shimna Mile, Riverside Park and Bryansford Road.

In addition to those properties that are at risk of inundation during a 1% AEP flood event, there are many more other properties which are at risk of being cut-off by flood waters and/or at risk of having the services and utilities disrupted as a result of a major flood event. The Do-Minimum or Do-Nothing scenario would also do little to reduce the risk of pollution incidents, given the fact that flooding often results in pollution problems from oil tanks, sewerage overflows, etc.

With the Do-Minimum/Do-Nothing scenario, the existing environment would largely remain in a similar state/condition as there would be limited grounds for new development within the area at risk of flooding as a result of restrictive planning policy. The development and implementation of other measures proposed under the FRMPs and the RBMPs may provide potential opportunities for more natural flood risk management, however, there would be limited scope for any noteworthy land use changes within the study area from the current state.

6. Consultations

6.1 Introduction

This section details the level of consultation taken place to date in relation to the Proposed Scheme and with whom.

Stakeholders are engaged in defining assessment activities. Statutory environmental bodies, local authorities, other public authorities with environmental responsibilities, and other key stakeholders are likely to have views on the scope of the EIA, and it is good practice to consult with these groups to ensure that the issues are appropriately addressed in the evolving scheme design and indeed the ES itself.

Any dialogue should be directed towards establishing:

- whether and where there are existing resources or receptors that may need further investigation;
- whether existing environmental problems occur in the locality that may be ameliorated or potentially made worse by the Proposed Scheme;
- whether opportunities exist to improve environmental conditions which may coincide with delivery of the Proposed Scheme;
- whether any trends or intermittent events occur that would be of relevance to the assessment, such as seasonal flooding or an activity occurring under some circumstances such as a large public event, diverted traffic, exceptional loads; and
- forthcoming events, activities, developments and land use changes that may have a bearing upon the future state of the environment.

6.2 Who is involved in managing the risk of flooding?

The Department is leading the delivery of the Floods Directive. This role is known as ‘competent authority’ and it is a legislative requirement that it is done with the co-operation of other government departments, agencies and stakeholders that have a flood risk management role. A number of groups have been established to ensure that the relevant stakeholders inform and shape the Floods Directive process.

As the requirements of the Floods Directive have been developed, a number of local forums have also been established, similar to the Greater Belfast Strategic Flood Forum which was set up as a pilot study. The public have played an important role in the stages leading up to the completion of Flood Risk Management Plans and the Department will continue to promote opportunities for people to get involved during implementation of those Plans. The Department will also keep the public informed on the progress of implementation through their website.

6.2.1 Floods Directive Steering Group

The Department established the Floods Directive Steering Group, comprising senior representatives from all of the key governmental stakeholders with an interest in this cross-cutting Directive; the Group provides the strategic direction for implementation of the Directive. The main aims of the Steering Group are to:

- consider and comment on the approach taken by the Department’s Floods Directive Implementation Group;
- ensure that there is a high-level commitment within all of the governmental stakeholders to provide the resources necessary to meet the requirements of the Directive;
- ensure the strategic co-ordination of all work required by governmental bodies in taking forward the Directive towards full implementation;
- facilitate the alignment of all government policies/programmes and the Directive; and

- identify and make recommendations for the development of water and land-use policies that might affect flood risk and the management of flood risk.

The Steering Group is chaired by the Deputy Secretary of the Department, or a substituting official, and meets three times yearly. The Steering Group in itself has no responsibility for the management of flood risk and has no specified role to communicate with the public or others in regard to flood risk.

The Steering Group comprises senior representatives from the key government stakeholders and provides strategic direction for the implementation of the Directive.

6.2.2 Stakeholder Group

The Stakeholder Group comprises government representatives with responsibility for flood risk management, the environment, fisheries, planning and civil contingencies. Farming and insurance interests are also represented. It helps develop policies to deliver the Floods Directive and ensures compliance with the environmental objectives of the Water Framework Directive.

6.2.3 Local Flood Forums

The Department has established three Local Flood Forums to help develop a better understanding of flood risk and how it can be pro-actively managed in the future.

The forums are made up of government departments, agencies, stakeholders and the public or their representatives and provide groups with an opportunity to participate in the preparation of Flood Risk Management Plans.

This level of local engagement allows officials to get a real sense of what it is like to experience flooding and assists in the drafting of measures to reduce the impact.

The forums cover the three River Basin Districts:-

- Neagh Bann;
- North Eastern; and
- North Western.

6.3 Previous Public Consultations

6.3.1 Legislative Stage – creating local legislation

Draft legislation was put out to public consultation in August 2009 over an eight-week consultation period. Local legislation is now in place.

6.3.2 Stage 1 – identifying areas at significant risk

This is a largely technical stage which requires specialised computer modelling and mapping technology. Specialist staff in the Department completed this work with input from the Steering Group.

6.3.3 Stage 2 – flood risk and flood hazard maps

This is another technical stage requiring specialised computer modelling and mapping technology. Again, specialist staff in the Department undertook this stage of work and the public can view the results via https://www.infrastructure-ni.gov.uk/topics/rivers-and-flooding/flood-maps-ni.

6.3.4 Stage 3 – flood risk management plans

There have been a number of opportunities for public participation at this stage. The main channel for engagement with the public and local groups with an interest in the development of Flood Risk Management Plans has been through Local Flood Forums. The Department hosted a series of Community Information Events where the public was able to learn more about the Directive, discuss

proposals for their area, and provide input and feedback to assist the Department in drafting the Flood Risk Management Plans.

A public consultation on the draft Flood Risk Management Plans took place between December 2014 and June 2015. Following the consultation, the Plans were updated and revised and final Plans published in December 2015.

6.3.5 Next Steps

Now that the first sets of Plans are produced, they will be implemented over the 6-year Plan cycle. In-tandem with this, preparation for the second cycle of flood risk management planning will commence. There will be continuing public involvement in implementing the Plans and during the development of the 2nd cycle planning process.

6.4 Environmental Impact Assessment Consultation

An integral element of the EIA includes consultation with statutory authorities and other interested bodies to establish any relevant constraints or factors to be taken into account when considering the Proposed Scheme. The objectives of the Statutory Procedures consultation include:

9. formal notification of the scheme, including an invite to a Public Information Day;
10. inform relevant stakeholders of the design and Statutory Procedures process; and
11. provide opportunity to submit representation.

The EIA process looks at the effects of the Proposed Scheme on the environment, in consultation with external bodies to inform the design and decision making. The EIA consultation commenced for the vast majority of stakeholders in May 2018 to allow relevant interested bodies an opportunity to register concerns or particular requirements during the EIA process, consult on the levels of assessment necessary, and seek input to the ES. However, a number of bodies did not respond to the first consultation phase and were subsequently reminded to do so in July 2018, before closing the consultation period for the vast majority of stakeholders in August 2018. For some of the bodies consulted again, the second consultation phase still did not yield a response. Furthermore, as the design progressed and more information became available about other parties that may have an interest in the Proposed Scheme, these too were consulted over the course of the assessment and as such allowances were made regarding the consultation period for these bodies.

The comments and views obtained from the consultees have subsequently been used to identify baseline conditions over the area, and considered in the decision making process. Where possible, the comments obtained have been used to refine the Proposed Scheme and to form mitigation proposals to minimise scheme effects.

The following bodies were consulted over the course of the EIA for the Proposed Scheme:

- RSPB Northern Ireland;
- NIEA – Natural Environment Division;
- NIEA – Water Management Unit;
- DfC - 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;
- DAERA - Inland Fisheries;

- Loughs Agency;
- National Trust Regional Office;
- NIEA – Resource Efficiency Division (Waste Management);
- The Rivers Trust;
- Newry, Mourne and Down District Council;
- Department of Agriculture, Environment and Rural Affairs - Marine and Fisheries Division;
- Department of Agriculture, Environment and Rural Affairs - Forest Service;
- Department of Agriculture, Environment and Rural Affairs - Air and Environmental Quality Unit;
- Department of Agriculture, Environment and Rural Affairs - Countryside Management Development Branch;
- Geological Survey of Northern Ireland;
- Mourne Heritage Trust;
- The Woodland Trust Northern Ireland; and
- Shimna Angling Club.

Of those bodies which did respond, the majority of comments were received via letter or email. A summary of these responses is included in Table 6.1 below.

Table 6.1: Summary of Formal Consultee Responses Received

Consultee	Date Received	Summary
Shimna Angling Club	28th June 2018	Concerned with the health of the river with regards to its fish population and with the surrounding habitat which impacts the fish population. Issues of concern included light pollution on the river, minimisation of tree loss, steps taken to minimise any possible increase in light pollution on the river, and access to the Shimna River in Tipperary Wood.
NIEA - CDP	03rd August 2018	Provided a response detailing the potential for scheme impact upon Shimna River ASSI, Murlough ASSI and Murlough SAC. Noted that the ES should include an assessment of the potential impacts of the proposed works on the river and detail construction methodologies, timings and proposed mitigation and enhancement measures. Noted the proposal's hydrological connectivity via the Shimna River ASSI to a number of other National and European designated sites (Murlough ASSI, Murlough SAC and East Coast Marine pSPA).
DAERA - Air and Environmental Quality Unit	03rd August 2018	Noted sources of air quality and noise information and legislation in Northern Ireland, and noted that the relevant district council can give further information on local level air quality and noise baseline and possible impacts of the proposed scheme.
Woodland Trust	08th August 2018	Provided woodland maps and comments on the scheme, and noted that some of the woodland in the general area has been there since 1860 and possibly older, so it could constitute long-established woodlands if looked into further. Would be very disappointed if there is significant loss to this woodland habitat, as it likely has many ancient features worth protecting.
Mourne Heritage Trust	09th August 2018	Raised concern that the proposals relating to installation of a flood gate, with access to Tipperary Lane then being facilitated by way of a stile, would hamper use of this popular route for people in wheelchairs, buggies, bikes etc.
DAERA – Marine & Fisheries Division	29th June 2018	Marine Plan Team advised that as the proposed works 'affect or might affect' the marine area of Northern Ireland, appropriate consideration should be given to the UK Marine Policy Statement. Marine Licensing Team noted that the applicant should be made aware that all construction or deposition works below the Mean High Water Spring Tide (MHWST) mark are subject to licensing

Consultee	Date Received	Summary
		under the Marine and Coastal Access Act 2009. Marine Conservation & Reporting Team carried out an assessment of the proposal on any marine conservation areas and found that the proposal is hydrologically connected to National and European designated sites (Murlough ASSI and Murlough SAC). Also found that the application site is in close proximity to a proposed European designated site (East Coast Marine pSPA).
DAERA – Inland Fisheries	12th June 2018	Considered the proposal further through provision of additional plans and noted the potential fisheries habitat quality associated with the Tullybrannigan River. Liaised further informally with the appointed fisheries specialist for the scheme.
	18th July 2018	Noted that the Tullybrannigan stretch may contain good salmonid habitat and fish populations. Requested details on mitigation measures to protect fisheries habitat and fish stocks.
	25th July 2018	Discussion of potential habitat enhancement measures in the Tullybrannigan River after in-river works.
DAERA – Water Management Unit	08th June 2018	Given the nature and location of the works proposed, WMU recommend that Construction Method Statements are prepared based upon NIEA's pollution prevention guidance to ensure all risks to the water environment have been identified and appropriate mitigation planned.
The National Trust	11th June 2018	Requested additional mapping to consider the potential for impact further upon National Trust interests within the study area.
DAERA – Marine Strategy and Licensing Team	04th June 2018	Noted that they manage the bathing water at Newcastle and carry out catchment investigations in the Newcastle area in conjunction with NIEA. Requested further discussion as there may be a chance that works may impact on the bathing water and its environs.

6.5 Public Consultation - Information Day

An Information Day was held on 05th June 2018 at the Newcastle Centre. This invited the public to come and view the Proposed Scheme and voice any queries or pass on any feedback to the Department. The consultations included:

Feedback forms – two feedback forms were filled-in with regards to the Proposed Scheme. Positive feedback included appreciation of the Scheme having no impact on the shape or form of the Shimna River. Main concerns included, the visual impact of a bare sheet pile wall within Tipperary Wood and a lack of amenity value added. These concerns have been addressed within the ES and can be found within the Project Description section (Section 4).

Landowners – Landowners from the area came to gain a better understanding of the scheme and how it would impact on themselves and the wider environment. All conversations were positive and most landowners were pleased with the Proposed Scheme.

Elected Members – Some elected members attended the Information Day; their feedback was positive.

Shimna Angling Club – Several members were present throughout the day and voiced their concerns regarding, changes to current light conditions upon the Shimna River and changes to access to the Shimna River. These concerns have been addressed within the ES.

General interest – The general public engaged with the Scheme and took an interest in the proposals. All conversations were positive.

6.6 Landowner Liaison

Residential Land Agreements – AECOM, acting on behalf of DfI Rivers, has consulted with all residential landowners directly affected by the works (the flood defence walls run along the

landowners' property boundaries). These are private land agreements with the landowners and allow for the disturbance caused due to the installation of the new wall along their property curtilage.

Council Liaison – Further to the liaison with elected members of Council (detailed below), AECOM, acting on behalf of DfI Rivers, has liaised with Newry, Mourne & Down District Council to agree all finishes within the Park areas. Information relating to finishes can be found within the Project Description section (Section 4).

Forestry Liaison – DfI Rivers has liaised with DAERA – Forest Service to agree the finish and location of the flood defence wall within Tipperary Wood.

General Liaison – A letter drop was completed to 50no. properties in the immediate area, providing an overview of the Proposed Scheme. It included details of the Information Day detailed above.

6.7 Elected Representatives

AECOM, acting on behalf of DfI Rivers, attended a Mourne Elected Councillors meeting on 14th March 2018. AECOM gave a presentation to the councillors explaining the need for the scheme, the Proposed Scheme itself, and the planned programme. The councillors were also invited to voice any queries and pass on any feedback. The response on the day was positive. There was a query regarding back drainage; this would be overcome by ensuring all existing outfalls are brought through the sheet pile flood defence and have a flap valve installed. Drainage in general is addressed within the Project Description section (Section 4).

The Elected Members present were:

- Brian Quinn;
- Henry Reilly;
- Sean Doran;
- Jill MacAuley;
- Laura Devlin;
- Glyn Hanna; and
- Willie Clarke.

7. Air Quality & Climate

7.1 Introduction

This section of the ES assesses the impact to air quality and climate associated with the Proposed Scheme. The purpose of this assessment is to consider baseline air quality and climatic conditions in the study area, as well as the expected construction and operational impacts associated with the scheme. The overall aim is to robustly demonstrate that all likely significant effects (beneficial or adverse) are identified, considering the sensitivity of the environment and the magnitude of any potential impacts.

As the Proposed Scheme largely consists of 1430m of brick/concrete clad sheet piles or sheet pile core embankments, a new pathway, a realignment of a pathway and a floodgate, it would not give rise to operational phase emissions other than those associated with routine maintenance, which is likely to be an infrequent occurrence, and as such would be imperceptible and not significant.

On this basis, the focus of the assessment is primarily on the construction phase and those activities likely to give rise to adverse impacts, such as dust-raising activities in close proximity to sensitive receptors. Negative air quality impacts can come from many sources during construction, and also have the potential to generate greenhouse gases. These emissions are produced by construction machinery and use of construction materials.

Mitigation measures would be required so that construction works are carried out in such a manner that emissions of dust and other pollutants are limited, and that best practicable means are employed to minimise disruption, risks to human health, and to avoid unnecessary impacts on sensitive ecological habitats.

7.2 Methodology

7.2.1 Scope of the Assessment

In consideration of the potential for environmental and human health impacts related to emissions from the construction and operational phases of the Proposed Scheme, the study area needs to be defined.

In general, the potential impacts of any operational or construction related emissions would be intrinsically related to the level of exposure. Typically, receptors located closest to the source of the emission would be subject to the highest level of exposure. Whether or not the environmental and health impacts are likely to be significant associated with the Proposed Scheme, they are likely to be confined within the first 50–100m from it. Some impacts, such as climatic or traffic, would obviously have a wider sphere of influence.

On this basis, the assessment has considered whether existing air quality and climatic conditions would change due to emissions or influences associated with the construction and operation phases of the Proposed Scheme, by adopting the following approach as necessary:

- characterise the baseline air quality and climatic environment utilising DEFRA background concentration maps of Oxides of Nitrogen (NO_x), Nitrogen Dioxide (NO_2) and Particulate Matter (PM_{10}) for 2018 and Met Office data for the region;
- characterise the existing built and natural environment, paying particular attention to sensitive receptors, such as residential buildings, places of worship, education and medical buildings, sensitive vegetation etc., within 200m of the Proposed Scheme;
- characterise the traffic-related impacts associated with the Proposed Scheme (i.e. changes in Annual Average Daily Traffic (AADT) distribution, speed and volume);
- determine appropriate criteria for evaluating the significance of air quality and climate impacts through reference to local plans and statutory documents where applicable and best practice;
- calculate potential air quality and climate impacts using industry standardised calculation methods and assess the impact by comparing the calculated levels against the adopted criteria;

- specify ameliorative, remedial or reductive mitigation measures to control the impact associated with either the construction or operational phases of the Proposed Scheme as necessary; and
- demonstrate that all likely significant effects (beneficial or adverse) are identified, considering the sensitivity of the environment, the magnitude of any potential impacts associated with the Proposed Scheme, and the proposed mitigation measures.

7.2.2 Operational Assessment

As the Proposed Scheme largely consists of 1430m of brick/concrete clad sheet piles or sheet pile core embankments, a new pathway, a realignment of a pathway and a floodgate, it would not give rise to operational phase emissions other than those associated with routine maintenance, which is likely to be a very infrequent occurrence, and as such would be imperceptible and not significant.

Furthermore, as there would be no change to the local road network or traffic levels during the operational phase, no further assessment was carried out for this scenario.

7.2.3 Construction Assessment

The methodology adopted for assessing construction impacts has been prepared in accordance with '*Guidance on the assessment of dust from demolition and construction*' (Institute of Air Quality Management, 2014) which provides a framework for the assessment of risk.

Activities on construction sites have been divided into four types to reflect their different potential impacts. These are:

- Demolition;
- Earthworks;
- Construction; and
- Trackout.

The potential for dust emissions is assessed for each activity that is likely to take place. Obviously, if an activity is not taking place, then it does not need to be assessed. Dust is defined as all particulate matter up to $75_{\mu m}$ (microns) in diameter and comprising both suspended and deposited dust, whereas PM_{10} is a mass fraction of airborne particles of diameter 10 microns or less. The health impacts associated with dust include eye, nose and throat irritation, in addition to the nuisance caused by deposition on cars, windows and property. Dust and PM_{10} emissions arise from a number of sources, so both construction activities and emissions from vehicles associated with the construction site need to be considered.

The assessment methodology considers three separate dust impacts, with account being taken of the sensitivity of the area that may experience these effects:

- annoyance due to dust soiling;
- the risk of health effects due to an increase in exposure to PM_{10}; and
- harm to ecological receptors.

The risk of dust arising in sufficient quantities to cause annoyance and/or health and/or ecological impacts is determined using four risk categories: Negligible, Low, Medium and High risk.

A site is allocated to a risk category based on two factors:

- the scale and nature of the works, which determines the potential dust emission magnitude as Small, Medium or Large; and
- the sensitivity of the area to dust impacts, which is defined as Low, Medium or High sensitivity.

These two factors are combined to determine the risk of dust impacts with no mitigation applied. The risk category assigned to the site can be different for each of the four potential activities (demolition, earthworks, construction and trackout). More than one of these activities may occur on a site at any one time.

The assessment is used to define appropriate mitigation measures to ensure that there will be no significant effect. The locations of any sensitive receptors within 200m of the construction site should be clearly identified, such as housing, schools and hospitals or designated species or habitats within a protect ecological site, so that mitigation measures to reduce dust emissions can be rigorously applied.

7.3 Regulatory & Policy Framework

7.3.1 Air Quality Legislation

The management of air quality in Northern Ireland is currently based on the requirements of European Union (EU) Air Quality Directives, and the UK Air Quality Strategy.

The Clean Air for Europe (CAFE) programme revisited the management of Air Quality within the EU and replaced the EU Framework Directive 96/62/EC (Council of European Communities, 1996), its associated Daughter Directives 1999/30/EC (Council of European Communities, 1999), 2000/69/EC (Council of European Communities, 2000), 2002/3/EC (Council of European Communities, 2002), and the Council Decision 97/101/EC (Council of European Communities, 1997) with a single legal act, the Ambient Air Quality and Cleaner Air for Europe Directive 2008/50/EC (Council of European Communities, 2008).

Directive 2008/50/EC is the principal instrument for governing outdoor ambient air quality policy in the EU. It sets health and environmental objectives and emission reduction targets for the key air pollutants associated with human health and ecological impacts. It proposes to deliver the objectives in stages, and make it possible to protect EU citizens from exposure to particulate matter and ozone, and protect European ecosystems more effectively from acid rain, excess nutrient nitrogen (in the form of ammonia and nitrogen oxides, which disrupts plant communities, and leaches into fresh waters, leading in each case to a loss of biodiversity), and ozone.

In Northern Ireland, this Directive is transposed by the Air Quality Standards Regulations (Northern Ireland) 2010 [as amended]. The Regulations introduce a limit value to $PM_{2.5}$ in addition to the existing limit values for PM_{10}, NO_2 and Oxides of Nitrogen. These limit values are binding in Northern Ireland and have been set with the aim of avoiding, preventing and reducing harmful effects on human health and on the environment as a whole. Air quality limit values are an appropriate measure to use in assessing the significance of effects on air quality sensitive receptors. It is the responsibility of the Department of Agriculture, Environment and Rural Affairs (DAERA) to inform the public about air quality in the region, particularly with regard to warning the public when information and alert thresholds are exceeded.

Of relevance to the scheme, the limit values (as detailed within Schedule 2 of the Regulations) for pollutants specific to the protection of human health are provided in Table 7.1.

Table 7.1: Relevant Air Quality Standards for the protection of human health

Pollutant	Averaging period	Value	Maximum Permitted Exceedances
Nitrogen Dioxide (NO_2)	Annual Mean	40µg/m^3	None
	Hourly Mean	200µg/m^3	18 times per year
Particulate Matter (PM_{10})	Annual Mean	40µg/m^3	None
	24-hour	50µg/m^3	35 times per year
Fine Particulate Matter ($PM_{2.5}$)	Annual Mean	25µg/m^3	None

Source: Schedule 2 of the Air Quality Standards Regulations (Northern Ireland) 2010

DAERA also has a duty to ensure that critical levels for the protection of vegetation, as detailed in Schedule 6 of the Regulations, are not exceeded. The critical levels for pollutants of relevance to the scheme are provided in Table 7.2.

Table 7.2: Critical levels for the protection of vegetation

Pollutant	Critical Level	
	Concentration	Measured as
Oxides of Nitrogen (NO_x)	30µg/m^3	Annual mean

Source: Schedule 6 of the Air Quality Standards Regulations (Northern Ireland) 2010

A list of other current Northern Ireland Air Quality legislation, which may be pertinent to the assessment of the scheme, is detailed on the DAERA's Air Quality Northern Ireland webpage (http://www.airqualityni.co.uk).

7.3.2 Air Quality Policy

7.3.2.1 Local Air Quality Management

Local Air Quality Management (LAQM) provides the framework under the Environment Order (NI) 2002 within which air quality is managed by the councils in Northern Ireland. LAQM requires councils to review and assess a range of air pollutants against the objectives set by the Air Quality Strategy, using a range of monitoring, modelling, observations and corresponding analyses. For locations where objectives are not expected to be met by the relevant target date, councils are required to declare an Air Quality Management Area (AQMA), and (along with relevant authorities), to develop an Action Plan addressing the problem.

7.3.2.2 Regional Development Strategy

In 2012, the then Department for Regional Development (now DfI) published the Regional Development Strategy 2035 (RDS). The document sets out the policies and strategies for Northern Ireland, and includes region-wide policies. Policy RG9 states:

"Reduce our carbon footprint and facilitate mitigation and adaptation to climate change whilst improving air quality.

***Protect Air Quality Management Areas**. In order to improve air quality for all citizens in Northern Ireland local authorities are responsible for reviewing the state of air quality in their district. To assist them with this process an Air Quality Strategy has been devised for the UK. This sets down standards and objectives for the air quality pollutants causing the problems and allows local authorities to review air quality in their area against these. Where local air quality fails to meet the required standard, the local authorities must declare an AQMA, covering the geographical area where a problem has been identified for the pollutant that exceeds its permitted standard. Development should be consistent with the AQMA action plans. NI departments also have a responsibility to ensure limit values, target values and alert thresholds for specified pollutants are not exceeded."*

***Identify key assets and areas that are at risk through climate change.** In adapting to climate change it is essential that we maintain accurate and reliable information about key assets. 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."*

7.3.3 Climate Policy

In relation to international commitments, under the Kyoto Protocol, Member States must achieve legally-binding Greenhouse Gas (GHG) limitation and emission reduction targets, with the EU adopting a target to reduce GHG emissions by 20% from 1990 levels by 2020. According to the Northern Ireland Action Plan, climate change is a devolved issue, which is influenced by UK and EU legislation and policy within Northern Ireland.

From the UK, the Climate Change Act (2008) extends to Northern Ireland with the consent of the Northern Ireland Executive and Assembly. The Climate Change Act made the UK the first country in

the world to have a long-term legally-binding framework for emissions reduction, to align with the Kyoto Protocol.

Under the Climate Change Act, the UK's total emissions are limited to:

- 3,018 million tonnes of CO_2 eq for the carbon budget period (2008-2012);
- 2,782 million tonnes of CO_2 eq over the second carbon budget period (2013-2017);
- 2,544 million tonnes of CO_2 eq over the third carbon budget period (2018-2022); and
- 1,950 million tonnes of CO_2 eq over the fourth carbon budget period (2023-2027).

However, there are no specific emissions targets set for Northern Ireland under the 2008 UK Climate Change Act. The Action Plan for NI states the while there is no specific target or carbon budget for Northern Ireland in the Climate Change Act 2008, it is implicit that Northern Ireland contributes to the UK effort, which aims to reduce GHG emissions by at least 80% by 2050.

7.4 Baseline Environmental Conditions & Constraints

7.4.1 Air Quality

With reference to the Ards Down Area Plan 2015, Newcastle is a service centre for the surrounding rural hinterland, a commuter settlement and a holiday and retirement resort. It remains one of the main centres for tourism in Northern Ireland due primarily to the beauty of its natural setting and provides a range of tourist accommodation, in particular caravan parks. Local service and recreation facilities include churches, schools, a library, golf courses, Gaelic football and soccer pitches, outdoor swimming pools and playing fields. The service sector is the main source of employment, much of which is associated with the tourist industry and general professional services; consequently, the demand for industrial land within the town has been very low. On this basis, there are very few notable sources of emissions which could give rise to adverse air quality conditions other than from domestic uses and vehicular activity in the area.

The town of Newcastle falls within the jurisdiction of Newry, Mourne and Down District Council (NMDDC). Councils have a statutory duty under the Environment (NI) Order 2002 to review air quality and assess whether any locations within their jurisdiction are likely to exceed the Air Quality Strategy Objectives. This involves consideration of present and likely future air quality. If they identify areas of exceedance, then one or more AQMAs will need to be defined. Currently, NMDDC has declared two AQMAs within its jurisdiction, both of which are within Newry and therefore not of any relevance to the study area or the Proposed Scheme.

7.4.1.1 Local Air Quality

To characterise the baseline air quality in the study area, DEFRA background concentration maps of NO_x, NO_2 and PM_{10} for 2018 were utilised. The main purpose of these background maps is to provide estimates of background concentrations for specific pollutants. These can then be used in air quality assessments to better understand the contribution of local sources to total pollutant concentrations. They provide information on how pollutant concentrations change over time and across a wide area; they also provide an estimated breakdown of the relative sources of pollution. The maps allow for the assessment of new pollutant sources that are introduced into an area and the impact they may have upon local air quality.

The 2018 air pollution background concentrations of the pollutants of most concern (NO_2, NO_x, and PM_{10}) for the Newcastle urban area are provided in Table 7.3.

Table 7.3: Estimated Background Pollutant Levels (2018) for Newcastle

Pollutant	Background Level	Limit Value
NO_2	3.96µg/m^3	40µg/m^3
NO_x	5.02µg/m^3	30µg/m^3
PM_{10}	8.72µg/m^3	40µg/m^3

Source: DEFRA: Background Mapping data for local authorities

When comparing the estimated background pollutant levels within Table 7.3 to the relevant Air Quality Standards for the protection of human health contained within Table 7.1, it can be confidently predicted that the existing pollutant levels are well below the limit values as outlined in Schedule 2 of the Air Quality Standards Regulations (Northern Ireland) 2010.

7.4.1.2 Sensitive Facilities

Some facilities are deemed particularly sensitive to changes in air quality, such as those used by the elderly, schools and hospitals, or outdoor communal facilities. Within the study area, such facilities include Autism Initiatives Day Service; Newcastle Tennis Club; Islands Park; Walking and Amenity routes through Tipperary Wood; and Castle Park.

7.4.1.3 Designated Sites

There is one nationally designated site for its ecological interest within the study area, the Shimna River ASSI. According to the APIS website, the river element of this site is sensitive to nitrogen, and subsequently could be adversely affected by an increase in air pollutant concentrations.

7.4.2 Climate

Information provided within this sub-section is reproduced from the Met Office's climate summary for Northern Ireland, based on its records from the years 1971 to 2000.

In general, Northern Ireland is cloudier than the rest of the United Kingdom, because of the hilly nature of the terrain and its proximity to the Atlantic Ocean. Even so, the coastal strip of County Down has an annual average total of over 1,400 hours of sunshine. The dullest parts of Northern Ireland are the more mountainous areas of the north and west, with annual average totals of less than 1,100 hours of sunshine. Mean daily sunshine figures reach a maximum in May or June, and are at their lowest in December. The key factor is the variation in day length through the year, but wind and cloud are major controlling factors as well. Annual mean sunshine duration for the scheme area would typically be between 1,250 and 1,300 hours.

Rainfall in Northern Ireland varies widely, with the highest average annual totals being recorded in the Sperrin, Antrim and Mourne Mountains, where the annual precipitation is approximately 1,600mm. Proximity to the Atlantic Ocean and the prevailing south-westerly low pressure systems are the cause of the comparatively high rainfall figures experienced in the west of the Province of up to 1,950mm of rainfall per annum, compared with just less than 800mm of rainfall per annum to the south of Lough Neagh and the east of the Province.

Seasonal rainfall variation in Northern Ireland is not large, but the wettest months are between October and January. This is partly a reflection of the relatively low frequency of thunderstorms in the Province and the high frequency of winter Atlantic depressions.

The occurrence of snow is closely linked to temperature and altitude, being comparatively rare near sea level but much more frequent over the hills. The average number of days when snow falls varies between 10 days near the east coast, to over 35 days in the mountains of Sperrin, Antrim and Mourne. The number of days on which snow lies varies, from less than 5 days around the coast, to over 30 days in the mountains. On rare occasions, the snow has lain in excess of 30 days or indeed caused travel disruption for up to 5 days. Throughout Northern Ireland, mean annual temperature varies little at low altitudes, averaging between 8.5°C to 9.5°C with the higher mean values occurring nearer to the coasts.

As would be expected, the lowest mean annual temperatures are recorded with increasing height; therefore Slieve Donard (Northern Ireland's highest mountain) would have an average annual temperature of approximately 4.5°C. Due to the influences of the surrounding sea, Northern Ireland's winter temperatures are relatively mild; therefore inland areas generally experience colder temperatures than the coast, with the opposite being the case in the summer months. On average, the study area can expect a mean annual temperature of 8.5°C to 9.5°C.

Inland, generally January or February are the coldest months of the year, with mean daily minimum temperatures being between 0.5°C in upland areas and approximately 2.0°C on the coast. July is the warmest month, with the mean daily maximum temperatures being between 17.0°C in upland areas to almost 20.0°C. In general, wind speed increases with height with the strongest winds being recorded over the summits of hills and mountains.

The coastal fringes of County Antrim and Down have about 15 gales per year, while the number of days decreases inland to five days or fewer. These are associated with the passage of deep depressions across or close to the British Isles and most frequently occurring in the winter months. In comparison with the rest of the British Isles, the frequency of gales experienced in Northern Ireland is relatively low due to the shielding effect that the rest of Ireland and some parts of Scotland has on decreasing wind speed.

7.5 Predicted Impacts

7.5.1 Do-Nothing Scenario

Under the Do-Nothing scenario, it is not envisaged that there would be any perceptible change in local air quality or climatic conditions, particularly as the risk of flooding and inundation in the area surrounding the Shimna River would remain. The restrictions on future development (i.e. housing) on land potentially affected by flooding would negate the potential to introduce new sources of emissions not directly associated with the scheme.

Furthermore, any potential concern in terms of air quality, either from traffic or industrial activities, would remain greatly reduced by the town's coastal location. The attendant sea winds and air movements would result in the dispersal of emissions in the town, and as such, air quality in the general study area would remain to be not a significant issue under the Do-Nothing scenario.

Consequently, existing air quality in the vicinity of the study area would remain at ambient levels as currently typical of the area.

7.5.2 Operational Phase

As noted previously, the Proposed Scheme largely consists of 1430m of brick/concrete clad sheet piles or sheet pile core embankments, a new pathway, realignment of a pathway and a floodgate. It would not give rise to operational phase emissions other than those associated with routine maintenance, which is likely to be an infrequent occurrence, and as such would be imperceptible and not significant. On this basis, there would be no predicted operational phase impacts upon sensitive receptors or designated ecological sites that would result in perceptible adverse effects.

As detailed within the Ards Down Area Plan 2015, flooding is a constraint to development adjacent to some of the main rivers within Newcastle and it is envisaged that the flood alleviation scheme would provide the opportunity to release land for development within the Plan period. With respect to the nature of existing development, any future development is likely to be for low density housing, of which the primary sources of emissions are likely to be:

- additional vehicular traffic on public roads, which would have local air quality impacts; and
- greenhouse gas emissions to atmosphere during the operational phase of any housing development.

Nevertheless, considering the areas of land that could be made available for development and associated increases in traffic, it is confidently assumed that any changes in emissions associated with additional vehicular activity on public roads or emissions from new build houses would be imperceptible in terms of exposure to airborne pollutants and would minimise greenhouse gas

emissions as a consequence of up-to-date building regulation standards. Existing air quality in the vicinity of the study area would therefore still largely remain at ambient levels.

There would not be a significant impact on climate as a result of the Proposed Scheme as it has no energy requirements during operation, and thus there would be no emission impacts.

7.5.3 Construction Phase

7.5.3.1 Air Quality

Emissions from the Proposed Scheme would largely be limited to the construction phase, and therefore transient in nature. This would include emissions from vehicles and plant, and dust-raising activities from earthworks and construction processes utilising concrete and aggregates. Dust and air pollution, including odours, can cause disruption to properties and the public adjacent to the construction works, and can also have adverse impacts upon other environmental receptors, including watercourses and ecologically designated sites.

The use of construction plant itself, would result in generation of pollutants in the form of exhaust emissions including, but not limited to, NO_x, carbon monoxide, sulphur dioxide, particulate matter (including PM_{10} and $PM_{2.5}$), volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs). Consequently, during construction works, the levels of these pollutants would increase in the immediate vicinity of the plant during use. There is unlikely to be an impact on the air quality of the area, given the relatively small size and nature of the works proposed. There may be a slight transient impact on local sensitive facilities, such as the play park during the works, however the degree of impact would depend on weather conditions at the time of plant operation. The impact would be greater during dry, windy conditions when dust can travel further.

To assess the risk of dust impacts, firstly the potential dust emission magnitude must be defined followed by the sensitivity of the area. These two factors are combined to determine the risk of dust impacts with no mitigation applied. Every site is different in terms of timing (seasonality), building type (construction materials), duration and scale (area, volume and height), and therefore professional judgement is applied when allocating activities into one of the three potential dust emission magnitude categories.

7.5.3.1.1 Defining the Potential Dust Emission Magnitude

The dust emission magnitude is based on the scale of the anticipated works and should be classified as Small, Medium, or Large, and are summarised in Table 7.4 below.

Table 7.4: Potential Dust Emission Magnitude for the Works

Activity	Dust Emission Magnitude
Demolition	Not Relevant
Earthworks	Small
Construction	Small
Trackout	Small

Demolition: As no demolition would be required, there is no potential for dust emissions from the works in this regard.

Earthworks: The site area would effectively be split by the Shimna River, with the works area to the north of the river encompassing approximately 1380m^2, and the works area to the south encompassing approximately 2500m^2. Heavy machinery on-site is likely to be limited to excavators and piling rigs, the latter of which in particular would have limited movement, focusing on the driving of piles. The potential dust emission magnitude would therefore likely be small as a result of earthworks.

Construction: Other than the formation of earthwork embankments (which are only a small element of the overall flood alleviation project), piles and associated construction material (i.e. cladding, timber, cement) would have low potential for dust release. On this basis, potential dust emission magnitude would likely be small during construction.

Trackout: Factors which determine the dust emission magnitude during trackout are vehicle size, vehicle speed, vehicle numbers, geology and duration. Again, the majority of plant likely to be on-site would be excavators and piling rigs. Furthermore, as the site is very constrained by the river corridor and existing surrounding land uses, the potential for trackout to raise dust emissions would be small.

7.5.3.1.2 Defining the Sensitivity of the Area

The sensitivity of the area takes account of a number of factors, including:

- the specific sensitivities of receptors in the area;
- the proximity and number of those receptors;
- in the case of PM_{10}, the local background concentration; and
- site-specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust.

7.5.3.1.2.1 Sensitivities of People to Dust-Soiling Effects

The type of receptors at different distances from the site boundary or, if known, from the dust-generating activities, should be included. Consideration also should be given to the number of 'human receptors'. Judgement is used to determine the approximate number of receptors (a residential unit is one receptor) within each distance band.

At this stage, it is possible to give an approximate indication of the likely number of dust sensitive receptors that may be disrupted due to construction, as outlined in Table 7.5 below.

Table 7.5: Number of dust sensitive receptors within 200m of the Proposed Scheme

Distance Band	Residential Properties	Sensitive Facilities
0-20	61	Autism Initiatives Day Service
20-50m	25	Islands Park, Newcastle Tennis Club
50-100m	92	-
100-200m	326	Castle Park
TOTAL	**504**	**4**

As detailed within Sub-Section 5.3, the study area centres on the Shimna River which serves as a valuable and diverse area of landscape and ecological importance. The study area forms a locally distinctive landscape within the town and includes the Shimna valley, Tipperary Wood and the river corridors associated with the Tullybrannigan and Burren rivers.

The main existing land uses that surround the riparian corridors of the three rivers are amenity and residential. Islands Park is the predominant land use which is considered a valuable area of active open space and recreation for Newcastle, as designated within the Ards and Down Area Plan 2015. It includes grassed open space areas, children's playground, parking area, toilet block, wildflower meadow, numerous footways (which facilitate long distance walking routes such as the Ulster Way, Mourne Way and the Newcastle Way), pedestrian bridges, footgolf (currently closed), and tennis courts. The walking routes along the river are a valuable tourism asset within the Newcastle area, which forms a hub point for services and hospitality on a range of rambling and walking routes through the Mourne Mountains.

The riparian corridor of the Shimna River and amenity area is backed onto by a number of low density residential areas. These include private residences along Bryansford Avenue, Bryansford Road, River Side Park and more modern housing developments within Shimnamile and Alfred Crescent (located off Bryansford Road).

On this basis, it is reasonable to expect that users within the area currently enjoy a high level of amenity, and that the appearance, aesthetics or value of adjacent properties would be diminished by potential soiling; and people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. As such, the receptors in this area, particularly considering the number which would be within 20m of the scheme, are deemed to be of high sensitivity to dust soiling effects. Those within 50m would be of a medium sensitivity and those beyond of a low sensitivity.

7.5.3.1.2.2 Sensitivities of People to the Health Effects of PM_{10}

For the sensitivity of people to the health effects of PM_{10}, the IAQM recommends that the sensitivity of the receptor is considered in relation to whether it is likely to be exposed to elevated concentrations over a 24-hour period.

Whilst there would be approximately 61 properties less than 20m from the works area, it is considered that at worst they would be of medium sensitivity to the health effects of PM_{10}, as the estimated background pollutant levels of PM_{10} in the Newcastle area would be well below the relevant PM_{10} Air Quality Standard for the protection of human health, so the risk is generally low. With increasing receptor distance from the works, the sensitivity of people to the health effects of PM_{10} would reduce to low.

For the users of Islands Park and Castle Park, the sensitivity would also be low due to the transient nature of human exposure in these areas.

7.5.3.1.2.3 Sensitivities of Receptors to Ecological Effects

Dust deposition due to earthworks, construction and trackout has the potential to affect sensitive habitats and plant communities. Dust can have two types of effect on vegetation: physical and chemical. Direct physical effects include reduced photosynthesis, respiration and transpiration through smothering. Chemical changes to soils or watercourses may lead to a loss of plants or animals, for example via changes in acidity. Indirect effects can include increased susceptibility to stresses such as pathogens and air pollution. These changes are likely to occur only as a result of long-term demolition and construction works adjacent to a sensitive habitat. Often impacts will be reversible once the works are completed, and dust emissions cease.

As shown on **Figure 9.1**, the works area would surround Shimna Area of Special Scientific Interest (ASSI) and Shimna and Trassey Rivers Site of Local Nature Conservation Importance (SLNCI), particularly downstream of the Bryansford Road Bridge. In terms of sensitive vegetation, marginal semi-natural vegetation along the Shimna River is limited, except at its headwater, and is generally confined to a narrow belt of woodland. This woodland is mainly confined to the riverbank and adjacent slopes. The woodland is generally acidic (calcifugous) in type with a variable structure and composition. Some of the commoner trees and shrubs include downy birch, hazel, goat willow and hawthorn. However, in a few locations, impressive mature sessile oak line the river. The field layer is a mixture of bramble and ferns while the ground cover supports carpets of bluebell, wood anemone and greater wood-rush. On this basis, the Shimna ASSI and Shimna and Trassey Rivers SLNCI can be considered of medium sensitivity, as it is a national designation receptor where the features may be affected by dust deposition.

7.5.3.1.3 Risk of Air Quality Impacts

The determined dust emission magnitude is combined with the sensitivity of the area to determine the risk of impacts with no mitigation applied using matrices provided in '*Guidance on the assessment of dust from demolition and construction*' (IAQM, 2014). This is used to determine the level of mitigation that must be applied and is summarised in Table 7.6. For those cases where the risk category is 'negligible', no mitigation measures beyond those required by legislation will be required.

Table 7.6: Summary of Dust Risk to define Site-Specific Mitigation

Source	Dust Soiling	Human Health	Ecology
Demolition	Negligible	Negligible	Negligible
Earthworks	Low	Low	Low
Construction	Low	Low	Low
Trackout	Low	Low	Low

7.5.3.2 Climate

A climate assessment for the construction phase should normally be carried out to identify sources and quantify total greenhouse gas emissions generated from construction activities associated with the Proposed Scheme. In terms of release of greenhouse gases, this assessment aims to identify and assess the sources and describe the measures in place to minimise releases of compounds with global warming potential. Many natural and human activities generate releases that can contribute to

global warming. Due to the diverse and diffusive nature of sources, the effect that the Proposed Scheme might have on global warming cannot be specifically quantified within this assessment, particularly as a Contractor has yet to be appointed and thus the material quantities to be excavated and required for construction to calculate the carbon footprint of the scheme cannot be known at this stage. Nevertheless, it can be confidently assumed that the estimated greenhouse gas emissions from construction of the Proposed Scheme would be negligible in the context of the long-term legally binding framework for emissions reduction, as per the requirements of the Kyoto Protocol.

7.6 Mitigation & Enhancement Measures

7.6.1 Operational Phase

Since there would be no operational phase impacts on air quality/climate as a result of the Proposed Scheme, no operational phase mitigation is proposed.

7.6.2 Construction Phase

As part of the procurement process, the Contactor shall be required to provide a conservative quantification of the carbon balance for construction works using the carbon calculator for construction activities developed by the Environment Agency (EA) in the UK. The carbon calculator calculates the embodied carbon dioxide (CO_2) of materials plus CO_2 associated with their transportation. It also considers personnel travel, site energy use and waste management. As set out below, the Contractor would be required to address the sustainability aspects of his construction practices in this regard.

At present, there are no statutory UK or EU standards for use in the assessment or control of nuisance dust. The emphasis of the regulation and control of demolition and construction dust should therefore be the adoption of good working practices on site.

Good design practice is a process that is informed by impact assessments and is able to avoid the potential for significant adverse environmental effects at the design stage. This approach assumes that mitigation measures beyond those inherent in the proposed designs are identified as being necessary in the impact assessment and would be applied during the works to ensure potential significant adverse effects are minimised. Examples of accepted good site practice include guidelines published by the IAQM (IAQM, 2014) and Considerate Constructors Schemes.

Negative air quality impacts can come from many sources during construction. Mitigation measures (as outlined below) would be required so that construction works are carried out in such a manner that emissions of dust and other pollutants are limited, and that best practicable means are employed to minimise disruption, risks to human health, and to avoid unnecessary impacts on sensitive ecological habitats, such as the Shimna River ASSI and Burren, Shimna and Trassey Rivers SLNCI.

The Contractor would be required to implement measures to minimise the amount of dust and emissions (including odour) produced during the Works. There would be a Duty of Care on the Contractor to ensure that dust-raising activities are located away from sensitive receptors (i.e. the Play Park at Islands Park) as much as feasibly possible and duration kept to a minimum when in proximity to a receptor.

The Contractor shall prepare an Air Quality Management Plan (AQMP) (also referred to as a Dust Minimisation Plan (DMP)) and incorporate the relevant mitigation measures within; reflecting the requirements of best practicable means and level of risk. This shall be included as part of the CEMP.

Regular site inspections shall be undertaken by the Contractor's CEMP-C/Environmental Site Representative to monitor compliance with the AQMP, record inspection results, and make an inspection log available to the relevant authorities/environmental bodies and the Employer's Project Manager when requested.

7.6.2.1 Vehicle and Plant Emissions

Emissions to the atmosphere, in terms of gaseous and particulate pollutants from vehicles and plant used on-site, should be controlled and limited, as far as reasonably practicable, using measures and appropriate control techniques as listed below:

- the engines of all vehicles and plant on-site should not be left running unnecessarily (i.e. idling) to minimise exhaust emissions (and noise);
- vehicles and plant should be low emission, and fitted with catalysts, diesel particulate filters or similar devices;
- Ultra-low sulphur fuels should be used in plant and vehicles;
- plant, equipment and emission control apparatus shall be selected to minimise the engine exhaust emissions, taking into consideration economic constraints and practicability;
- vehicles and plant should be in good working order and certified where applicable, with servicing completed in line with manufacturer's recommendations. Records of servicing should be maintained and visual checks carried out to ensure that black smoke is not emitted at times other than at ignition;
- the use of diesel or petrol-powered generators should be minimised where possible, with battery-powered equipment used as an alternative (where feasible);
- vehicle / plant exhausts should be directed away from the ground to minimise risk of re-suspension of ground dust, where reasonably practicable; and
- maximise energy efficiency, which may include using alternative modes of transport, maximising vehicle utilisation by ensuring full loading and efficient routing.

7.6.2.2 Control of Dust

- The Contractor should take all necessary measures to minimise disturbance caused by dust during construction works. Excavation and earthworks can be a potential source of dust if they are not properly controlled, especially in dry and windy weather and thus should be avoided at these times if practicable.
- Activities which have the potential to generate dust should be subject to a risk assessment, taking into account proximity to sensitive receptors. This will allow appropriate mitigation and management techniques to be implemented.
- Visual inspections should be undertaken regularly when dust-raising activities are occurring. Inspections should take into account prevailing meteorological conditions, and results shall be recorded and maintained. These inspections should take place at least daily, and should determine the effectiveness of the applied mitigation and management techniques.
- Measures to minimise the amount of dust produced might include for example, keeping roads clean, and using covers to minimise dust blow from lorries. Appropriate measures should reflect the nature of the construction activity (type, dust source points, construction operation periods and time of year) as well as ameliorating conditions (such as prevailing wind directions and speeds, typical precipitation and the dampening effect of retained soil moisture). Possible methods of reducing and controlling dust emissions during construction are listed in Table 7.7.

Table 7.7: Possible Dust Control Measures

Activity	Possible Dust Control Methods
Soil handling and storage	• Restrict the duration of the activity. Seal storage mound surfaces as soon as is practicable. • Protect surfaces from winds until disturbed areas are sealed and stable.
Overburden handling	• Protect exposed material from wind (by keeping material within voids or protecting them by topographical features). • Spray exposed surfaces of mounds regularly to maintain surface moisture unless mound surface has formed a crust after rainfall or is

Activity	Possible Dust Control Methods
	grassed. • Minimise handling.
Loading/unloading	• Reduce drop heights wherever practicable. • Protect activities from wind.
Material Storage	• Dampen material. • Protect from wind and store under cover. • Screen material to remove dusty fractions prior to external storage.
Transport by vehicle within and off-site	• Restrict vehicle speed. • Water unsurfaced roads and paved roads. • Wheel or body wash at an appropriate distance from site entrance. This should always be within the site, and the roadway from the washing facility to the highway should be hard-surfaced. • Load and unload in areas protected from wind. • Minimise drop heights. • Sheet or cover loaded vehicles. • Use water sprays/spray curtains to moisten material. • Sweep/wash paved roads. • Use paved roads where practicable.

7.6.2.3 Traffic Management

This section prescribes the mitigation measures necessary for the Contractor to minimise impacts upon construction operatives, the local community, and residents directly affected by the works and associated traffic, travel management and vehicle usage.

Although the direct impact to the existing road network would be minimal due to the scale and location of the works, the Contractor shall be required to establish a traffic management system for:

- planning and controlling the movement of vehicles, plant and non-motorised users that are present within the site, access to and egress from the site and on the adjacent road network;
- ensure that safety of construction operatives, motorised and non-motorised users are not compromised. This shall be achieved by effective implementation of a Traffic Management Plan (TMP) to be prepared and initiated by the Contractor and agreed with the Employer. The TMP shall be included as part of the CEMP. The objective of this plan shall be to: minimise journeys to and from the site by the workforce, sub-contractors, suppliers and anyone else who is likely to visit the site regularly;
- provide protection from traffic hazards that may arise as a result of the construction activities and journeys to and from the site;
- manage potential adverse impacts on the public road network and ensure network performance is maintained at an acceptable level;
- minimise adverse impacts on users (motorised and non-motorised) of the public road network and adjacent properties and community facilities;
- plan deliveries to the site; and
- ensure that the roads and footways at the site access are kept clear of debris, soil and other material.

7.7 Residual Effects

The Proposed Scheme would not give rise to operational phase emissions other than those associated with routine maintenance, which is likely to be an infrequent occurrence, and as such would be imperceptible and not significant. On this basis, there would be no predicted operational phase impacts upon sensitive receptors or designated ecological sites that would result in perceptible adverse effects. Furthermore there would be no significant impact on climate as a result of the

Proposed Scheme as it has no energy requirements during operation, and thus there would be no emission impacts.

In terms of potential air quality impacts during the construction phase, approximately 504 properties would be within 200m of the proposed works. There is potential for nuisance, and health and safety impacts associated with the generation of excessive dust during construction; however, these impacts should be minimised with effective implementation of the Contractor's Dust Minimisation Plan. The contribution of airborne contaminants from site vehicles and plant to local air quality would therefore be largely Negligible, and any effects transient.

8. Cultural Heritage

8.1 Introduction

This section is an assessment of the Cultural Heritage resource within and in the vicinity of the Proposed Scheme. The assessment identifies the archaeological remains, historic buildings and historic landscape. It aims to:

- assess the potential impacts that the scheme may have on cultural heritage features and to determine whether any further assessment / mitigation is required;
- ensure that the Cultural Heritage assessment is tailored to the characteristics of the Proposed Scheme and carried out to the appropriate level of detail; and
- identify, describe and assess the environmental advantages, disadvantages and constraints associated with the Proposed Scheme under consideration.

8.2 Methodology

8.2.1 Data Sources

The Proposed Scheme has the potential to adversely impact local historic environment sites (**Figure 8.1**). To identify the location of sites within or in the vicinity of the Proposed Scheme, a Historic Environment Division (HED) digital GIS dataset was downloaded from the Department for Communities' (DfC) web-page (July 2018):

- World Heritage Sites (no entries within study area);
- Monuments in State Care;
- Scheduled Monuments;
- Listed Buildings;
- Register of Parks, Gardens and Demesnes of Special Historic Interest;
- Archaeological Sites and Monuments on the Sites and Monuments Record of Northern Ireland;
- Areas of Significant Archaeological Interest;
- Battlefield sites;
- Industrial Heritage Record (IHR) sites; and
- Defence Heritage database.

Cartographic sources consulted comprised historic mapping held by the Public Record Office of Northern Ireland (PRONI), Ordnance Survey of Northern Ireland (OSNI) mapping, including historic mapping (**Plates 8.1 - 8.4**), recent topographic mapping and aerial photography.

Information on Conservation Areas was obtained from the Department for Infrastructure's (DfI) Planning Portal.

This culminated in the preparation of a gazetteer of heritage assets (**Appendix 8 – Annex A**).

8.2.2 Study Area and Scope of Assessment

The assessment of archaeological impact considers a study area that typically extends 300m from the flood walls. The proposed locations of the flood walls were subject to a site appraisal. The aims of this site appraisal were to:

- evaluate the archaeological potential of the locations of the proposed flood walls;
- check the condition of visible assets within the Study Area and record any that have not been previously noted; and

- inform decisions about further field survey technique or mitigation to be applied, if necessary.

8.2.3 Impact Assessment Methodology

The significance (heritage value) of a heritage asset is derived from its heritage interest which may be archaeological, architectural, artistic or historic (NPPF Annex 2, Glossary). The significance of a place is defined by the sum of its heritage values. Taking these criteria into account, each identified heritage asset can be assigned a level of significance (heritage value) in accordance with a three-point scale, as set in **Table 8.1**.

Table 8.1: Criteria for determining the significance (heritage value) of heritage assets

Significance (heritage value)	Criteria
High	World Heritage Sites (including nominated sites); Grade A and B+ Listed Buildings; State Care Monuments; Scheduled Monuments (including proposed sites); Historic landscapes of international value, whether designated or not; Extremely well preserved historic landscapes with exceptional coherence, time-depth or other critical factor(s); Undesignated assets of schedulable quality and importance; Assets that can contribute significantly to acknowledged national research agendas.
Medium	Designated or undesignated assets that contribute to regional research objectives; Grade B (including B1 and B2) Listed Buildings; Historic (undesignated) buildings that can be shown to have exceptional qualities in their fabric or historical associations; Conservation Areas; Historic Townscape or built-up areas with important historic integrity in their buildings, or built settings (e.g. including street furniture and other structures); Undesignated historic landscapes that would justify special historic landscape designation, landscapes of regional value; Averagely well-preserved historic landscapes with average or reasonable coherence, time-depth or other critical factor(s).
Low	Non-designated heritage assets of a local resource value as identified through consultation; Non-designated heritage assets whose heritage values are compromised by poor preservation or damaged so that too little remains to justify inclusion into a higher grade; Buildings / structures that appear on the Industrial Heritage Record; Buildings that have been de-listed but retain historic interest.

Source: NPPF 6 Annex 2 (2012)

Having identified the significance of the heritage asset, the next stage in the assessment is to identify the level and degree of impact to an asset arising from the development. Impacts may arise during construction or operation and can be temporary or permanent. Impacts can occur to the physical fabric of the asset or affect its setting.

When professional judgement is considered, some sites may not fit into the specified category in this table. Each heritage asset is assessed on an individual basis and takes into account regional variations and individual qualities of sites.

The level and degree of impact (impact rating) is assigned with reference to a four-point scale as set out in Table 8.2. In respect of cultural heritage, an assessment of the level and degree of impact is made in consideration of any scheme design mitigation (embedded mitigation).

Table 8.2: Criteria for determining the magnitude of impact on heritage assets

Magnitude of Impact	Description of Impact
High	Change such that the significance of the asset is totally altered or destroyed. Comprehensive change to setting affecting significance, resulting in a serious loss in our ability to understand and appreciate the asset.
Medium	Change such that the significance of the asset is affected. Noticeably different change to setting affecting significance, resulting in erosion in our ability to understand and appreciate the asset.
Low	Change such that the significance of the asset is slightly affected. Slight change to setting affecting significance resulting in a change in our ability to understand and appreciate the asset.
Minimal	Changes to the asset that hardly affect significance. Minimal change to the setting of an asset that have little effect on significance resulting in no real change in our ability to understand and appreciate the asset.

Source: NPPF 6 Annex 2 (2012)

An assessment of the level of significant effect, having taken into consideration any embedded mitigation, is determined by cross-referencing between the significance (heritage value) of the asset (Table 8.1) and the magnitude of impact (Table 8.2). The resultant level of significant effect (Table 8.3) can be negligible, adverse or beneficial.

Table 8.3: Criteria for determining the significance of effect

Significance (heritage value)	Magnitude of Impact			
	High	Medium	Low	Minimal
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Minor
Low	Moderate	Minor	Minor	Negligible

Source: NPPF 6 Annex 2 (2012)

The ES reports on the significance of effect in accordance with EIA regulations. Effects of major or moderate significance are considered to be significant. An assessment of the predicted significance of effect is made both prior to the implementation of mitigation and after the implementation of mitigation to identify residual effects. This first highlights where mitigation may be appropriate and then demonstrates the effectiveness of mitigation and provides the framework for the assessment of significance which takes mitigation measures into consideration.

8.3 Regulatory & Policy Framework

The following guidelines, legislation and planning policies provide the framework for the protection and conservation of cultural heritage assets in Northern Ireland.

8.3.1 Legislative Context

- Protection of Wrecks Act 1973;
- The Historic Churches (Northern Ireland) Order 1985;
- The Nature Conservation and Amenity Lands (Northern Ireland) Order 1985;
- Planning (Northern Ireland) Order 1991;
- Historic Monuments and Archaeological Objects (Northern Ireland) Order 1995;
- Treasure Act 1996;
- The Historic Monuments (Class Consents) Order (Northern Ireland) 2001; and

- Planning Act (Northern Ireland) 2011. http://www.legislation.gov.uk/nia/2011/25/contents

8.3.2 Planning Policy

- Planning Service (1999) Development Control Advice Note 10;
- DOENI (1999/2011) Planning Policy Statement 6: Planning Archaeology and the Built Heritage;
- DRD (2010) Regional Development Strategy 2035;
- DOENI (2013) Planning Policy Statement 2: Natural Heritage;
- DOENI (2013) Banbridge/Newry and Mourne Area Plan 2015;
- DOENI (2014) Planning Policy Statement 23: Enabling Development for the Conservation of Significant Places; and
- DOENI (2015) Strategic Planning Policy Statement for Northern Ireland: Planning for Sustainable Development.

8.3.2.1 Archaeological Sites and Monuments

8.3.2.1.1 Scheduled and State Care Monuments

Archaeological sites and monuments may be in State Care or Scheduled for protection under Article 3 of the Historic Monuments and Archaeological Objects (NI) Order 1995. Once a site or monument has been scheduled, it benefits from statutory protection. Under Article 4, Scheduled Monument Consent (SMC) must be obtained prior to any works affecting scheduled monuments, including archaeological investigations.

State Care monuments are managed by the Department for Communities (DfC) - Historic Environment Division (HED) (formerly NIEA) under The Historic Monuments and Archaeological Objects (Northern Ireland) Order 1995. The DfC - HED controls and manages works to monuments in their guardianship and prior permission to undertake works on or affecting State Care monuments must be obtained.

PPS 6 Policy BH 1 (The Preservation of Archaeological Remains of Regional Importance and their Settings) states that *"The Department will operate a presumption in favour of the physical preservation in situ of archaeological remains of regional importance and their settings. These comprise monuments in State Care, scheduled monuments and other important sites and monuments which would merit scheduling. Development which would adversely affect such sites of regional importance or the integrity of their settings will not be permitted unless there are exceptional circumstances."*

8.3.1.1.1 Archaeological Sites and Monuments

Archaeological sites identified in the Northern Ireland Sites and Monuments Record (NISMR) are defined as a site of archaeological interest in the Planning (General Development) Order (NI) 1993.

PPS 6 notes that Archaeological Sites and Monuments add meaning to our natural environment and are a limited, finite and non-renewable resource, in many cases highly fragile and vulnerable to damage and destruction. *"They can contain irreplaceable information about our past and the potential for an increase in future knowledge, which, once destroyed, cannot be replaced. They are part of our sense of place and are valuable both for their own sake and for their role in education, leisure and tourism"* (PPS 6, 3.2). *"In all cases the desirability of preserving an archaeological site or monument and its setting, whether scheduled or otherwise, is a material consideration in determining planning applications"* (PPS 6, 3.3).

According to PPS 6 Policy BH 2 (The Protection of Archaeological Remains of Local Importance and their Settings), *"Development proposals which would adversely affect archaeological sites or monuments which are of local importance or their settings will only be permitted where the Department considers the importance of the proposed development or other material considerations outweigh the value of the remains in question."*

"On many occasions it will be possible to avoid conflicts with archaeological interests, particularly through seeking suitable alternative sites for development. However where it is decided that

development may proceed, this will be conditional on appropriate archaeological mitigation measures" (described in Policy BH 4).

According to PPS 6 Policy BH 3 (Archaeological Assessment and Evaluation), *"Where the impact of a development proposal on important archaeological remains is unclear, or the relative importance of such remains is uncertain, the Department will normally require developers to provide further information in the form of an archaeological assessment or an archaeological evaluation. Where such information is requested but not made available the Department will normally refuse planning permission."*

PPS 6 Policy BH 4 (Archaeological Mitigation) notes that *"Where it is decided to grant planning permission for development which will affect sites known to contain archaeological remains, the Department will impose conditions to ensure that appropriate measures are taken for the identification and mitigation of the archaeological impacts of the development, including where appropriate the completion of a licensed excavation and recording of remains before development commences."* Mitigation may require design alterations to development schemes (PPS 6, 3.15) and *"The excavation recording of remains is regarded by the Department as a second best option to their physical preservation. The preservation in situ of important archaeological remains is … always to be preferred"* (PPS 6, 3.16).

The discovery of archaeological remains, which have not been previously known, may therefore represent a material change which can affect the nature of development which will be permitted (PPS 6, 3.20).

8.3.2.1.3 Areas of Significant Archaeological Interest

Development plans, where appropriate, designate Areas of Significant Archaeological Interest (ASAIs), and highlight areas of archaeological potential within the historic cores of towns and villages where it is likely that archaeological remains will be encountered in the course of continuing development and change (PPS 6, 2.1-2.7).

8.3.2.1.4 Shipwrecks and Marine Archaeology

There is one shipwreck in Northern Ireland, La Girona (off Lacada Point, County Antrim) which is protected under the Protection of Wrecks Act 1973.

8.3.2.1.5 Built Heritage

Listed buildings are protected under the Planning (Northern Ireland) Order 1991. Article 42 of the Order places a statutory duty on the Historic Environment Division (HED) to compile a list of structures of special architectural and historical interest. The list is based on the results of two surveys; the First Survey began in the early 1970s and was completed in 1994, whilst the Second Survey was begun in 1997 and is still in progress.

Following designation, the agency has *"a special regard to the desirability of preserving a building or its setting or any features of special architectural or historic interest which it possesses"* (Article 45). The protection of structures designated under the Order is expanded on in PPS6. Paragraph 6.4 states that the agency *"will require full information to accompany all applications to enable assessment of the likely impact of proposals on the special architectural or historic interest of the building and its setting"*. Annex C (revised March 2011) presents criteria for listing, set out below:

Grade A
Buildings of greatest importance to Northern Ireland, including both outstanding architectural set-pieces and the least altered examples of each representative style, period and type.

Grade B+
High quality buildings that because of exceptional features, interiors or environmental qualities are clearly above the general standard set by grade B1 buildings. Also buildings which might have merited Grade A status but for detracting features such as an incomplete design, lower quality additions or alterations.

Grade B1
Good examples of a particular period or style. A degree of alteration or imperfection of design may be acceptable. Generally B1 is chosen for buildings that qualify for listing by virtue of a relatively

wide selection of attributes. Usually these will include interior features or where one or more features are of exceptional quality and/or interest.

Grade B2
Special buildings which meet the test of the legislation. A degree of alteration or imperfection of design may be acceptable. B2 is chosen for buildings that qualify for listing by virtue of only a few attributes. An example would be a building sited within a conservation area where the quality of its architectural appearance or interior raises it appreciably above the general standard of buildings within the conservation area.

Source: PPS 6 Annex C (2011)

8.3.2.1.6 Industrial Heritage

Industrial heritage features include the remains of corn, flax and beetling mills, cotton and linen mills and other manufacturing industries, and associated workers' accommodation. The historic pattern of roads, railways and canals and historic utilities networks also form an important part of the industrial heritage (PPS 6, 8.1-8.2). The Department is responsible for identifying and protecting buildings and other industrial heritage features; many important features are already subject to existing protection measures as archaeological sites or monuments, or as listed buildings (PPS 6, 8.3).

8.3.2.1.7 Historic Landscape

The register of parks, gardens and demesnes of special historic interest in Northern Ireland is maintained by the HED (PPS 6, 2.17). Conservation areas are designated following Article 50 of the Planning (NI) Order 1991 (PPS 6, 2.18-2.19).

The effect of proposed development on a park, garden or demesne, or its setting included in the register, is a material consideration in the determination of planning and / or listed building consent applications and appeals.

PPS 6 Policy BH 6 (The Protection of Parks, Gardens and Demesnes of Special Historic Interest) states that *"The Department will not normally permit development which would lead to the loss of, or cause harm to, the character, principal components or setting of parks, gardens and demesnes of special historic interest. Where planning permission is granted this will normally be conditional on the recording of any features of interest which will be lost before development commences."*

"Where a decision is taken to permit development which would result in the loss of any distinctive features of parks, gardens and demesnes, the Department will normally require developers to carry out recording, working to a brief prepared by the Department, so that knowledge of this part of our landscape heritage is not entirely lost" (PPS 6, 5.5).

Some sites and monuments located within or adjoining settlements may be designated as Local Landscape Policy Areas (LLPAs). Local Landscape Policy Areas comprise features and areas within and adjoining settlements considered to be of greatest amenity value, landscape quality or local significance and therefore worthy of protection from undesirable or damaging development. These LLPAs are identified in the process of Countryside Assessment and are designated and maintained through development plans (PPS 6, 2.23-2.24).

These environmental assets may include archaeological sites and monuments and their surroundings; listed and other locally important buildings and their surroundings; river banks and shore lines and associated public access; attractive vistas, localised hills and other areas of local amenity importance; areas of local nature conservation interest, including areas of woodland and important tree groups.

Trees can be protected through Tree Preservation Orders (TPO) under the Planning (Trees) Regulations (Northern Ireland) 2003 and the Planning (Amendment) (Northern Ireland) Order 2003. A TPO provides protection for trees considered to be of special value in terms of amenity, history or rarity. It makes it an offence to cut down, top, lop, uproot or wilfully damage or destroy a protected tree, or to permit these actions, without first seeking the Department's consent to do so.

8.3.2.2 Regional and Local Planning Policy

8.3.2.2.1 Banbridge/Newry and Mourne Area Plan 2015

The Banbridge/Newry and Mourne Area Plan (BNMAP) 2015 Strategic Plan Framework (DoE 2013) notes that a *"major thrust of this strategy is to promote more sustainable patterns of development based on … the sensible and sensitive use of the built heritage and the rural environment"*. Plan objectives include *"conserving, sustaining and enhancing the area's environmental qualities, local distinctiveness and sites of environmental importance in terms of landscape character and diversity, wildlife and habitats, townscape and archaeology"*.

The Strategic Plan Framework notes *"Evidence of past human activity within the Plan Area is illustrated by archaeological sites and monuments, vernacular and historic buildings, features and structures surviving from past industries, planned parkland landscapes and in the pattern of streets and buildings in our historic townscapes. There is also a particular maritime element in the local heritage of coastal areas. This heritage is finite and vulnerable and it is important that it be cherished and protected for future generations to enjoy as we do"*.

Policy CVN 2 – Areas of Significant Archaeological Interest notes: *"Within designated Areas of Significant Archaeological Interest, planning permission will not be granted for proposals for large scale development, unless it can be demonstrated that there will be no significant impact on the character and appearance of this distinctive historic landscape"*.

Strategic Northern Ireland Tourist Board plans in the area include *"The Saint Patrick and Christian Heritage Project, plans to capitalise on the strength of the Christian Heritage product by concentrating on Armagh and Downpatrick and linking them through a high quality touring trail that will include Newry City and Dromore. The Mournes Signature Project aims to take advantage of the potential designation of the area as a National Park and the tourism benefits it may bring"*.

8.3.3.2.2 Regional Development Strategy 2035

The Regional Development Strategy 2035 (DRD, 2010) notes that "*The Region has a rich and diverse built heritage which contributes to our sense of place and history. It is a key tourism and recreational asset and sustainable management of the built heritage makes a valuable contribution to the environment, economy and society. The built heritage embraces many sites of local and international interest which once lost cannot be fully replaced*.

- *Identify, protect and conserve the built heritage, including archaeological sites and monuments and historic buildings. Northern Ireland's archaeological sites and monuments provide a tangible link to the distant past, as well as more modern remains. For example, the suite of historic monuments in State Care in the Region ranges from the earliest known dwelling-sites and burial monuments through to twentieth-century fortifications. New discoveries are made every year that contribute to our understanding of the past and its place in the future landscape. Continuing work to identify these built heritage assets, on land, along the coast and within coastal waters helps inform future decisions about development and land-use change.*
- *Identify, protect and conserve the character and built heritage assets within cities, towns and villages. Historic buildings and monuments are key elements of our historic townscape, Conservation Areas, key civic and publicly-accessible buildings, as well as everyday dwellings and shops. If these assets are recognised and managed they can make a positive contribution to regeneration. This will allow the maintenance of craft skills, and the development of a sense of place that can be respected by future development.*
- *Maintain the integrity of built heritage assets, including historic landscapes. Historic sites, buildings and landscapes do not exist in isolation. Their appropriate management and wider integration with their surroundings will help contribute to local character, and ensure that these assets continue to make a valuable contribution to our tourism economy."*

8.3.2.2.3 Areas of Outstanding Natural Beauty (AONBs)

The area of the scheme is located within the Mourne Area of Outstanding Natural Beauty (AONB). The AONB Management Plan (NIEA, 2010) sets out what makes the area special and what the various interested parties see as important to maintaining and enhancing those qualities.

8.3.2.2.4 Standards and Guidance

- Department for Communities and Local Government (2012) National Planning Policy Framework;

- Chartered Institute for Archaeologists, Code of Conduct and Standards (2014) and Guidance for Historic Environment Desk-based Assessment (2017); and
- Department for Communities (2018) Historic Environment Division Guidance on Setting and the Historic Environment.

8.4 Baseline Conditions

8.4.1 Archaeological Sites and Monuments

There is one archaeological site noted on the NISMR within the 300m study area with another site just outside this area (**Figure 8.1**). The asset within the study area is a castle (DOW 049:004). This castle (DOW 049:004) was located at the mouth of the Shimna River. Harris (1744) reported that the castle was built for Felix Magennis and had a date stone of 1588 set above the door. 'Newcastle', however, was referenced in the Annals of the Four Masters in 1433, suggesting that a castle was in existence at this time. It is likely that the 1588 castle replaced this earlier structure (A.S.C.D. 1966).

Harris (1744) described the castle as a house set in a well improved demesne owned by Edward Matthews. It was formerly owned by Magennis, Lord Iveagh but was forfeited in the Rebellion of 1641 and granted to Robert Hawkins who was the grandfather of Robert Hawkins Magill. Magill passed the estate onto Matthews who modernised the castle into a commodious dwelling. The castle later passed into the hands of the Annesley Family who rented it to the Board of Customs for the accommodation of revenue officers. It was pulled down by the Earl of Annesley in 1830 with the Annesley Arms Hotel built in its place.

There are no longer any visible traces of the castle, though several sketches and paintings exist which allow an interpretation. It appeared to consist of a square tower with a machicolation at roof level in the centre of one face but not directly above the door shown (A.S.C.D. 1966). The castle was previously included with others with Scottish style corbelled turrets based on a misinterpretation of one drawing (U.J.A. 1951). However, no Scottish features are apparent in other drawings.

DfC HED has defined an area of archaeological potential associated with the castle (**Figure 8.1**). This incorporates the area of Main Street / Central Promenade where the castle stood, as well as the area to the foreshore to the east and immediately east of Castle Bridge incorporating the river.

The archaeological site just outside the study area is a rath (DOW 049:007) adjacent to the Newcastle to Bryansford road. This rath is an impressive site located on the west edge of a valley on ground that slopes downhill to the west. Known as St Cillan's Fort, this largely overgrown monument is enclosed by a large earthen bank measuring 48m north to south, by 52m east to west. The bank is 2m above the interior, 9m wide and 3.5m above the exterior ditch which is 4m wide by 2m deep. This ditch encloses the site from south to west to north-west, but is absent elsewhere. There is a possible entrance ramp at the north-west. A sewer has been dug in the base of the ditch and this has been covered with hard core. The edges of the ditch were damaged during the laying of the sewer.

A visit was made in 1954 by W.A. Seaby when less vegetation was present on the monument. He noted that bank had been bonded on the east and south-east sides by a drystone wall possibly erected when the adjacent house was built during the mid-19th century. Seaby noted two recesses in the drystone wall, each approximately five feet high. One is half rectangular in plan with the other semi-circular. Each recess has a low stone seat around the wall inside and show roofing with large flat stones. Seaby speculated that one of these recesses could be the blocked end of a souterrain formed inside the bank of the rath.

The name Cillan is first noted in 12th century sources in association with a *Rathsillan in Achadhcail* which was located in the territory of Lecale on the bank of the estuary of Dundrum. Cillan was the brother of St Domongart (Donard) who had a church at the monastery site of Maghera which is now the church of St. Donard, the parish church in Newcastle. The location of Rathsillan was unknown until the early 19th century when the name 'St Cillan's Fort' was discovered in local tradition. The identification of the site as Rathsillan, added to the good preservation of the monument, has led DfC-HED to schedule the monument for protection.

No previous archaeological work has been carried out in relation to the rath (DOW 049:007) though two investigations have taken place in relation to development work within the vicinity. The first of

these took place in 2003 and involved the archaeological monitoring of topsoil stripping at a housing development, approximately 50m to the north-east of the rath under licence AE/03/35 (ADS, 2003). The monitoring uncovered a spread of black sticky clay containing burnt stone. This material possibly related to a burnt mound which is a type of site normally associated with the Bronze Age. The spread was 11m long by 5m wide and no more than 0.12m deep. The material appeared to be mixed with old topsoil / ploughsoil which produced post-medieval pottery. No other archaeological features or artefacts were uncovered during the archaeological monitoring of this part of the housing development.

Further archaeological work associated with the housing development was carried out in August 2003 when the south-east corner of the development site was topsoil stripped under archaeological supervision under licence AE/03/63. Nothing of archaeological significance was uncovered.

8.4.2 Historic Buildings

There is one Historic Building located within the study area according to the NISMR. This is Curraghard Lodge (HB 18/13/038) located at 109 Tullybrannigan Road (**Figure 8.1**). It consists of a largely single-storey Regency-style hipped-roof villa with return wings and a gabled entrance porch. The house was constructed between 1835 and 1840, while a storey was added to one of the wings in the 1930s. There is a collection of hipped-roof outbuildings including a small store for game to the rear of the property.

Curraghard Lodge is considered of architectural interest in terms of style, proportion, ornamentation, quality and survival of interior and setting. It is considered of local interest and has been listed grade B1.

Examination of the building at this location during the site walkover revealed a structure that did not match the description given for the villa. Instead, the building at the location is a modern dwelling contemporary with the surrounding housing development. Cartographic sources show Curraghard Lodge actually to be located some distance to the west of Newcastle and well outside the study area.

8.4.3 Industrial Heritage

There are three sites noted on the Industrial Heritage Record within the study area (**Figure 8.1**). The first of these is the New Bridge (IHR 03558:000:00) which carries the Bryansford Road over the Shimna River. The bridge was first shown on the Ordnance Survey Second Edition map sheet (1862) with steps marked at the location on the previous Ordnance Survey First Edition map sheet (1834). It is marked on all subsequent Ordnance Survey map editions.

The second is another bridge (IHR 03560:000:00) which carries the Shimna Road over the Shimna River. The road was constructed during the first half of the 20th century with the bridge marked on the Ordnance Survey Fourth Edition map sheet (1938) onwards.

The last industrial heritage site is also a bridge (IHR 03570:000:00) which carries Bryansford Avenue over the Burren River. It is known as Hagan's Bridge and was marked on all Ordnance Survey map editions from 1834 onwards.

8.4.4 Battles

One battle site is noted within the study area (**Figure 8.1**). This is the battle of Newcastle which took place in 1642 during the Irish rebellion and centred on the former location of the castle (DOW 049:006). The castle was owned by the Magennis Family who were part of the rebellion against the English Crown. The castle was besieged by Crown forces under Sir James Montgomery. The siege was successful with Montgomery capturing the castle from the defending Irish garrison. The NISMR has defined an area within Newcastle relating to the battle. This is centred on the castle and extends for a radius of 150m around it. The majority of the battle site is located outside the study area.

8.4.5 Previous Archaeological Excavations

An examination of the online summary accounts of archaeological excavations in Ireland (excavations.ie) was carried out for evidence of previous archaeological work within the study area

townlands of Tollymore and Ballaghbeg. This revealed that previous work has been carried out on three occasions within the townland of Tollymore, while no previous work has been carried out in Ballaghbeg.

The first two archaeological investigations took place in 2003 in relation to the monitoring of groundworks associated with a commercial housing development. These have already been discussed in relation to the archaeological monument St Cillan's Fort (DOW 049:007) in Section 8.4.1.

The last archaeological investigation took place in 2011 and related to a development on the Castlewellan Road (Nicol, 2011). This investigation took the form of mechanically excavated trenches dug across the site under archaeological supervision. Nothing of archaeological interest was uncovered within these trenches.

All of these archaeological investigations took place well outside the immediate study area.

8.4.6 Historic Background and Cartographic Evidence

There is possibly some evidence for activity within the study area during the Bronze Age (2500BC-600BC) in the form of burnt mound material which was uncovered during archaeological monitoring of construction works to the north-east of the rath, St Cillan's Fort (DOW 049:007). This rath is evidence of activity within the area during the Early Medieval period (450AD-1150AD).

There was a settlement at Newcastle during the 16th century and evidence of this is the castle (DOW 049:004) which was built in 1588. However, the Annals of the Four Masters reference a New castle at the site in 1433 which suggests that the area of the current town was occupied at least 250 years before the Magennis castle, and it was this earlier fortification that the town is named after. Historical mapping from this period consulted at the Public Record Office of Northern Ireland (PRONI) does not show the castle or settlement, though these would have been in existence.

The Magennis Family held the castle and surrounding lands during the first half of the 17th century. This was a period of change following the Nine Years War and subsequent flight of the Earls. Ulster's economy was developing and this included Newcastle. The Ulster Port Books 1612-1615 make no mention of Newcastle as a trading port (Scott, 2012). However, in 1625 William Pitt was appointed as Custom of the ports of Dundrum, Killough, Portaferry, Donaghadee, Bangor and Hollywood and Newcastle.

As noted in sections 8.4.1 and 8.4.4, the Magennis Family forfeited the castle and surrounding lands after taking part in the rebellion of 1641, with these being granted to Robert Hawkins. The Hawkins Family passed the castle and lands to the Matthews family who were in residence when Walter Harris visited in 1744. Harris (1744) notes that fishing was plentiful along the coast with salmon and sand eels, while Slieve Donard offered good opportunities for game. He does not describe the surrounding settlement of Newcastle, though does note that the castle has been modified into a large house and had associated outbuildings and a Brewhouse. The map (PRONI Ref: T2158) accompanying Harris' book marks Newcastle, though the scale is too large for any detail to be shown.

Other mapping from this period consulted at PRONI focussed on the estate of the Earl of Clanbrassil at Tollymore to the north-west, rather than Newcastle. The Annesley Family owned the area by the early 19th century by which time the castle was rented by the Board of Customs for the accommodation of revenue officers. The presence of the revenue officers shows the importance of trade along this part of the coast. Newcastle would have been a small fishing port at this time, though Earl Annesley had plans to change this.

The Ordnance Survey First Edition map sheet (1834) shows the area towards the middle of the 19th century (Plate 8.1). The immediate area is undeveloped and dominated by the courses of the Shimna and Tullybrannigan Rivers. The Bryansford Road runs north-west through the area of the scheme. The New Bridge (IHR 02558:000:00) is not extant and steps are marked where the road crosses the river. The area around the steps is shown as marginal ground. Tullybrannigan Bridge (IHR 02558:000:00) is shown to the south carrying the Bryansford Road over that river.

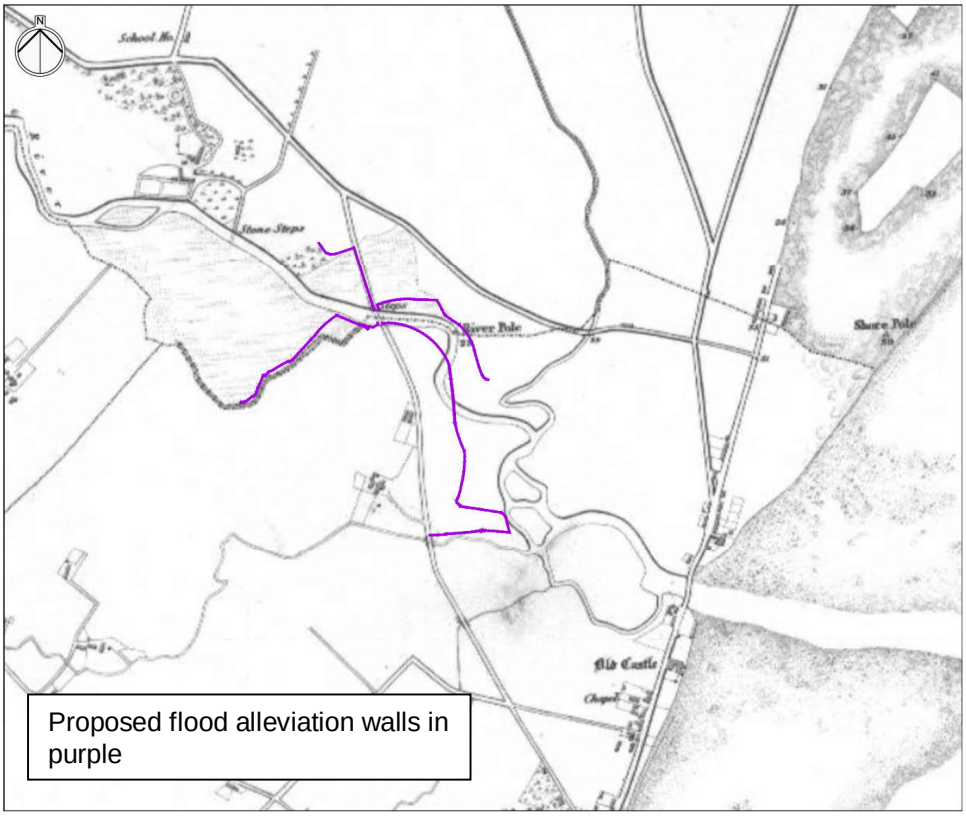


Plate 8.1: Ordnance Survey First Edition map sheet (1834) (https://apps.spatialni.gov.uk)

The immediate study area was clearly located well outside the settlement of Newcastle at this time. This, including the port, is shown much further to the south situated close to Earl Annesley's Donard Lodge. The castle (DOW 049:004) is shown as a rectangular building with an annex to the rear labelled *Old Castle.* It should be noted that the castle was located on the east (seaward) side of Main Street and to the south-east of the location given on the NISMR. The castle would have been pulled down shortly after this map was completed and replaced by the Annesley Arms Hotel.

Lewis (1837) records that Newcastle had been gradually increasing in importance from a fishing village since 1822. A new pier had been built at a cost of £30,000 which facilitated the export of barley, potatoes and oats, along with granite from quarries on Slieve Donard. In addition to trade, Earl Annesley had been developing Newcastle as a fashionable tourist destination for sea bathing. The town main street was now nearly a mile long and included several large, handsome private dwelling houses, as well as numerous lodging houses.

Many of the maps and plans in PRONI relating to Newcastle from this time are concerned with potential development as a tourist destination and do not relate to the immediate study area. The Ordnance Survey Second Edition map sheet (1862) shows the immediate study area during the middle of the 19th century (Plate 8.2). It is better defined with boundaries now shown and New Bridge (IHR 02558:000:00) was now extant and the area to the north is shown as densely planted, though now part of the grounds associated with Tollymore House to the north-west, while to the west of the bridge is still shown as marginal ground. The immediate study area was still largely undeveloped and evidently outside the main settlement of Newcastle. It should be noted that there is no sign of the Historic Building Curraghard Lodge (HB 18/13/038) which would have been extant at this time. This further suggests that the location of this asset has been misplaced by the NISMR.

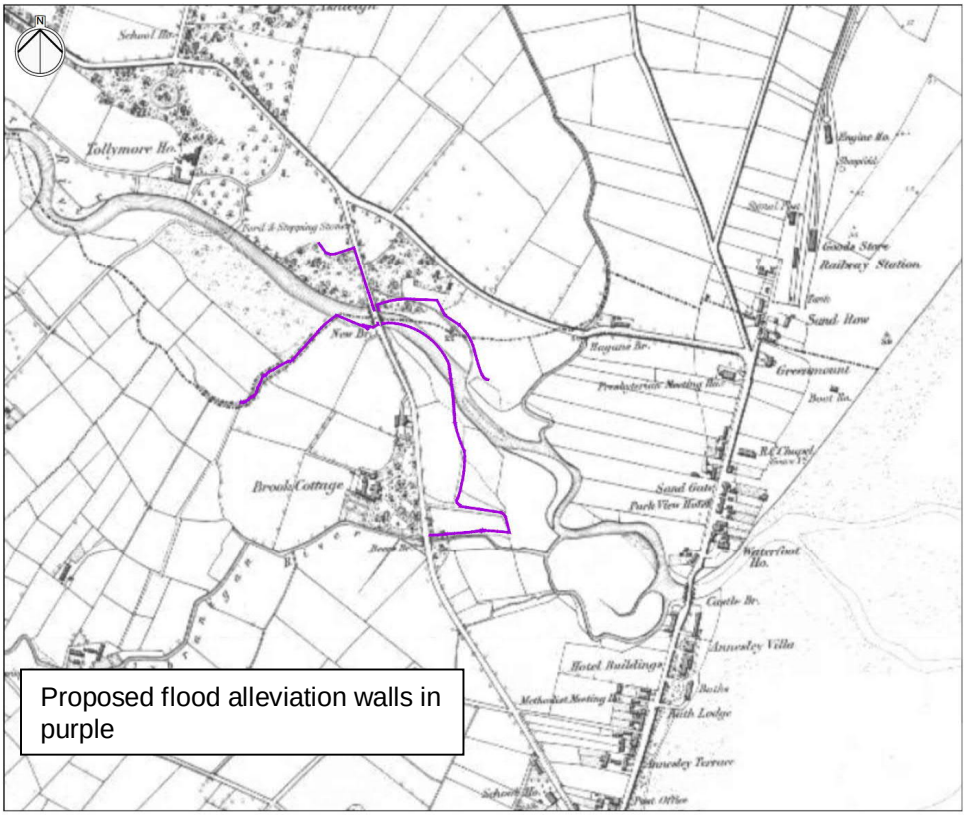


Plate 8.2: Ordnance Survey second edition map sheet (1862) (https://apps.spatialni.gov.uk)

The settlement of Newcastle has expanded greatly with housing, hotels and public buildings now running north past the Annesley Arms Hotel, while a railway terminus has been created at the northern extent of the town.

The Ordnance Survey Fourth Edition map sheet (1938) shows the immediate study area towards the middle of the 20th century (Plate 8.3). It is still largely undeveloped and dominated by the Shimna and Tullybrannigan rivers. It is better defined on this map edition and the terrain around the rivers is shown as marginal and wet. This includes the area where the NISMR places the Historic Building Curraghard Lodge (HB 18/13/038) and there are no signs of the building at this location. The ground to the north-west of New Bridge (IHR 2558:000:00) is still marked as densely vegetated and now associated with a new residence Shimna House.

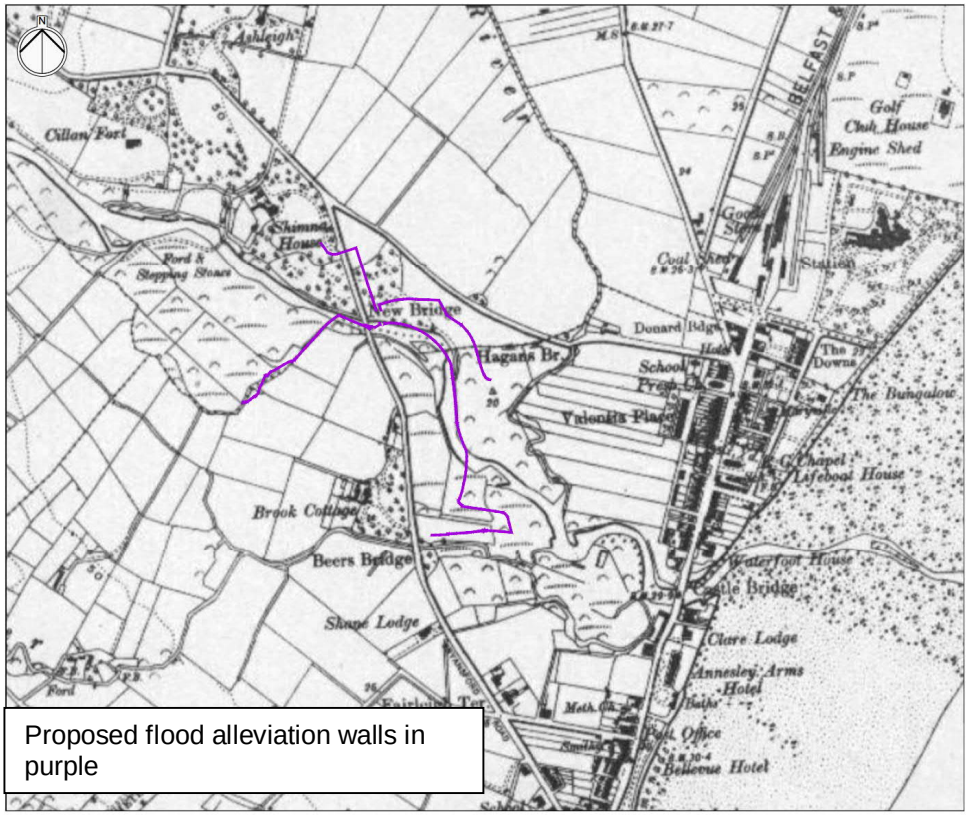


Plate 8.3: Ordnance Survey Fourth Edition map sheet (1938) (https://apps.spatialni.gov.uk)

The town of Newcastle is still focussed on either side of the Main Street and appears as a very linear settlement hugging the shoreline. Any development appears to be along the Main Street with little change inland. The north of the town is now dominated by golf links with the Slieve Donard hotel immediately to the south, reinforcing the town's now dominant role as a tourist destination.

By the Ordnance Survey Fifth Edition map sheet (1919 – 1963), the environs of Newcastle have begun to encroach on the immediate study area (Plate 8.4). The area to the south of the Tullybrannigan River is marked as Castle Park Miniature Golf Course, while the area to the north of the river is identified as *Glen Isle.* The area to the immediate north of the Shimna River is identified as *Castle Park.* The northern extent of the immediate study area still consists of heavily vegetated ground associated with Shimna House and marginal ground to the south-west across the Shimna River.

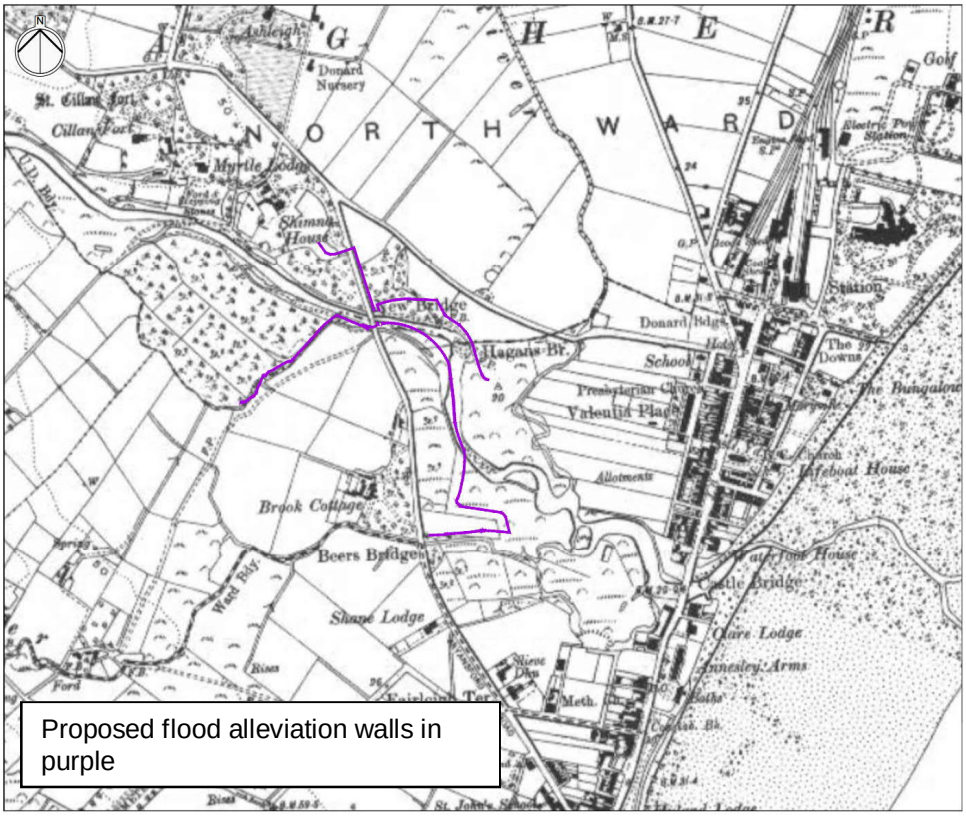


Plate 8.4: Ordnance Survey Fifth Edition map sheet (1919 – 1963) (https://apps.spatialni.gov.uk)

The OSNI 1:10,000 Metric Scale Irish Grid map sheet (1952 – 1969) shows the immediate study area approximately 50 years ago (map not reproduced). The urban expansion of Newcastle now extends along the Bryansford Road, Bryansford Avenue and Shimna Road with the result that the immediate study area is now surrounded by housing. Miniature golf courses now occupy the areas north and south of the Tullybrannigan River, while the area to the north of the Shimna River is now marked as picnic areas with a path running around the outer edge of the open area. The ground to the west of the Shimna River is still largely open ground and a group of small structures are now extant at Glen Isle. There is no sign of the Historic Building Curraghard Lodge (HB18/13/038) which should have been located to the north of this. The northern part of the immediate study area is still covered in dense vegetation.

8.4.7 Site Walkover

An initial site walkover was carried out along the line of each proposed flood wall, where accessible, to verify the results of the desk-based study and to assess the scheme area for previously unrecorded heritage assets which could be impacted should the scheme progress. Designated Cultural Heritage assets discussed in the baseline study were also examined to assess potential impact upon their settings.

To the south, the scheme would start on the Tullybrannigan Road with a section of flood wall running along the north bank of the Tullybrannigan River (Plate 8.5). This bank is densely vegetated. The surrounding area is still used for leisure activity as noted on the historic cartographic sources and is currently known as Islands Park. The terrain on both sides of the Tullybrannigan River within the park is level and well maintained. It was previously a mini-golf range with evidence of this being sand pits, small fairways and teeing-off locations (Plate 8.6). Construction of this mini-golf range will have required ground disturbance in the form of landscaping and drainage.

Plate 8.5: North bank of the Tullybrannigan River

Plate 8.6: Former mini-golf range

The flood wall would continue north, following the western boundary of Islands Park before joining the west bank of the Shimna River. This area consists of a narrow strip of land between the river and the rear of the Shimna Mile Housing development (Plate 8.7). This area is also heavily vegetated and was not accessible. Several fish weirs formed from rows of boulders are present within this stretch of river (Plate 8.8). The NISMR notes the designated heritage asset Curraghard Lodge (HB 18/13/038) approximately 32m west of this location. This building is described as a single-storey Regency-style hipped-roof villa with return wings and a gabled entrance porch. The building at this location is set within the modern housing development Shimna Mile (Plate 8.9). It does not match the description given and appears to be a new construction, contemporary with the surrounding development.

Plate 8.7: Section of river adjacent to Shimna Mile Housing Development

Plate 8.8: Fish weir within the Shimna River

Plate 8.9: Modern dwelling at location given for Curraghard Lodge (HB 18/13/038)

A further section of flood wall would commence to the north-east of the Shimna River, adjacent to a children's playpark (Plate 8.10). As part of the park, this area is largely grassed though a path and trees are present. Both sections of wall would continue north-west to the New Bridge (IHR 03558:000:00) where they would be tied into the bridge using clad sheet piles (Plate 8.11). This clad would match the existing parapet stone and would effectively extend the parapet a slight distance.

Plate 8.10: Section of scheme adjacent to children's playpark

Plate 8.11: The New Bridge (IHR 03558:000:00)

From the New Bridge (IHR 03558:000:00), the flood walls would split running north-west and south-west. The section to the south-west runs from the New Bridge along an existing pathway for approximately 68m before turning south-west to follow the boundary between Tipperary Wood with Riverside Park (Plate 8.12). This area is heavily vegetated with mature tree growth. The line of the flood wall would be set within an existing drainage channel running through the wood (Plate 8.13).

Plate 8.12: Area of scheme within Tipperary Wood

The section of flood wall to the north-west would follow the west side of the Bryansford Road within the former grounds of Shimna House (Plate 8.14). The area where the flood wall would run is densely vegetated while Shimna House has been demolished and a new housing development is currently being constructed in its place.

Plate 8.13: Existing drainage channel in Tipperary Wood

Plate 8.14: Area of scheme within former grounds of Bryansford House

Heritage assets within the vicinity include the rath, St Cillan's Fort (DOW 049:007), which is located to the north-west on Rathcillanwood (Plate 8.15). This scheduled designated asset has been incorporated into the surrounding housing development and is heavily overgrown to the extent that the monument is not visible. There are no views between the rath and the proposed flood alleviation scheme.

Plate 8.15: The rath, St Cillan's fort (DOW 049:007)

Other heritage assets within the area include the former site of Newcastle (DOW 049:004) and the late medieval castle which was replaced by the Annesley Arms Hotel during the first half of the 19th century. The Annesley Arms Hotel is now the Newcastle Welcome Centre (Plate 8.16). As noted on the historical cartographic evidence, this building is located to the east side of the Central Promenade and not at the location given on the NISMR. The actual location of this asset is well outside the study area associated with the Proposed Scheme.

Plate 8.16: The Annesley Arms Hotel (former site of Newcastle (DOW 049:004))

There are no visible signs relating to the battle of Newcastle which took place around the castle (DOW 049:004) in 1642, nor are there any upstanding remains relating to the Area of Archaeological Potential which has been assigned to the historical core of the town around the former site of the castle.

8.5 Assessment of Environmental Impacts

8.5.1 Potential Impacts

The potential impacts of the Proposed Scheme can be separated into the Construction Phase or Operation Phase of a development.

8.5.1.1 Potential Impacts during Construction

Construction of the scheme under consideration has the potential to affect heritage assets in the following ways:

- Partial or total removal of heritage assets during site clearance and construction of flood walls, pathways, picnic areas and contractor compound areas;
- Impact of landscaping, spoil disposal and planting on the setting of heritage assets, and damage caused to archaeological deposits caused by planting or earthwork embankments;
- Compaction of archaeological deposits due to construction traffic movement or materials storage; damage through rutting of superficial deposits from construction traffic;
- Vibration and changes in air quality, causing damage to historic monuments during construction;
- Changes in groundwater levels leading to the desiccation of previously waterlogged archaeological deposits, damage caused by changes to hydrology and chemical alteration, or changes in silt deposition regimes;
- Effects on the setting of heritage assets, including visual and noise intrusion, and changes in traffic levels; and
- Severance causing dereliction or neglect of historic monuments or reduction of group value and adverse impacts on amenity as a result of construction works.

8.5.1.1.1 Potential for Physical Impact during Construction

There is one heritage asset within the footprint of the scheme. This is the New Bridge (IHR 03558:000:00) which is recorded as an Industrial Heritage feature. The bridge is an integral part of local infrastructure, carrying the Bryansford Road over the Shimna River. Under the current proposals, the New Bridge would remain extant but would be physically impacted by the flood walls which would be tied into the sections of the bridge on the river banks using clad sheet piles. This clad would match the existing bridge stone extending the parapet a slight distance. The physical appearance of the bridge span within the river would not be impacted. The heritage value of this asset is **Low** and the magnitude of impact can be classed as **Low Adverse** giving a significance of effect of **Minor**.

There are no recorded archaeological monuments within the footprint of the scheme which is located well outside the historical settlement of Newcastle and its associated area of archaeological potential. No recorded archaeological monuments would be physically impacted by the scheme.

The area of the scheme appears to have been open ground which remained unchanged until comparatively recently when it was developed as leisure facilities in the form of Islands Park and the Pitch & Putt course. Landscaping and drainage works associated with this development will have physically impacted upon the local terrain while the dense mature tree plantations along the river banks and in Tipperary Wood will also have caused sub-surface disturbance.

While the previous groundworks / planting noted will have negatively impacted upon the area, there is the possibility for buried and currently unknown archaeological remains, or other heritage assets that have not yet been identified or recorded on HED datasets to be present within the footprint of the scheme. Such assets are likely to be of local significance and would be judged of **low** heritage value.

Groundworks associated with the Proposed Scheme would severely impact upon such assets either severely disturbing or destroying them. This can be classed as **High Adverse** giving a significance of effect of **Moderate**.

8.5.1.1.2 Potential for Impacts affecting Setting during the Construction Phase

The Construction phase would require the presence of machinery and structures which would not normally be present at this location while the groundworks would cause visual and noise intrusion.

The heritage asset, New Bridge (IHR 03558:000:00), is located within the footprint of the scheme. It spans the Shimna River at the north-west corner of Islands Park which is a popular recreation area. While the setting of this heritage asset would likely be affected during the Construction Phase resulting in a minor adverse temporary effect, any potential effect on setting would be reduced once the groundworks are completed. The magnitude of impact can be classed as **Medium**, giving a significance of effect of **Minor**.

According to the NISMR, there is one designated asset, Listed Building Curraghard Lodge (HB 18/13/038) noted within the study area with one other, the scheduled monument St Cillan's Fort (DOW049:007) located just outside the study area. Both are considered to be of Regional importance.

Examination of the building at the location given on the NISMR for Curraghard Lodge (HB 18/13/038) revealed that this asset has been misplaced and, in reality, it is not located within the study area, or indeed, within the general environs of the scheme. Given this, Curraghard Lodge can be removed from the scope of this assessment and will not be discussed further.

St Cillan's Fort (DOW049:007) is located within a modern housing development to the north-west of the Proposed Scheme. It is currently heavily overgrown with mature vegetation so that the monument is barely visible. Additionally, the intervening landscape is urban with mature tree growth. As such, there are no views between the monument and the scheme. The setting of St Cillan's Fort would not be impacted visually during the construction stage of the scheme though the setting could be affected by construction noise. This would be limited to working hours and would likely be muffled by the intervening urban landscape. The magnitude of impact can be classed as **Minimal** giving a significance of effect of **Minor**.

Table 8.4: Potential effects during Construction Phase

Asset Reference	Importance	Description of Impact (Type, Duration)	Magnitude of Impact	Significance of Effect
New Bridge (IHR 03558:000:00)	Low	Permanent physical negative impact and impact to setting through flood walls being tied into bridge.	Low Adverse	Minor
Potential unrecorded archaeological assets	Low	Permanent physical negative impact through construction of the Proposed Scheme.	High, if present	Moderate Adverse
Rath -St Cillan's Fort (DOW049:007)	High	Temporary impact to setting during construction of the Proposed Scheme.	Minimal	Minor

8.5.1.2 Potential Impacts during Operation

8.5.1.2.1 Potential for Physical Impact during Operation

Physical impacts are linked to groundworks associated with the construction phase. There is little potential for physical impact during the operation.

8.5.1.2.2 Potential for Effects on Setting during Operation

The scheme would be completed with the flood walls in place during Operation, with all extraordinary construction-related personnel and items removed from the area which will be recreational once again. Given this, the potential for effects on setting would only relate to visual intrusion.

The flood walls would have a physical presence especially within the immediate vicinity of the heritage asset, New Bridge (IHR 03558:000:00). While there is the potential for the walls to impact upon the setting, views to the bridge along the river are largely screened by mature vegetation along the river bank. The flood walls would be set back along the river banks and thereby less visible in

views to the bridge. As such, the magnitude of impact can be classed as **Minimal**, giving a significance of effect of **Minor**.

There would be no views between the scheduled rath, St Cillan's Fort (DOW049:007) and the scheme. The magnitude of impact can be classed as **Minimal**, giving a significance of effect of **Minor** on an asset of high value.

Table 8.5: Potential Impacts during Operation

Asset Reference	Importance	Description of Impact (Type, Duration	Magnitude of Impact	Significance of Effect
New Bridge (IHR 03558:000:00)	Low	Permanent impact to setting of asset through flood walls being tied into bridge.	Minimal	Minor
Rath -St Cillan's Fort (DOW049:007)	High	Permanent impact to setting during operation of the Proposed Scheme.	Minimal	Minor

8.5.2 Cumulative Impacts

There are other developments within the area including the new housing being constructed within the former grounds of Shimna House. The Proposed Scheme would extend into this area. None of these developments within the vicinity of the scheme have the potential to cause any cumulative impact to the identified cultural heritage resource. The adjacent housing development does not have the potential to combine with the Proposed Scheme to block an important view, nor would the setting of any of the heritage assets be affected.

8.5.3 Do-Nothing Scenario

The Do-Nothing scenario would not result in any significant changes to the baseline cultural heritage resource.

8.6 Mitigation

8.6.1 Archaeological Works

Archaeological testing or monitoring would be carried out in areas identified in the construction impacts section above where the Proposed Scheme has the potential to impact upon archaeological remains (e.g. wall foundations, pathways, picnic area and construction compound), taking into account the depth of impact of the particular element of the proposals and the depth of soil above the archaeological horizon.

All archaeological works (which would be agreed by the Archaeological Consultant and DfC HED) would be carried out in compliance with the Historic Monuments and Archaeological Objects (NI) Order 1995.

A suitably qualified and licensed Archaeological contractor would be appointed to carry out the archaeological fieldwork. Relevant licenses would be acquired from the DfC HED for all archaeological works, which would be carried out in accordance with an over-arching Method Statement for Archaeological Works prepared by the Archaeological Consultant and agreed with the DfC HED.

If unexpected archaeological remains or artefacts are discovered during construction work, work in that area would cease and the area would be protected. An unexpected finds procedure would be included in the over-arching Method Statement for archaeology. The Archaeological Consultant and DfC HED would be notified, and the unexpected find protocol would be implemented.

8.7 Residual Effects

A summary of effects, both before and after mitigation, is provided in Table 8.6. Only those assets where an impact has been identified are discussed in this section. Those assets where no impact has been identified are not included.

8.7.1 Assets of Local importance

New Bridge (IHR 03558:000:00) is a locally important asset located within the footprint of the Proposed Scheme. Flood walls would be tied into the sections of the bridge on the river banks using clad sheet piles which would match the existing bridge stone mitigating any impact to the physical appearance of the bridge. Additionally, the flood walls would be visually screened by existing vegetation along the river bank. The heritage value of this asset is **Low** and the magnitude of impact can be classed as **Low Adverse** giving a significance of effect of **Minor**. The residual effect is therefore assessed to be **Minor**.

Potential currently unrecorded archaeological deposits which could be present within the site would experience a very high or high impact from the Proposed Scheme. Mitigation has been proposed in the form of archaeological testing and excavation, if appropriate, to determine the presence/absence of such features and to mitigate impacts arising from the Proposed Scheme. Based on the results of the baseline report, it is assessed that previously unrecorded archaeological assets within the site are likely to be of **Low** value. The residual effect is therefore assessed to be **Moderate**.

Table 8.6: Residual Impacts

Asset Reference	Importance	Description of Impact (Type, Duration	Magnitude of Impact	Significance of Effect	Mitigation	Residual Effect
New Bridge (IHR 03558:000:00)	Low	Permanent physical impact and impact to setting through flood walls being tied into bridge.	Low	Minor Adverse	Clad sheet piles would match existing stonework of bridge while existing vegetation along river bank would be retained screening the flood walls.	Minor
Potential unrecorded archaeological assets	Low	Permanent physical negative impact through construction of the Proposed Scheme.	High, if present	Moderate Adverse	Archaeological testing, excavation and recording, if required.	Moderate

9. Biodiversity – Terrestrial Ecology

9.1 Introduction

Ecology can be defined as 'the scientific study of living organisms and their relationship with each other and their environment' whilst nature conservation is concerned with 'maintaining a viable population of the country's characteristic fauna and flora and the communities which they comprise'.

This Ecological Impact Assessment (EcIA) chapter provides an assessment of the potential impacts of the proposed scheme on the ecological environment, including the environmental protection which exists within the area and on species and habitats.

This section has regard for relevant guidance, including the Guidelines for Ecological Potential Impact Assessment in the UK and Ireland (Chartered Institute of Ecology and Environmental Management (CIEEM), 2016).

The EcIA aims to:

- identify and describe all potentially significant ecological effects associated with the Proposed Scheme;
- ensure compliance with nature conservation legislation and to address any potentially significant ecological effects;
- set out the mitigation measures required;
- provide an assessment of the significance of any residual effects; and,
- identify appropriate enhancement/compensation measures.

9.2 Legislative and policy context

9.2.1 Wildlife legislation

The following wildlife legislation is potentially relevant to the Proposed scheme:

- The Wildlife and Natural Environment Act 1985 (Northern Ireland) 2011;
- The Wildlife (Northern Ireland) Order 1985 (as amended);
- The Nature Conservation and Amenity Lands (Northern Ireland) Order 1985 (as amended);
- The Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995 (as amended);
- The Habitats Directive (92/43/EEC); and,
- The Birds Directive (2009/147/EC).

The above legislation has been considered when planning and completing this EcIA using the methods described in Section 9.3, when identifying potential effects from the scheme, and when proposing required mitigation, as discussed in Section 9.6. Compliance with legislation may require the attainment of relevant protected species licences prior to implementation of the Proposed Scheme.

9.2.2 The Wildlife and Natural Environment Act (Northern Ireland) 2011

This Act amended the Wildlife Order by giving protection to a wider range of plants, animals and birds, and providing additional enforcement powers and increased penalties for wildlife related offences. The Act also introduced a statutory duty on all public bodies to further the conservation of biodiversity, which includes restoring or enhancing habitats of populations of floral and faunal species. The Act states the following:

12. *It is the duty of every public body, in exercising any functions, to further the conservation of biodiversity so far as is consistent with the proper exercise of those functions.*
13. *In complying with subsection (1), a public body must in particular have regard to any strategy designated under section 2 (1).*
14. *Conserving biodiversity includes— (a) in relation to any species of flora or fauna, restoring or enhancing a population of that species; (b) in relation to any type of habitat, restoring or enhancing the habitat.*

In addition, all public bodies must have regard to any strategy designated for the conservation of biodiversity i.e. Valuing Nature, A Biodiversity Strategy for Northern Ireland to 2020 (DOE, 2015).

9.2.3 Relevant planning policy

Planning Policy Statements (PPS) are consolidated within the Strategic Planning Policy Statement (SPPS) (2015) which furthers the Northern Ireland Executive's commitment in its Programme for Government (PfG) to preserve and improve the built and natural environment and halt the loss of biodiversity. PPS set out the policies of the former Department of the Environment (now Department of Agriculture, Environment, and Rural Affairs) on particular aspects of land-use planning and apply to the whole of Northern Ireland. Their contents must be taken into account in preparing development plans and are also material to individual planning applications and appeals. PPS 2 Natural Heritage (2013) sets out the Department's planning policies for the conservation, protection and enhancement of natural heritage, defined as "*the diversity of our habitats, species, landscapes, and earth science features*". In addition, it outlines the criteria that local councils and the Department for Infrastructure (formerly Planning NI) employs when processing planning applications which might affect nature conservation interests and to which developers should have regard when preparing proposals.

Policies within PPS2 that are applicable are:

- Policy NH 1 "*European and Ramsar Sites – International*", which states that planning permission will only be granted for a development proposal that, either individually or in combination with existing and/or proposed plans or projects, is not likely to have a significant effect on a European site, including Ramsar sites;
- Policy NH 2 "*Species Protected by Law*", whereby planning permission will only be granted for a development proposal that is not likely to harm a European protected species;
- Policy NH3 "*Sites of Nature Conservation Importance – National*", which states that planning permission will only be granted for a development proposal that is not likely to have an adverse effect on the integrity, including the value of the site to the habitat network or special interest of, amongst others, an Area of Special Scientific Interest (ASSI);
- Policy NH4 "*Sites of Nature Conservation Importance – Local*", which states that planning permission will only be granted for a development proposal that is not likely to have a significant adverse impact on a Local Nature Reserve or a Wildlife Refuge; and,
- Policy NH 5 "*Habitats, Species or Features of Natural Heritage Importance",* whereby planning permission will only be granted for a development proposal which is not likely to result in the unacceptable adverse impact or damage to a list of considerations including Priority Habitats and Species.

9.2.4 Other relevant policy

Other relevant policy that has been referred to in order to inform this EcIA includes:

- Newry, Mourne and Down Local Biodiversity Action Plan, 2017-2022;
- Newry, Mourne and Down Local Development Plan 2030; and
- Ards and Down Area Plan 2015.

9.3 Methodology

9.3.1 Desk study

A desk study was carried out to identify nature conservation designations, and protected and Priority Habitats and Species potentially relevant to the Proposed Scheme. A stratified approach was taken when defining the desk study area, based on the likely zone of influence of the scheme on different ecological receptors, and an understanding of the maximum distances typically considered by statutory consultees. The desk study identified any site with international nature conservation designations within 15 km of the site boundary, such as Special Protection Areas (SPA), Special Conservation Areas (SAC), Ramsar sites, sites with national nature conservation designations within 2 km of the site such as Areas of Special Scientific Interest (ASSI) and National Nature Reserves (NNR). Local non-statutory nature conservation designations, such as Sites of Local Nature Conservation Importance (SLNCI), Woodland Trust Sites for Ancient/Long-Established Woodland, and records of protected and notable habitats and species were also searched for within 2 km of the site boundary.

Datasets consulted included the NIEA Protected Sites map viewer, Sites of Local Conservation Importance (SLNCI) dataset, and the Woodland Trust Ancient Woodland Database. Additionally, the Centre for Environmental Data and Recording (CEDaR) was consulted for records in proximity to the site. Protected and notable habitats and species were obtained to include those listed as Northern Ireland Priority Habitats and Species. Records of non-native invasive weed species listed under Schedule 9 Part II of the Wildlife (Northern Ireland) Order 1985 (as amended) were also collated.

9.3.2 Zone(s) of influence and survey area

The ‘zone of influence’ (ZoI) for a project (or “spatial extent of the impact” as described in Annex III(3) of the new EIA Directive) is the area over which ecological features may be subject to significant impacts as a result of the proposed project and associated activities. The ZoI is likely to extend beyond the boundary of a Proposed Scheme, for example where there are hydrological links extending beyond the site boundaries. Activities associated with the construction, operation, decommissioning (and where applicable, restoration) phases should be separately identified (where relevant). The ZoI will vary for different ecological features depending on their sensitivity to an environmental change. It is therefore appropriate to identify different ZoI for different features. The features affected could include habitats, species, and the processes on which they depend. ZoI are specified for different features, and types of potential impact. As recommended by CIEEM (2016), professionally accredited or published studies have been used to determine ZoI. Having considered the Proposed Scheme, ZoI have been estimated for habitats and flora and fauna species and their habitats (Appendix 9 – Annex A). In the context of determining the ZoI for potential pollution effects from the scheme, a conservative approach has been adopted assuming that the ZoI includes all areas downstream of the Proposed Scheme.

Desktop and field survey areas
Desktop survey areas corresponded, as a minimum, to the ZoI of potentially significant effects for each ecological feature. Field surveys were constrained in cases by land access and/or by resources. Field studies for the ZoI for potential pollution effects, which included the entire downstream surface water catchment, were not carried out but are considered further in the Drainage and Water Environment Section (Section 13). In this section, the study area for cumulative effects includes at least the extent of the ZoI from the Proposed Scheme boundary.

9.3.3 Field surveys

A Phase 1 Habitat survey, conducted in accordance with the standard survey method (Joint Nature Conservation Committee, 2010) as part of a Preliminary Ecological Appraisal (PEA; CIEEM, 2014) was carried out. The standard Phase 1 Habitat survey method was “extended” to identify the potential of habitats to host protected, notable and invasive species. Where necessary, further survey during the most appropriate time of year was conducted for protected species to determine detailed status in order to inform mitigation measures. Table 9.1 details these ecological surveys.

Table 9.1: Schedule of ecological surveys

Survey	Date	Personnel
Phase 1 Habitat survey	09/07/2018, 17/07/2018	Eleanor Ballard, Jenny Jones, Rachel Whyte
Otter survey	09/07/2018, 18/07/2018	Paul Lynas, Scott McCollum, Rachel Whyte
Badger survey	09/07/2018, 18/07/2018, 24/07/2018	Paul Lynas, Scott McCollum, Rachel Whyte
Bat preliminary ground level roost assessment (trees) survey	09/07/2018, 24/07/2018	Emma Boston, Rachel Whyte
Potential roost feature inspection (tree climbing) survey	26/07/2018	Emma Boston, Miles Newman
Red squirrel survey	09/07/2018, 16/07/2018, 17/07/2018, 18/07/2018	Eleanor Ballard, Jenny Jones, Paul Lynas, Scott McCollum, Emma Boston, Rachel Whyte
Breeding bird surveys	29/06/2018, 16/07/2018	Paul Lynas, Scott McCollum

9.3.3.1 Phase 1 Habitat survey

A Phase 1 Habitat survey, conducted in accordance with the standard survey methodology (Joint Nature Conservation Committee, 2010) was carried out for the scheme. A Phase 1 Habitat survey involves categorising the different habitat types and features within the site. Where ecological receptors were present, Target Notes were recorded onto field maps. Photographs (Appendix 9 – Annex B) were taken of representative habitats and Target Notes were also recorded where additional information was necessary. Data was recorded and habitats mapped using a handheld mobile mapper (Panasonic ToughPad). Typical and notable plant species present within habitats were recorded for each habitat type encountered. The recorded species reflect habitat compositions and conditions at the time of survey. The Phase 1 Habitat survey was not intended to be a detailed inventory of the plant species present in the survey area, as this is not required for the purposes of Phase 1 Habitat survey. Species lists are presented in Appendix 9 – Annex C.

9.3.3.2 Invasive species survey

A search was made for invasive plant species as listed in Schedule 9 of The Wildlife (Northern Ireland) Order 1985 (as amended). Locations of such species were mapped using the mobile mapping device, and notes were made on features of the plants including species, extent, and any evidence of treatment.

9.3.3.3 Otter survey

An otter *Lutra lutra* survey was conducted along the Shimna and Tullybrannigan rivers. This survey followed the 'Otter Survey - NIEA Specific Requirements' set out by NIEA (2017). Surveyors searched for otter refuge sites including holts and lay-ups, and any other evidence of otter, such as spraints, slides and footprints. Suitable terrestrial habitats, e.g. woodland, were also searched for evidence of otter. Results were recorded on a Panasonic ToughPad.

9.3.3.4 Badger survey

A badger *Meles meles* survey was conducted for the scheme, both within the immediate vicinity and extending to at least 25m beyond, where necessary and access allowed. This survey followed the 'Badger Survey – NIEA Specific Requirements' set out by NIEA (2017), and with cognisance to Harris *et al*. (1989). All woodland, hedgerows and dense vegetation within 25m of the proposed flood walls which were considered suitable badger habitat were systematically checked for signs of badger activity or habitation. These signs include the presence of main, annex, subsidiary, and outlier setts, foraging evidence (e.g. snuffle holes), latrines, access runs and trails, hairs caught on wires and bushes, tracks, and prints. Results were recorded using a Panasonic ToughPad.

9.3.3.5 Bat surveys

Preliminary ground level roost assessment
A preliminary ground level roost assessment was conducted on all trees that may be affected by the scheme. The survey was carried out during daylight hours, and close-focusing binoculars were used to identify, from the ground, any potential roost features (PRF) for bats in trees. Trees were studied and assessed for the presence of PRF including cavities, trunk and branch splits, rot holes, and knot holes. Data was recorded using a Panasonic ToughPad, allowing accurate GPS location of trees. The results were used to grade trees as having Negligible, Low, Moderate, or High suitability for roosting bats in accordance with the Bat Conservation Trust's (BCT) Bat Surveys for Professional Ecologists: Good Practice Guidelines (Collins, 2016).

Potential roost feature inspection survey
A PRF inspection survey was conducted on trees which were assessed as having Moderate or High suitability for roosting bats, as per BCT guidance. Trees were climbed to gain access to PRF identified during the preliminary ground level roost assessment and were searched for evidence of bats, including dead or live bats, staining, or droppings. A digital endoscope was used under license to investigate PRF, and take photographs where possible. Following these surveys, the results of the preliminary ground level roost assessment were revisited to reclassify the suitability of trees to roosting bats trees, using the same BCT categories as above.

9.3.3.6 Red squirrel survey

Red squirrel *Sciurus vulgaris* surveys were conducted following 'Red Squirrel Surveys – NIEA Specific Requirements' set out by NIEA (2017). Non-invasive survey techniques comprising a combination of visual surveys, drey counts, and feeding sign surveys (e.g. nibbled cones) were implemented on four separate occasions within a two-week period within the Tipperary Wood area. All data were recorded using a Panasonic ToughPad.

9.3.3.7 Breeding bird survey

Breeding bird surveys using adapted British Trust for Ornithology (BTO) Breeding Bird Survey (BBS) methodology were conducted. Transects throughout the site were walked at a steady pace on two separate occasions and all birds visually observed or heard were recorded, in addition to notes on their behaviour and territories. All observations were recorded on Panasonic ToughPad mobile mapper. The results are displayed using standard BTO bird codes.

9.3.3.8 Fisheries and Aquatic Ecology survey

A fisheries and aquatic ecology survey was undertaken and reported separately under Section 15 of this ES.

9.3.3.9 Survey personnel

Dr Eleanor Ballard BSc(Hons) PhD CEnv MCIEEM has over 19 years' post-doctoral experience in the delivery and execution of ecological projects, including project design and management. Eleanor has been involved with major infrastructure projects including the strategically important DBFO2 in Northern Ireland, taking the role of Scheme Principal Ecologist in 2008. Eleanor has worked previously in academia and as a manager delivering biodiversity projects in a large conservation charity. Eleanor has excellent client interface, leadership, communication and team-building skills along with a comprehensive working knowledge of current ecological best practice and legislation. These skills combine to give a proven track record in major project delivery. Eleanor has extensive experience in a consultative capacity working in Northern Ireland, the Republic of Ireland and Great Britain conducting a range of protected species surveys, habitat surveys in aquatic, marine and terrestrial environments, producing EcIA and writing Habitats Regulations Assessments/ Natura Impact Assessments. Eleanor excels in implementing environmental design into reality, working with both construction and design teams within AECOM and externally. Eleanor has held Northern Ireland Environment Agency smooth newt, squirrel, lizard, otter, bat and badger licences. Eleanor is also a JNCC accredited Trained Marine Mammal Observer and is on the EPA certified SSRS surveyor list. She has been the SQE or validating ecologist for over 30 BREEAM\CfSH assessments.

Dr Paul Lynas BSc(Hons) MRes PhD CEnv MCIEEM is an experienced ecologist with over 13 years professional experience in carrying out a range of habitat and species surveys. Paul has now been with AECOM for 10 years where he currently is employed as a Principal Ecologist. Specialising in Ecological Impact Assessment especially of birds and protected species surveys, he has undertaken numerous flora and fauna assessments for both public and private sector clients, including those for newts, birds, badgers, bats and otters, and those requiring Phase 1 habitat surveys. He is also a regular NIEA licence holder to conduct survey/development work which could impact those species. Paul has also developed much expertise in the Appropriate Assessment. He has assessed a wide range of plans and projects which could potentially impact on Natura 2000 sites across Northern Ireland, including several in the vicinity of the current development proposal.

Dr Emma Boston BSc(Hons) PhD MCIEEM is a Principal Ecologist in the Belfast office with over 12 years' experience in research, conservation and consultancy. She has published 15 peer-reviewed publications from her research conducted across a number of international research institutions. Emma has lectured and delivered training at a range of levels (citizen scientists to graduates). She has experience in a variety of ecological survey methods and has worked independently and as part of a multidisciplinary environmental team as consultant. She has significant experience in the delivery of projects from their development to completion. Emma's primary expertise is in the survey methods for bats using of a range of survey methods, techniques and equipment. She has held protected species survey licenses to catch bats using hand nets, mist nets, a harp trap and licenses to radio-track bats in Northern Ireland and the Republic of Ireland. Emma has ample experience dealing with the issues regarding bats and development, and is well versed in the latest survey guidelines and mitigation methodologies.

Jenny Jones BSc(Hons) MSc AMRSB is a Consultant Ecologist with over 4 years' professional experience of ecological consultancy. She has worked as part of multidisciplinary and dedicated ecological teams contributing to projects in power and energy, infrastructure, industrial and commercial, and property and development across the UK and Ireland. Jenny has extensive field experience of a variety of species and habitat survey techniques. She is proficient in Phase 1 Habitat surveys across a variety of habitats including detailed hedgerow assessments. She has extensive experience of protected species surveys for badger, otter, pine marten, smooth newt, and wintering aquatic and seabirds. Jenny has held licences for smooth newt, and has assisted in licenced activities for badger and bat exclusions. Jenny's key expertise is bat ecology. Professionally, she has conducted numerous bat surveys, including bat activity, emergence / re-entry, assessments of trees and structures for roost suitability, assessment of habitats for commuting and foraging suitability, and subsequent acoustical call analysis using a range of programmes. Jenny has also provided in-house training on bat surveys and analysis to junior colleagues. Jenny also has extensive experience surveying for invasive species, in addition to prescribing recommendations for control and writing Knotweed Management Plans. She has also acted as an Ecological Clerk of Works (ECoW) for a number of projects, including during Japanese knotweed excavation, and pre-construction vegetation checks for road schemes. Jenny is also a pioneer in the use of mobile mapping technology (ToughPad®) for high quality data collection in the field. She is constantly reviewing the use of this technology and training her colleagues in its use. To complement this, she is proficient in GIS.

Rachel Whyte BSc(Hons) began as a Graduate Ecologist at AECOM in July 2018 after completing an internship as part of her MSc. She is currently studying for her Masters in Ecological Management and Conservation Biology at Queen's University Belfast. Prior to joining AECOM, Rachel volunteered with several environmental charities, becoming experienced in freshwater invertebrate surveys, habitat management for protected species, and botanical surveys. Since starting with AECOM, Rachel has been involved in a number of bat emergence surveys, being trained under the expert tutelage of Dr Emma Boston. Rachel has also conducted surveys for protected species and assisted in Phase 1 Habitat surveys, in addition to habitat suitability surveys for smooth newt, and preliminary roost assessment surveys for bats.

Scott McCollum BSc(Hons) is a Graduate Ecologist who has been with AECOM for one year. Scott has gained experience in a wide variety of ecological surveys including surveys for animals such as bats, badger, otter, birds, and reptiles, as well as Phase 1 Habitat surveys. Previous to starting with AECOM, Scott studied at Queen's University Belfast, graduating with BSc (Hons) in Environmental Biology. For his honours project, Scott investigated the response of *Culicoides* midges to insect repellents, and has done further work with insects, surveying butterflies on a voluntary basis. Scott has also spent some time with CEDaR, Northern Ireland's biological records centre, where he

primarily worked on preparing moth and lichen records for upload, in addition to making corrective edits to records.

9.3.3.10 Limitations

The aim of a desk study is to help characterise the baseline context of a proposed development and provide valuable background information that would not be captured by a single site survey alone. Information obtained during the course of a desk study is dependent upon people and organisations having made and submitted records for the area of interest. As such, a lack of records for a particular habitat or species does not necessarily mean that the habitat or species do not occur in the study area. Likewise, the presence of records for particular habitats and species does not automatically mean that these still occur within the area of interest or are relevant in the context of the proposed development. Biological records can be received from a wide variety of sources and may or may not be comprehensive and accurate. However, if assessed in conjunction with a Phase 1 Habitat survey, they can contribute to a robust ecological assessment of a site.

The site and a buffer area of c.100m was searched in its entirety where access allowed; all council owned, and publically accessible areas were surveyed, however large areas of land are under private ownership e.g. back gardens of residential areas etc., and such areas were not accessed.

Although carried out during the botanical surveys, woodlands are best surveyed in early spring, as this is largely when woodland ground flora is most abundant.

9.3.4 Impact assessment methods

9.3.4.1 Baseline conditions

Ecological baseline conditions are those existing in the absence of proposed activities. The impact assessment determines how the conditions will change in relation to this baseline to facilitate a clear understanding of the effects of a project. Assessing the impacts of any project and associated activities requires an understanding of the baseline conditions prior to and at the time of the project proceeding or specific activities taking place.

9.3.4.2 Valuing ecological features

Important ecological receptors must be identified. Such ecological receptors which should be subject to detailed assessment are those considered to be important and potentially affected by the project. The values of such baseline ecological receptors are determined, using professional judgement and consideration of for example, available guidance and distribution/status of receptors. It is important to note that certain ecological features that are not included in lists of important sites or features, may be considered important on the basis of expert judgment e.g. because of their local rarity or because they enable effective conservation of other important features. The importance of an ecological feature should be considered within a defined geographical context, (e.g. the receptor is of importance at International/European level, e.g. Natura 2000 sites); it should be noted that, in some cases, (such as invasive non-native species) value may be negative. To attain a level of value, a receptor must meet the criteria set out in Table 9.2. In some cases, professional judgment is used to increase or decrease the value of receptors, based on contemporary studies or first-hand knowledge.

Table 9.2: Geographic value criteria

Geographical receptor value	Criteria
International and European Value	• Natura 2000 sites, e.g. SPA, SAC, Ramsar sites or equivalent; • Areas which meet the published selection criteria for the sites listed above but which are not themselves designated as such; • Resident, or regularly-occurring, populations of species which may be considered at an International or European, level where: – the loss of these populations would adversely affect the conservation status or distribution of the species at this geographic scale; or – the population forms a critical part of a wider population at this scale; or, – the species is at a critical phase of its life cycle at this scale.

Geographical receptor value	Criteria
National **e.g. British Isles: (England, Wales, Scotland, Northern Ireland and Republic of Ireland)**	• Nationally designated sites such as Areas of Special Scientific Interest (ASSI) or equivalent; • Areas which meet the published selection criteria for the sites listed above but which are not themselves designated as such; • Areas of key/priority habitats identified in the UK Biodiversity Action Plan (BAP), including those published in accordance with Section 3 of The Wildlife and Natural Environment Act (Northern Ireland) 2011 and those considered to be of principal importance for the conservation of biodiversity; • Areas of Ancient Woodland e.g. woodland listed within the Ancient Woodland Inventory; • Resident, or regularly-occurring, populations of species which may be considered at an International, European, UK or National level, where: – the loss of these populations would adversely affect the conservation status or distribution of the species at this scale; or – the population forms a critical part of a wider population at this scale; or – the species is at a critical phase of its life cycle at this scale.
Regional **e.g. All-Ireland Value: (Northern Ireland and Republic of Ireland)**	• Sustainable areas of key habitat identified in the All-Ireland Action Plans or NIBAP and Republic of Ireland BAP or smaller areas of such habitat that is essential to maintain the viability of a larger area; • Non-statutory sites that the designating authority has determined meet the published ecological selection criteria for designation, including Local Nature Reserves; • Some non-statutory designated sites (Ancient Woodland, TPO); • Any regularly-occurring, locally important population of a species listed in a Regional Red Data Book or LBAP on account of its regional rarity or localisation, which is integral to supporting the status of the species within the biogeographical unit that is the island of Ireland.
Metropolitan / County Value: **e.g. County Down**	• Designated sites including: Sites of Local Nature Conservation Importance (SLNCI) and Local Nature Reserves (LNR); • Areas which meet the published selection criteria for those sites listed above but which are not themselves designated as such; • Areas of key/priority habitats identified in the Local BAP; and areas of habitat identified in the appropriate Natural Area Profile (or equivalent); • Resident, or regularly-occurring, populations of species which may be considered at an International, European, UK or National level, where: – the loss of these populations would adversely affect the conservation status or distribution of the species across the County; or – the population forms a critical part of a wider population; or – the species is at a critical phase of its life cycle.
Local **e.g. Newcastle**	• Designated sites including: Local Nature Reserves (LNR), SLNCI, designated in the local context; • Trees that are protected by Tree Preservation Orders (TPO); or, • Areas of habitat, or populations/communities of species considered to appreciably enrich the habitat resource within the local context (such as veteran trees), including features of value for migration, dispersal or genetic exchange.
Zone of Influence / site level **e.g. construction footprint and variable buffer zone to account for disturbance to species**	• Common and widespread species; • Areas of heavily managed or modified vegetation of low intrinsic interest and low value to species of nature conservation interest, that do not appreciably enrich the site or locally.

9.3.4.3 Characterising ecological impacts

Potential impacts of the Proposed Scheme (both positive and negative) are predicted for all significant ecological features; however only those impacts that are likely to be significant require detailed descriptions. In accordance with CIEEM (2016) guidelines, potential impacts are characterised by considering parameters shown in Table 9.3 below. Additionally, impacts may occur during both the

construction phase and the operation phase of a project. Impacts may be indirect as well as direct. Direct impacts are directly attributable to an action associated with a scheme. Indirect impacts are often produced away from a scheme, or as a result of other initial impacts.

Table 9.3: Descriptions of potential impact parameters (adapted from CIEEM (2016) guidelines)

Potential impact parameter	Description
'Quality' of effects (i.e. positive vs negative)	Positive potential impact – a change that improves the quality of the environment or slows an existing decline in the quality of the environment. Negative potential impact – a change which reduces the quality of the environment e.g. destruction of habitat, removal of species foraging habitat.
Magnitude or extent	The spatial or geographical area over which the impact/effect may occur. Can be synonymous with Magnitude for habitats. Proportion of a population, or other measurable unit significantly impacted by an effect.
Duration	Duration should be defined in relation to ecological characteristics (such as a species' lifecycle) as well as human timeframes. Effects may be described as short, medium or long-term and permanent or temporary. Short, medium, long-term and temporary are defined in months/years.
Frequency and timing	Frequency refers to how often the effect will occur (e.g. once, rarely, occasionally, frequently, hourly, daily or constantly). Timing differs from frequency and is of particular relevance to biodiversity effects; the timing of an activity may result in a significant potential impact if it coincides with critical life-stages or seasons e.g. bird nesting season. Outside this period, similar actions may not cause significant impacts.
Reversibility	An irreversible effect is one from which recovery is not possible within a reasonable timescale or there is no reasonable chance of action being taken to reverse it. A reversible effect is one from which spontaneous recovery is possible or which may be counteracted by mitigation.

9.3.4.4 Assessment of cumulative impacts

Cumulative effects can result from individually insignificant but collectively significant actions taking place over a period of time or concentrated in a location. More than one impact acting on a receptor simultaneously may have a cumulative impact that is greater than when the same impacts act in isolation. Cumulative impacts may entail the assessment of all the impacts of the scheme upon a feature (e.g. impacts at the construction and operation stage), or the combined impacts of a number of schemes that would affect the same area. The area affected may vary depending on the receptor being considered. Cumulative effects are particularly important in EcIA as many ecological features are already exposed to background levels of threat or pressure and may be close to critical thresholds where further impact could cause irreversible decline. Effects can also make habitats and species more vulnerable or sensitive to change.

9.3.4.5 Assessment of residual impacts

After assessing the impacts of the Proposed Scheme, attempts should be made to mitigate (preferably by avoidance) ecological impacts. Once measures to avoid and mitigate ecological impacts have been finalised, assessment of the residual impacts should be conducted to determine the significance of their effects on ecological features. Any residual impacts that will result in effects that are significant, and proposed compensatory measures, will be the factors considered against ecological objectives (legislation and policy) in determining the outcome of the planning process.

9.3.4.6 Determining ecologically significant effects

Significance is defined as the weight that should be attached to effects when decisions are made. For the purpose of EcIA, a 'significant effect' is an effect that either supports or undermines the integrity of biodiversity conservation objectives for ecological receptors. Conservation objectives may be specific (e.g. for a designated site) or broad (e.g. national/local nature conservation policy) or more wide-

ranging (enhancement of biodiversity). Effects can be considered significant at a wide range of scales from international to local.

The term integrity is used here in accordance with the definition adopted in Planning Policy Statement 2 (PPS 2) Natural Heritage (Planning NI, 2013) based on European Communities guidance (European Commission, 2000) whereby site integrity refers to "*the coherence of the site's ecological structure and function, across its whole area or the habitats, complex of habitats and / or populations of species for which the site is or will be classified*". For non-designated sites/species, this can be amended to "*the coherence of ecological structure and function, that enables it (in this case, the area being considered; e.g. county/region) to maintain the levels of populations of species in its/their pre-development condition*". Integrity therefore refers to the maintenance of the conservation status of a species population at a specific location or geographical scale.

Significant effects are therefore those of sufficient importance to warrant assessment and reporting so that the decision maker is adequately informed of the environmental consequences of development. A significant effect does not however immediately result in the refusal of planning permission for a development. For example, many projects with significant negative ecological effects can be lawfully permitted following EIA procedures, as long as the mitigation hierarchy has been applied effectively as part of the decision-making process.

According to CIEEM (2016) guidance, significant effects should be qualified with reference to an appropriate geographic scale. Whilst European case law is specific regarding significance in relation to European sites and Annexed habitats, the scale of significance of an effect may not be the same as the geographic context in which the feature is considered important. For example, if a SLNCI is cited for the population of a particular species of bat, that population is of county importance, but other features of the site may be less important. Similarly, legal protection at a national level, or the presence of a priority species or habitat in a Local Biodiversity Action Plan (LBAP), does not always imply national importance.

The level of significance of an impact on the ecological integrity of the receptor or resource depends upon all of the factors described above. Initially, consideration of the impact on ecological integrity does not take account of recommendations for mitigation or compensation that might subsequently be described. Residual impacts and their level of significance are determined after applying mitigation or compensation measures.

9.4 Baseline conditions

9.4.1 Desk study

9.4.1.1 Statutory designations

There are two SACs, one proposed SPA (pSPA) within 15 km and four ASSI within 2 km of the indicative study area. The boundaries of Eastern Mournes ASSI and Murlough ASSI are congruent with the SAC of the same name. The Shimna River, along a stretch of which the scheme is proposed, is designated as an ASSI. A summary of these designated sites is presented in Table 9.4, and locations shown on **Figure 9.1**.

Table 9.4: Sites with statutory designations for nature conservation

Site	Reason	Proximity to site
International sites		
Murlough SAC (UK0016612)	Murlough SAC is designated under Directive 92/43/EEC, Annex I habitats 'Fixed coastal dunes with herbaceous vegetation ("grey dunes")' and 'Atlantic decalcified fixed dunes (*Calluno-Ulicetea*)', which are priority features within the SAC. Other qualifying features, though not primary reasons for selection, are 'sandbanks which are slightly covered by sea water all the time', 'mudflats and sand flats not covered by seawater at low tide', 'Atlantic salt meadows (*Glauco-Pucinellietalia maritimae*)', 'embryonic shifting dunes', 'shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes")' and, 'dunes with *Salix*	0.22 km E Hydrological link present.

Site	Reason	Proximity to site
	repens ssp. *argentea* (*Salicon arenarie*)'. Additionally, the marsh fritillary butterfly *Euphydryas aurina* is an Annex II species present as a primary selection feature, whilst common seals *Phoca vitulina* are an additional Annex II species present as a qualifying feature.	
Eastern Mournes SAC (UK0016615)	The site is designated under Directive 92/43/EEC for an array of Annex I habitats. 'European dry heaths' and 'Northern Atlantic wet heaths with *Erica tetralix*' are primary selection features for the SAC, and are excellent examples of these habitats, spanning the greatest area of the SAC. Other qualifying Annex I habitats, though not primary selection features, comprise 'active blanket bogs (if active)', 'alpine and boreal heaths', 'siliceous alpine and boreal grasslands', 'siliceous rocky slopes with chasmophytic vegetation' and 'ailiceous scree of the montane to snow level'.	0.92 km SW Hydrologically linked, (however Proposed Scheme is downstream).
Carlingford Marine pSPA (UK9020161)	Located on the east coast of NI, and straddling the border with the Republic of Ireland, Carlingford Lough is a proposed marine SPA comprising a narrow sea lough surrounded by mountains. At the mouth of the lough are several small rock and shingle islands, whilst the northern shore includes the most significant mud-flats in the lough and an area of saltmarsh; these areas provide breeding and foraging habitat for breeding and overwintering birds. This site qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of common tern *Sterna hirundo* and sandwich tern *Sterna sandvicensis*, and under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of overwintering brent goose *Branta bernicla hrota*.	4.5 km S Hydrological link present.
National sites		
Shimna River ASSI	This ASSI covers an area of c.38.7ha and is designated for physical features of the river, naturalness of riverbanks and channels, associated riverine flora and fauna. The area includes the Shimna River and one of its main tributaries, the Trassey River. The Shimna River rises on the slopes of Ott Mountain and flows into the Irish Sea at Newcastle. It is one of the best examples in Northern Ireland of an upland, oligotrophic (base-poor) river. Apart from the presence of Fofanny Dam, the river basin is in a highly natural state due to limited human impact. It is of particular note for the naturalness of the river channel, which exhibits all the physical attributes of in-channel features, flow and riverbed types typical of unaltered upland rivers. The Shimna River provides habitat for spawning salmonids, with populations of Atlantic salmon *Salmo salar*, brown trout *Salmo trutta* and sea trout *Salmon trutta* present.	Within development area
Murlough ASSI	Covering an area of 1452.8 ha, this ASSI is designated on the basis of its coastal flora, fauna, and physiography, and is considered one of the best examples of a coastal system in Northern Ireland, notable for its extent and wide range of floral and faunal communities. Notable habitats in the ASSI comprise strandline vegetation, saltmarsh, mudflats, sandflats, and coastal sand dunes. Such habitats support notable higher plant and invertebrate assemblages. Dundrum Bay (including the outer and inner bays) is an important site for overwintering wildfowl and waders, supporting internationally important numbers of light-bellied brent geese, and nationally important populations of common scoter *Melanitta nigra* and red-breasted merganser *Mergus serrator*, whilst significant numbers of common seal use the Ballykinler sand-bar as a high-water haul out site.	0.22 km E Hydrological link present.
Eastern Mournes ASSI	This 7505.5 ha ASSI is designated due to its geological and physiographical features, and its heathland and upland flora and fauna. Heathland is a scarce and scattered resource and the Eastern Mournes support the most extensive tracts in Northern Ireland. Upland communities are notable, as the area is the highest	0.92 km SW Hydrologically linked, (however Proposed Scheme is downstream).

Site	Reason	Proximity to site
	upland block in Northern Ireland. Blanket bog and grasslands are also represented, producing a varied and diverse mosaic of habitats. These habitats support an array of associated flora and fauna, including notable fungi assemblages, higher plant assemblages (including a number of rare plants), and invertebrate assemblages, and a significant upland bird community, including the rare ring ouzel *Turdus torguatus*.	
Mournes Coast ASSI	This 84.7 ha ASSI is designated for geological features, honeycomb worm biogenic reefs, intertidal rock communities, grey seal *Halichoerus grypus* and common seal, maritime and terrestrial vegetation communities (including saltmarsh and coastal grasslands) and important bird populations of kittiwake *Rissa tridactyla* and black guillemot *Cepphus grylle*. The Mournes Coast has the best example in Northern Ireland of reefs constructed by the honeycomb worm. This species is fairly rare as it needs very particular conditions to survive and has a limited distribution in the UK and Ireland.	1.85 km SSE Hydrological link present.

Source: DAERA citation documents, JNCC website [accessed July 2018].

9.4.1.2 Non-statutory designations

Two SLNCIs occur within 2 km of the site. These are both named Shimna and Trassey Rivers SLNCI, and are contiguous parcels which flow through the scheme area. These areas were declared a SLNCI because of the riverine and surrounding woodland habitats. **Figure 9.2** shows the non-statutory nature conservation designations identified by the desk study.

9.4.1.3 Ancient / long-established woodland

Twelves parcels of long-established woodland were identified within 2 km of the site. There are no apparent terrestrial or hydrological links between these woodland sites and the scheme area. **Figure 9.2** displays the location of these sites in relation to the scheme.

9.4.1.4 CEDaR data request

Following a data request, CEDaR provided a dataset of records within 2 km of the site. A large number of records were received from the data request; to increase relevance, only species of regional or international importance have been presented. This resulted in 976 records representing 96 species. These are presented in Appendix 9 – Annex D. Due to the proximity of well-studied designated sites (e.g. Murlough SAC ASSI), it is considered likely that a number of records received are associated with these sites (e.g. spring vetch *Vicia lathyroides*, a Priority Species within the dataset, is associated primarily with sand dunes, and as such is unlikely to occur within the site). Records considered pertinent to the scheme, based on the habitats present within the survey area, include badger, otter, pine marten *Martes martes*, red squirrel, holly blue *Celastrina argiolus*, kingfisher *Alcedo atthis*, Atlantic salmon *Salmo salar*, and trout *Salmo trutta*.

9.4.2 Field survey

9.4.2.1 Phase 1 Habitats

The habitats recorded, their extent and distribution are shown in Table 9.5 and **Figure 9.3**. The areas are approximate only. Illustrative photographs are provided as appropriate in Appendix 9 – Annex B. Relevant information from the desk study on particular habitats is noted in Table 9.5.

Table 9.5: Dominant habitats present, in descending order based on spatial area occupied

Habitat	Brief description	Area (ha)	% of site area
Amenity grassland	The dominant habitat noted, grassland maintained for amenity value covers the parkland area of Islands Park.	5.39	24

Habitat	Brief description	Area (ha)	% of site area
Broadleaved semi-natural woodland	Several parcels within the survey area; primarily forms a riparian corridor along the Shimna River.	3.49	16
Coniferous plantation woodland	A large parcel of planted conifers within Tipperary Wood, west of the Bryansford Road.	2.41	11
Mixed scattered trees	Scattered trees are present across the site, both individually and forming tree lines. Broadleaved treelines are associated with woodland margins and property boundaries, whilst mixed scattered trees occur within the Islands Park area.	2.52	11
Running water	Shimna, Tullybrannigan, and Burren rivers are all present within the survey area. A smaller stream flows along the southern boundary of Islands Park, and enters the Tullybrannigan River.	1.87	8
Mixed semi-natural woodland	A large parcel to the north of the scheme, bound by the Bryansford Road and the Shimna River. There has been some disturbance associated with development.	1.05	5
Mixed plantation woodland	A small parcel of the habitat lies within Tipperary Wood, separated from the semi-natural woodland fringing the Shimna River by a footpath.	1.18	5
Hardstanding	Comprises car parking areas, roads, and footpaths.	1.15	5
Dense/continuous scrub	Associated with unmanaged waste grounds, riverbanks, and woodland fringes across the site.	0.90	4
Semi-improved neutral grassland	A large parcel associated with Islands Park is likely managed for species diversity. A smaller parcel is located between the Shimna River and Tipperary Wood, within a canopy break of semi-natural woodland. Other areas of this habitat are associated with currently disused waste grounds along Bryansford Road.	0.75	3
Scattered scrub	Associated with semi-natural grasslands within waste grounds and tall ruderal/grassland fringes of river banks within the site.	0.52	2
Ephemeral/short perennial	Short patchy vegetation occurring on old spoil heaps, rubble, and hardstanding associated with disused/derelict waste ground.	0.33	1
Broadleaved plantation woodland	A small parcel of the habitat lies within Tipperary Wood. The parcel bounds the back of several residential properties, and is surrounded on other sides by mixed plantation woodland.	0.18	1
Poor semi-improved grassland	Located as narrow fringes along Shimna and Tullybrannigan rivers, separating the rivers from the adjoining amenity grasslands.	0.16	1
Fence*	Delimits private and public lands across the site.	0.04	<1
Wall*	Comprising an existing flood wall along the Burren River, and small stone/brick walls associated with gardens and properties boundaries.	0.03	<1
Tall ruderal	Located as narrow fringes along Shimna and Tullybrannigan rivers, separating the rivers from the adjoining amenity grasslands.	0.02	<1
Swamp	A small parcel of common reed fringes the Shimna River immediately west of where the Shimna flows under A2 Main Street.	0.02	<1
Buildings	Comprise a public toilet and a pavilion associated with tennis courts. Numerous residential buildings lie within the wider area.	0.02	<1
Dry ditch*	Forms the boundary delimited residential properties on Riverside Park with Tipperary Wood. Likely conveys water to the Shimna River during heavy rain.	0.01	<1
	Total:	*22.15*	*100*

(*) measures by length in metres (m)

All habitats identified during the survey are described in greater detail below. Habitats are presented in order of JNCC classification.

A1.1.1 Broadleaved semi-natural woodland

Parcels of native semi-natural woodland are present within the surveyed area, primarily forming a riparian corridor of both sides of the Shimna River, and along the Tullybrannigan River. The woodland corridor along the Shimna River contains numerous mature tree specimens in addition to many smaller, semi-mature or leggy trees. The woodland corridor overhangs the river to a degree, providing shading. A second, smaller parcel of semi-natural woodland fringes a path between Islands Park and the Bryansford Avenue, north of the scheme. An area of this woodland appears to have been recently cleared, in order to facilitate an allotment (Target Note 1, **Figure 9.3**). This parcel gives way to a small strip of amenity grassland with scattered trees at the roadside; the woodland shows no evidence of management, however the path is maintained. Canopy species in this parcel comprise beech, alder, whitebeam *Sorbus* sp., sycamore and willow, with an impenetrable understorey, composed primarily of bramble, cotoneaster, and cherry laurel, with occasional holly, dogwood and raspberry. The ground flora associated with the parcel is primarily ruderal in nature, with species such as common hogweed, common nettle, and cleavers dominating, with frequent ground-elder, woundwort, and foxglove.

A1.1.2 Broadleaved plantation woodland

A small parcel of this habitat lies within Tipperary Wood; it abuts the back of several properties along Riverside Park, and is surrounded by both coniferous and mixed plantation woodland. A dry ditch (J2.6) runs along the boundary with the properties; it is considered likely that this ditch fills with water during heavy rain, conveying water to the Shimna, and was only dry during survey due to recent dry weather conditions. Trees within the woodland were densely planted, however a woodland structure which is more semi-natural in character is developing. Aside from limited tree-felling primarily associated with the boundary at the adjacent properties, there appears to be no evidence of woodland management. Canopy species comprise whitebeam *Sorbus* sp., silver birch, downy birch, sycamore, Norway maple, and ash, with an understorey of beech, holly, bramble, rose *Rosa* spp., and elder. Ground flora varied throughout the parcel; under the canopy, the ground was largely bare and obscured by leaf litter, with occasional, localised patches of forbs, including bluebell, lords-and-ladies, ramsons, tutsan, wood fescue, and great wood-rush. At the periphery where the woodland meets the houses, the ground flora was more ruderal in nature (Target Note 2, **Figure 9.3**), associated with levels of disturbance, including fly-tipping of grass cuttings and tree felling, likely associated with the residential properties. An outflow pipe (Target Note 3, **Figure 9.3**) was noted, creating localised wet conditions. Species noted within ruderal ground flora included wild celery, common nettle, meadowsweet, wood avens, hart's-tongue fern, and cleavers.

A1.2.2 Coniferous plantation woodland

This habitat comprises the bulk of Tipperary Wood. Although dominated by conifer trees, there are several species of deciduous trees scattered throughout the wood, comprising an element of both canopy species and understorey. Trees within the woodland were densely planted, however a relatively good woodland structure is developing. Management within the woodland is limited, however it appears to be extensively used by the public, with walking and biking trails clearly defined throughout the habitat. The topography is largely flat throughout, however there are numerous, compact embankments throughout, potentially relic field boundaries indicative of historical agricultural use. Coniferous canopy species comprise Scots pine, common larch, hemlock spruce, and yew, with scattered deciduous trees including ash, sycamore, birch, Norway maple and localised beech. Where light permits, the trees have become densely covered in ivy. The understorey is composed of bramble, honeysuckle, dog rose, and regenerating trees, including hazel, holly, and cherry laurel. Ground flora varies throughout the woodland. The ground is bare where it is associated with paths, otherwise it is predominantly covered in ivy with localised patches of forbs including herb Robert, wood sorrel, enchanter's nightshade, dog violet, and bracken.

A1.3.1 Mixed semi-natural woodland

This parcel of woodland is bound by the Shimna River to the north, and the Bryansford Road to the east, and comprises a mixed woodland, 50/50 broadleaved and coniferous trees. A remnant stone wall (J2.5) delineates the woodland from the Bryansford Road. There is evidence of anti-social behaviour within the woodland, close to the Shimna River, with litter and evidence of fire noted during survey. There is currently disturbance along the periphery of the habitat, associated with housing development (Target Note 4, **Figure 9.3**); this has included some localised tree-felling, resulting in pockets of ruderal vegetation at the woodland periphery. Several fallen, dead trees were identified within the woodland. Other than this, there is no evidence of woodland management. Canopy species were dominantly densely planted, although there were several small areas of canopy break; species noted comprised Scots pine, ash, alder, beech, elm and sycamore. Similarly, the understorey was

dense in part and dominated by cherry laurel and rhododendron, with bramble, elder, holly, and rose. Ground flora cover varied throughout; where the understorey was dense, ground flora was completely obscured, and in other areas, ground flora was largely absent or dominated by ivy. Localised patches of ruderal forbs were present throughout, often associated with areas of disturbance. Ground flora species noted include ground-elder, common nettle, and ivy.

A1.3.2 Mixed plantation woodland

A parcel of mixed plantation woodland lies within Tipperary Wood, merging imperceptibly with the broadleaved and coniferous plantations to which it adjoins; as such, habitat boundaries (**Figure 9.3**) are indicative only. This habitat is similar in structure, nature, and species composition to its contiguous plantation woodlands, the primary difference being the mixed nature of conifer and deciduous canopy species. It is unclear whether this habitat has arisen through deciduous interplanting within the adjacent coniferous woodland, or opportunistic regenerating deciduous trees. Canopy, understorey, and ground flora species and structure do not differ from the contiguous woodland parcels. An additional parcel of mixed woodland is associated with the boundary of Islands Park, close to the Tullybrannigan River.

A2.1 Dense/continuous scrub

This habitat is present across the survey area, largely associated with unmanaged waste grounds, riverbanks, and woodland fringes across the site. Dense parcels of scrub are associated with the banks of the Shimna River and the boundaries of Islands Park to the north. Scrub composition varies; often the fringes of the parcels are low-growing bramble and rose, with more impenetrable willow, alder, and gorse scrub, often with regenerating sycamore trees.

A2.2 Scattered scrub

Scattered scrub is associated with semi-natural grasslands within waste grounds and the strips of tall ruderal vegetation/poor semi-improved grassland which fringe the river banks within the site.

A3 Scattered trees

This habitat types comprises broadleaved scattered trees (A3.1), coniferous scattered trees (A3.2), and parcels of mixed scattered trees. It also includes both broadleaved and coniferous treelines. Scattered trees are predominantly associated with Islands Park, and are planted within amenity grassland. The age of trees varies, with some saplings apparently recently planted, in addition to older trees present. Treelines present across the site are associated with woodland margins, for example providing screening to bounding properties in Tipperary Wood, and the boundaries where Islands Park meets adjacent residential properties. Smaller treelines are also associated with Burren and Tullybrannigan rivers. Species noted include alder, willow, Leyland cypress, ash, silver birch, oak, cherry, and Scots pine.

B2.2 Semi-improved neutral grassland

Several parcels of semi-improved grassland are located within the survey area. A large, circular parcel associated with the north of Islands Park is likely planted and managed as a wildflower meadow for species diversity. It is mounded, and has several paths mown throughout it, with an informational sign at the top. Relative to the surrounding habitat, this grassland is species-rich; graminoid species noted include Yorkshire fog, sweet vernal grass, common bent, and perennial ryegrass, with forbs including field scabious, purple loosestrife, wild carrot, yarrow, common knapweed, and ox-eye daisy. A smaller parcel is located between the Shimna River and Tipperary Wood, within a canopy break of semi-natural woodland which fringes the river. Other semi-natural grasslands noted within the survey area are associated with currently disused waste grounds along Bryansford Road; these have extensive amounts of scattered bramble, broom, buddleia, and gorse scrub (A2.2). As private land, these were not fully accessed, and surveyed from the pavement.

B6 Poor semi-improved grassland

Narrow strips of poor semi-improved grassland area are located along the Shimna and Tullybrannigan rivers, separating the rivers from the adjoining amenity grasslands. Due to the small size of these strips, they are not mapped in **Figure 9.3**. There is no evidence of management associated with these strips, as the amenity grassland is mown up to the boundary of the strips. Species noted within these fringes include Yorkshire fog, perennial ryegrass, false oat grass, broadleaf dock, ribwort plantain, red clover, common hogweed, and creeping buttercup. These areas often have associated scattered scrub, including bramble, rose, gorse, and broom. A circular mound of poor semi-improved grassland is associated with Islands Park to the south, and is similar to the semi-improved grassland mound

previously described under B2.2, in that it is likely planted and managed as a wildflower meadow with mown areas creating paths. It differs however in species diversity; it appears to be recently created, and is dominated by Yorkshire fog, with yarrow, broadleaf dock, and dandelion also present. The parcel may become more species-rich with further management.

C3.1 Tall ruderal

Similar to poor semi-improved grasslands, tall ruderal vegetation is located as narrow fringes along the Shimna and Tullybrannigan rivers, separating the rivers from the adjoining amenity grasslands (e.g. Target Note 5, **Figure 9.3**). Due to the small size of these strips, they are not mapped in **Figure 9.3**. There is no evidence of management associated with these strips, as the amenity grassland is mown up to the boundary of the strips. These areas often have associated scattered scrub, including bramble, rose, gorse, and broom. Species noted within these fringes include Yorkshire fog, perennial ryegrass, false oat grass, broadleaf dock, common hogweed, wild celery, common nettle, thistle, horsetail, pendulous sedge, hedge bindweed, woundwort, meadowsweet, rosebay willowherb and great willowherb.

F1 Swamp

A narrow stand of common reed *Phragmites australis* is present fringing a small strip of the Shimna River (Target Note 6, Figure 9.3). It is present as a single species stand of 2-3m wide.

G2 Running water

Running water within the survey area comprises the Shimna, Tullybrannigan, and Burren rivers, in addition to a smaller stream within Islands Park which adjoins the Tullybrannigan. Shimna River is the largest of these, with a wet width of approximately 20m, although on the day of survey this was much reduced to c. 2-3m (widening at weirs), likely as a result of recent dry weather. The river substrate is primarily substrate with occasional cobbles, with rock-armoured banks often in the form of gabion baskets. The water quality appears to be good. Overhanging trees from fringing woodland creates shading along much of the length. Flow rate during survey was slow, and with the exception of a single-species stand of common reed, no macrophytes or other emergent vegetation was noted. The Burren River enters Islands Park via a culvert under Bryansford Avenue, and meanders along the eastern boundary of Islands Park and adjacent residential housing. The earth river banks are steep and heavily vegetated with tall ruderal vegetation with scattered trees and scrub. The width and depth is variable along the length, approximately 2-3m wide. The Tullybrannigan River enters Islands Park under Bryansford Road. The flow rate during survey was slow, and no macrophytes or emergent vegetation was noted, although there was abundant reed canary-grass on the banks. Similar to the Burren River, the river banks are steep and mostly constructed from rock-filled gabion baskets which have become in most places heavily vegetated with a mosaic of tall ruderal vegetation and poor semi-improved grassland on the park side, and broadleaved woodland/dense scrub on the other side. The average width is c. 10m, and the water was cloudy, indicating pollution, and giving no indication of depth. The flow rate during survey was slow, and no macrophytes or emergent vegetation was noted.

J1.2 Amenity grassland

The dominant habitat on site, amenity grassland forms the bulk of Islands Park and comprises a species-poor, well maintained grass sward, regularly managed for amenity value. The sward is dominated by a typical mix of graminoid species for amenity grassland with limited forb species. The amenity grassland has numerous associated mixed scattered trees (A3.3) across the habitat; these trees are semi-mature and pruned and maintained for amenity value. Species noted include silver birch, alder, pedunculate oak, Leyland cypress, and Scots pine.

J1.3 Ephemeral/short perennial

Two parcels of this habitat were identified in proximity to the scheme area. The larger of the two lies within a waste ground bound by the Shimna River and the Bryansford Road (Target Note 7, **Figure 9.3**). The waste ground was previously developed land, and the remains of a former building lie adjacent to the short patchy vegetation, which dominates the rubble, and spoil substrate. There appears to be no current management within this habitat. The parcel could be viewed from the adjacent wooded bank, which rose over the waste ground; the parcel, which is private land, was not fully accessed. Species noted include ribwort plantain, red clover, broadleaf plantain, common fumitory, knapweed, pineapple mayweed, scarlet pimpernel, eyebright, red valerian, and horsetail. A small parcel of ephemeral/short perennial, lies associated with the hardstanding remains of a former property along the Bryansford Road (Target Note 8, **Figure 9.3**). The parcel was delimited by heras fencing, and was not accessed during survey.

J1.4 Introduced shrub

This category comprises several areas of landscaped shrub, associated with the car park at Islands Park. These comprise non-native, ornamental species and are well-maintained by pruning, providing low value for wildlife. Non-native, invasive species, are discussed below in Section 9.4.2.2 (Invasive species).

J2. Boundaries – hedgerows

A species-poor intact hedgerow composed of New Zealand privet *Griselinia littoralis* (J2.1.2) provides a boundary between Islands Park and Main Street, while a species-poor defunct hedgerow composed of Leyland cypress x *Cupressocyparis leylandii* (J2.2.2) delimited Islands Park from adjacent residential properties.

J2.4 Fence

Various types of fencing are present across the site, delimiting private and public lands. Other than occasionally providing a support for climbing plants, fences provide limited value for wildlife.

J3.6 Buildings

Buildings present within the survey area comprise a public toilet and a pavilion associated with tennis courts. Other buildings present in the vicinity of the scheme area are residential dwellings..

Hardstanding

Hardstanding is present within the survey area, comprising unmettled and mettled paths through the parks and woodlands, car parking areas, roads, and a playground. The habitat provides negligible value for wildlife.

9.4.2.2 Invasive species

Nineteen stands of three invasive species were identified within the surveyed area; these comprised 16 stands of Japanese knotweed *Fallopia japonica*, two stands of Giant knotweed *Fallopia sachalinensis*, and one stand of Himalayan knotweed *Persicaria wallichii*. These three species are similar in nature; knotweed can radiate up to seven metres from the parent plant and grow three metres below the ground. However, three metres laterally is accepted as a likely area of extent of rhizomes. These stands are detailed in Table 9.6. Indicative areas, including a 3m buffer around the stand, can be viewed in **Figure 9.4**.

Table 9.6: Invasive species identified within the site

Species and reference	Approximate area (m^2)	Stand description
Japanese knotweed **JK01**	647	Extensive stand along the Shimna River. The stand is not a continuous cover of knotweed, rather it is scattered throughout the woodland corridor, with growth particularly concentrated along the woodland fringe where there is most light; however stand is also growing within woodland despite shade. There appears to be no treatment, as stand is relatively healthy, especially where light permits. Growth reaching heights of 1-2m, however appears to be extensive disturbance and knotweed has been trampled and flattened in some parts of stand.

Species and reference	Approximate area (m^2)	Stand description
		
Japanese knotweed **JK02**	110	Stand on river bank which has been treated and cut.
		
Japanese knotweed **JK03**	436	Japanese knotweed forming a scattered stand within a woodland parcel and scrub vegetation, likely linked to the extensive stand along the Shimna corridor. There is evidence of treatment and new, low growth.

Species and reference	Approximate area (m^2)	Stand description
		
Japanese knotweed **JK04**	113	Japanese knotweed forming a stand along bank of Shimna River in Islands Park. Growing in a grassland fringe along the river and down to water's edge. New growth present, but stand has previously been treated.
		
Japanese knotweed **JK05**	83	On bank of Shimna River in amongst dense scrub. Plant height is c. 1-1.5m; there is no evidence of treatment.

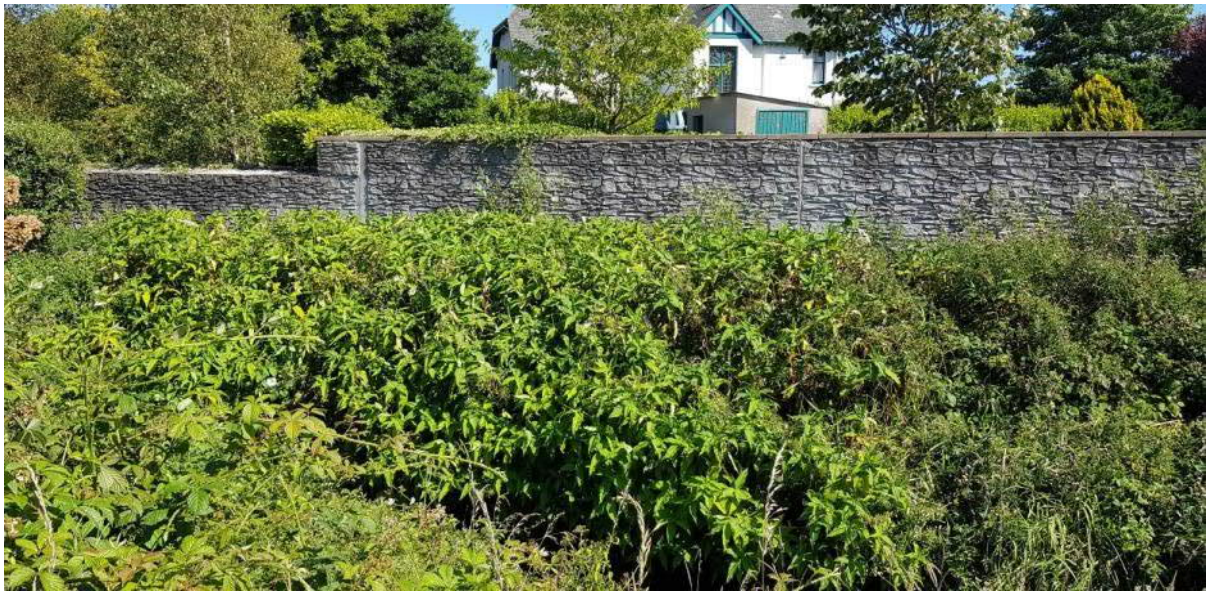
Species and reference	Approximate area (m^2)	Stand description
		
Japanese knotweed **JK06 - JK09**	4	Four scattered plants of Japanese knotweed growing within *Phragmites* swamp fringing the Shimna River, close to where the Burren River joins the Shimna.

Species and reference	Approximate area (m^2)	Stand description
		
Japanese knotweed **JK10**	18	Unhealthy looking stand along the Tullybrannigan River bank, located adjacent to footbridge. Maximum height is c. 1.5m, with stem diameter of 1-2cm. Appears treated; leaves are dried and discoloured. Located within a semi-improved grassland strip fringing river.
		
Japanese knotweed **JK11**	190	Extensive stand of dead canes at Bryansford Road roadside, with some new and stunted growth. Likely treated, evidenced by lack of other vegetation in bulk of stand. Stand extends further along river bank where there is more evidence of treatment, with extensive regrowth of scattered single stems, however there are some more mature areas of growth along bank, often growing under shade, where there appears to be no evidence of management. Stand also

Species and reference	Approximate area (m^2)	Stand description
		extends and is scattered in waste ground adjacent, to the north. Some plants along the roadside, and several scattered plants within the grassland and scrub parcel. Unclear as to the extent of treatment due to land ownership.
		
		
Japanese knotweed **JK12**	4	Small stand of about 10 stems growing along the riverbank amongst other vegetation.

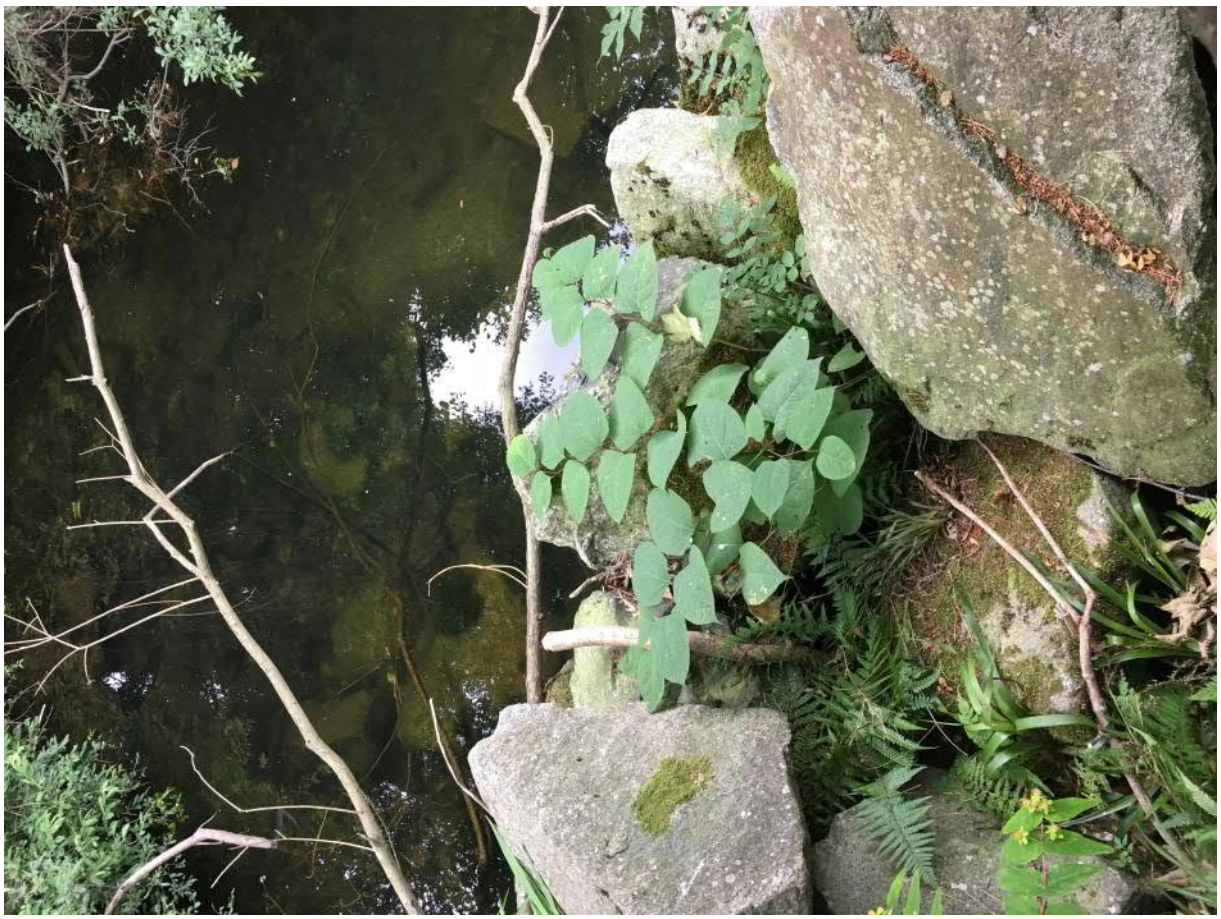
Species and reference	Approximate area (m^2)	Stand description
		
Giant knotweed **JK13**	5	Giant knotweed on Shimna River bank. Collection of low-growing individual stems >1m in height with 1cm stem diameter. Probably disturbed and trampled due to human activity; no evidence of treatment noted.
		
Japanese knotweed **JK14**	10	Present along the woodland fringe at the bank boundary of a property adjoining Tipperary Wood. Covering an area of c. 10m^2, the plants are scattered and there is evidence of growth associated with fly-tipping including loose crowns on ground surface. Dead canes are present, with new low growth of <1m in height, with 1cm stem diameter. Stand is possibly treated.

Species and reference	Approximate area (m^2)	Stand description
		
Japanese knotweed **JK15**	2	Small stand of healthy growth, height of c. 1.5m, and 1cm cane diameter. No evidence of treatment. Adjacent to boundary fence on woodland fringe, some dead canes from previous year.
		
Japanese knotweed **JK16**	52	Stands of Japanese knotweed on both sides of Burren River. On the Islands Park side, the stand is low growing (<1m height) and scattered along banks. Mainly growing within the grass/ruderal fringe of the river, but is encroaching into the amenity grassland - as a result, it is likely mowed during the grassland management. Stand appears treated, and some areas of the stand are devoid of other vegetation. The stand on the other bank is taller (c. 1m tall) and is obscured among other vegetation, showing no signs of management.

Species and reference	Approximate area (m^2)	Stand description
		
Himalayan knotweed **JK17**	209	Extensive stand of Himalayan knotweed along Burren River. Indicatively mapped as stand is located to the front of and abutting the flood defence wall, along the steep river bank. Inaccessible to fully assess, but plant heights >1m tall. Mixed with ruderal vegetation on steep bank, no evidence of treatment.
		
Japanese knotweed **JK18**	2	Small stand of c. $2m^2$ within waste ground adjacent to riparian corridor along Shimna River; not able to fully access so area is indicative. Height of plant is c. 1-2m; stand is located within scrubby vegetation and no evidence of treatment apparent.

Species and reference	Approximate area (m^2)	Stand description
		
Giant knotweed	8	Scattered plants covering approximately $8m^2$. Height of c. 1-1.5m, no evidence of treatment.

JK19



Species and reference	Approximate area (m^2)	Stand description

9.4.2.3 Otter

The site, including the Shimna, Burren, and Tullybrannigan rivers, and suitable terrestrial woodland habitat, was fully searched for evidence of otter. Evidence of otter was identified along the Shimna and Tullybrannigan rivers. This comprised one layup, spraints, and slides. Slides were noted along both Shimna and Tullybrannigan rivers; however due to the high level of human activity in Islands Park i.e. dog walkers, it is possible that these slides are attributable to dog. Indeed, dogs were noted swimming in the rivers during surveys. Evidence identified directly attributable to otter, including anecdotal information gleaned from members of the public, is detailed in Table 9.7, and presented in **Figure 9.5**.

Table 9.7: Otter evidence identified during surveys

Reference	Evidence	Description
OT01	Layup	Layup identified behind a rock in the rock armour of Shimna River with an old spraint near entrance.

Reference	Evidence	Description
		
OT02	Spraint	Two recent old spraints on rock, in rock weir in Shimna River.

Reference	Evidence	Description
		
OT03	Spraint	Two spraints on a rock within Shimna River, close to bridge at Bryansford Road; a recent spraint and an old spraint.
OT04	Spraint	One old spraint on a rock in the Shimna River.
		

Reference	Evidence	Description
OT05	Spraint	One old and three recent spraints on the rock weir in the Shimna River.

OT06	Spraint	Old spraint on rock along Shimna River bank.

OT14	Sighting	Anecdotal evidence of otters regularly seen commuting along Shimna River and a holt along small tributary was described by several dog-walkers. No further detail was given (e.g. dates).

9.4.2.4 Badger

The site was searched for badger evidence. Evidence of badger presence (digging, snuffle holes) was identified at two locations within Tipperary Wood. No other evidence of badger was identified. No badger setts were identified during surveys. Anecdotal evidence of a badger sett was given by a local landowner; the sett is located in the banked area around the edge of Tipperary Wood. The sett falls well outside both the survey area, and the zone of influence for badger; due to this, and the sensitive nature of badger sett locations, a location has not been supplied. Evidence of badger identified during survey, including anecdotal information gleaned from members of the public, is presented in **Figure 9.5**.

9.4.2.5 Bats

A preliminary ground level roost assessment was conducted on all trees within the site, with particular focus on those to be felled and which border the scheme area. Applying the BCT criteria (Collins, 2016), these preliminary surveys identified four trees as having Moderate suitability to host a bat roost.

Trees assessed as having Moderate suitability for roosting bats within or close to the footprint of the scheme during ground level assessment surveys, were identified as requiring a tree climbing survey to inspect PRF identified. Tree-climbing surveys were conducted on four trees, and resulted in a re-categorisation of suitability to roosting bats. A summary of these findings is presented in Table 9.8 and the locations of Moderate trees presented in **Figure 9.5**.

Table 9.8: PRF inspection survey results.

Tree reference	Previous bat roost suitability	Species	Climber	Feature ID	Description	Bat roost suitability (of feature)	New bat roost suitability (of whole tree)
T01	**Moderate**	Ash	MN	(i)	Small knot hole, horizontal c.10cm deep 3cm wide, vertical 3cm deep 2cm wide. Horizontal crevice wide with flat platform at the back. Suitable space for birds. No sign of bats but the vertical space could be suitable.	Low	**Low**
				(ii)	Large knot hole, slightly upward facing. Crevice 6cm wide, 6cm deep in both directions. One side is full of cobwebs.	Low	
				(iii)	Knot hole on branch overhanging the road. Very small entrance, not considered suitable.	Not fully assessed for safety reasons	
T02	**Moderate**	Alder	EBo	(i)	Knot hole on south side of main stem 3.5m above the ground open from above, then forks into two branches. First fork, 10cm wide hollow and open from above. Not considered suitable.	Negligible	**Moderate**
				(ii)	Second fork, 10cm wide hollow extending 1.5m upwards where it narrows. No evidence of bats.	Moderate	
				(iii)	West-facing branch from main stem. Broken branch facing upward, 4-5cm deep. Not considered suitable.	Negligible	
				(iv)	Second main stem, first branch, 3.5 m high. Upward facing, tear out with lifted bark. Large hollow space with bird droppings, and a solid bottom platform. Not considered suitable.	Negligible	
				(v)	Main stem, upper large fork, south-east facing. Tear out upward facing but narrows internally.	Low- Negligible	
T03	**Moderate**	Alder	EBo	(i)	Broken branch with one chamber, 12cm deep, 5cm+ wide with evidence of nesting birds. Not considered suitable.	Negligible	**Low-negligible**
				(ii)	Broken branch overhanging fence. Upward facing, not deep. Not considered suitable.	Negligible	

Tree reference	Previous bat roost suitability	Species	Climber	Feature ID	Description	Bat roost suitability (of feature)	New bat roost suitability (of whole tree)
				(i)	Hazard beam at 12m, 3-4cm deep, full of leaves and cobwebs. Space suitable for 1-2 bats.	Low	
T04	**Moderate**	Scots pine	MN	(ii)	Hazard beam at 10m. Lower section exposed. Two layers, 1cm wide, 10cm deep. Second section 5cm+ wide, 14cm deep.	Moderate	**Moderate**
				(iii)	Knot hole, 5cm+ wide, with vertical space extending only 2cm. Not considered suitable.	Low	

9.4.2.6 Red Squirrel

Four red squirrel surveys were carried out over a two-week window across all suitable habitat within the survey area for red squirrels, during suitable weather conditions. During the surveys no red squirrels were visually observed, and no dreys were identified within the surveyed area. Nibbled cones were identified on the woodland floor; however, it is not possible to distinguish between the feeding remains of red squirrel and grey squirrel *Sciurus carolinensis*. Grey squirrels were sighted during survey within the grounds of a property adjacent to Tipperary Wood.

Anecdotal evidence of red squirrel sightings was given by members of the public. Two sightings were from Tipperary Wood; one member of the public reported seeing red squirrels both within the wood, and in his garden which is adjacent to the woodland, whilst another member of the public reported seeing red squirrels with squirrel pox, and grey squirrels in Tipperary Wood. A third piece of anecdotal evidence is a report of a red squirrel within Islands Park, close to the Bryansford Road. Indicative locations of squirrel evidence, including anecdotal information, are shown in **Figure 9.5**.

9.4.2.7 Breeding birds

During breeding bird surveys, a total of 471 observations of 41 species were made. Fourteen species of conservation concern for breeding in Ireland, as listed in Birds of Conservation Concern in Ireland 2014–2019 (Colhoun and Cummins, 2013) were recorded on the site during the survey period. Three species are Red listed and are of High Conservation Concern, whilst eleven of the species are Amber listed, of Medium Conservation Concern.

Eleven species of bird were identified as breeding in the June survey, comprising 39 breeding individuals; this included five goldcrest, an Amber listed species. Eight species of bird were identified as breeding in the July survey, comprising of 33 breeding individuals. This included one robin, an Amber listed species. All other breeding individuals identified during survey are Green listed.

Seventeen herring gull, fifty-seven black-headed gull, and four grey wagtail were recorded on the site during the survey period. These are all Red listed species for breeding, and even though they were not recorded displaying breeding behaviours at the time of survey, may exploit suitable breeding habitat within the survey area. Full details of the species observed are detailed in Table 9.9, along with the relevant BTO code, and their conservation status in Ireland (Colhoun and Cummins, 2013). Breeding bird survey results are also indicatively shown in **Figure 9.6.1 & 9.6.2**.

Table 9.9: Results of the breeding bird surveys including conservation importance of each species

BTO Code	Species	Scientific name	Irish Conservation Status	Breeding		Non-breeding	
				June	July	June	July
B.	Blackbird	*Turdus merula*	Green	0	0	5	5
BC	Blackcap	*Sylvia atricapilla*	Green	5	1	0	5
BH	Black-headed gull	*Chroicocephalus ridibundus*	Red	0	0	0	57
BT	Blue tit	*Parus caeruleus*	Green	0	11	0	8
BF	Bullfinch	*Pyrrhula pyrrhula*	Green	0	0	2	0
CH	Chaffinch	*Fringilla coelebs*	Green	0	0	5	7
CC	Chiffchaff	*Phylloscopus collybita*	Green	2	0	0	0
CT	Coal tit	*Parus ater*	Green	8	0	3	2
CD	Collared dove	*Streptopelia decaocto*	Green	1	2	2	1
D.	Dunnock	*Prunella modularis*	Green	2	0	0	0
DI	Dipper	*Cinclus cinclus*	Green	0	0	0	2

BTO Code	Species	Scientific name	Irish Conservation Status	Breeding		Non-breeding	
				June	July	June	July
GC	Goldcrest	*Regulus regulus*	Amber	5	0	10	8
GO	Goldfinch	*Carduelis carduelis*	Green	0	4	5	2
GT	Great tit	*Parus major*	Green	5	0	3	5
H.	Grey heron	*Ardea cinerea*	Green	0	0	1	1
GL	Grey wagtail	*Motacilla cinerea*	Red	0	0	4	0
HG	Herring gull	*Larus argentatus*	Red	0	0	7	10
HC	Hooded crow	*Corvus cornix*	Green	3	0	5	4
HM	House martin	*Delichon urbicum*	Amber	0	0	7	10
HS	House sparrow	*Passer domesticus*	Amber	0	0	8	4
JD	Jackdaw	*Corvus monedula*	Green	0	0	1	2
J.	Jay	*Garrulus glandarius*	Green	0	0	1	0
KF	Kingfisher	*Alcedo atthis*	Amber	0	0	1	0
LB	Lesser Black-backed Gull	*Larus fuscus*	Amber	0	0	1	6
LR	Lesser redpoll	*Carduelis cabaret*	Green	0	0	1	1
LT	Long-tailed Tit	*Aegithalus caudatus*	Green	8	0	0	0
MG	Magpie	*Pica pica*	Green	0	0	8	7
MA	Mallard	*Anas platyrhynchos*	Green	0	0	17	6
OC	Oystercatcher	*Haematopus ostralegus*	Amber	0	0	0	3
PW	Pied wagtail	*Motacilla alba*	Green	0	0	2	3
R.	Robin	*Erithacus rubecula*	Amber	0	1	5	3
RO	Rook	*Corvus frugilegus*	Green	0	0	7	0
ST	Song thrush	*Turdus philomelos*	Green	0	0	0	1
SG	Starling	*Sturnus vulgaris*	Amber	0	0	0	0
SH	Sparrowhawk	*Accipiter nisus*	Amber	0	0	1	0
SL	Swallow	*Hirundo rustica*	Amber	0	0	3	1
SI	Swift	*Apus apus*	Amber	0	0	20	10
WH	Common whitethroat	*Sylvia communis*	Green	1	0	0	0
WP	Woodpigeon	*Columba palumbus*	Green	0	5	16	10
WR	Wren	*Troglodytes troglodytes*	Green	4	8	8	2
WW	Willow warbler	*Phylloscopus trochilus*	Green	0	1	0	1
			Total:	**49**	**33**	**197**	**192**

9.4.2.8 Fisheries and Aquatic Ecology

Fisheries and aquatic ecology are dealt with in, Section 15 of this ES.

9.4.2.9 Other protected species

The Shimna River provides suitable habitat for commuting and foraging kingfisher. It is considered that the habitat within the survey area is unsuitable for kingfisher burrows, both due to high levels of

disturbance from anthropogenic activity (e.g. dogs), and extensive rock armouring along the river banks (kingfisher require earth banks); indeed, no kingfisher burrows were identified. It is likely that there is suitable habitat for kingfisher burrows further upstream. There is suitable habitat within the site for pine marten, however despite thorough searches of habitat during Phase 1 Habitat, badger, and otter surveys, no evidence of pine marten was identified within the survey area. There is suitable terrestrial habitat for smooth newt, however there is no breeding habitat recorded within the wider survey area. There is limited suitable habitat within the site for other protected species, such as common lizard and smooth newt. These will therefore not be considered further in this section.

9.4.3 Summary of significant ecological features

As per the impact assessment methodology in Section 9.3, significant ecological features are considered to be those valued at 'Local Importance (Higher Value)' or higher. Ecological features valued at Local Importance (Lower Value) or of negligible value are not considered significant features and are not carried forward for impact assessment. Table 9.10 summarises all significant ecological features identified within the ZoI of potentially significant impacts.

Table 9.10: Evaluation of significant ecological features.

Features		Highest ecological valuation within ZoI	At risk of likely significant effects?	Significant ecological feature?
Designated sites	European sites (SAC, pSPA)	International	Yes	Yes
	National sites (ASSI)	National	Yes	Yes
	Non-statutory sites (SLNCI)	County	Yes	Yes
Habitats and flora	A1.1.1 Broadleaved semi-natural woodland	Local (Higher value)	Yes	Yes
	A1.1.2 Broadleaved plantation woodland	Local (Higher value)	Yes	Yes
	A1.2.2 Coniferous plantation woodland	Local (Higher value)	Yes	Yes
	A1.3.1 Mixed semi-natural woodland	Local (Higher value)	Yes	Yes
	A1.3.2 Mixed plantation woodland	Local (Higher value)	Yes	Yes
	A2.2 Scattered scrub	Local (Higher value)	Yes	Yes
	A3.3 Mixed scattered trees	Local (Higher value)	Yes	Yes
	B2.2 Semi-improved neutral grassland	Local (Higher value)	Yes	Yes
	B6 Poor semi-improved grassland	Local (Higher value)	Yes	Yes
	C3.1 Tall ruderal	Local (Higher value)	Yes	Yes
	F1 Swamp	County	No	No
	G2 Running water	County	Yes	Yes
	J1.2 Amenity grassland	Local (Lower value)	Yes	No
	J1.3 Ephemeral / short perennial	County	Yes	Yes
	J1.4 Introduced shrub (excluding invasive species)	Local (Lower value)	No	No
	J2.1.2 Species-poor intact hedgerow	County	No	No
	J2.2.2 Species-poor defunct hedgerow	County	No	No

Features		Highest ecological valuation within ZoI	At risk of likely significant effects?	Significant ecological feature?
	Invasive species	Regional	Yes	Yes
Fauna	Otter	County	Yes	Yes
	Badger	Local (Higher value)	Yes	Yes
	Bats	County	Yes	Yes
	Red squirrel	County	Yes	Yes
	Breeding birds	Local (Higher value)	Yes	Yes
	Kingfisher	Local (Higher value)	Yes	Yes
	Non-breeding birds	Local (Lower value)	Yes	No
	Pine marten	Local (Higher value)	Yes	Yes

Note: If a feature is not significant, it will not be carried forward to impact assessment.

9.5 Predicted Impacts

9.5.1 Do-Nothing scenario

In the absence of the Proposed Scheme, no significant changes in habitats or habitat condition are likely to occur under the current regime of parkland management for amenity purposes and woodland. Trees and woody vegetation would further mature to provide greater suitability for bats and breeding birds respectively. The potential value of the subject lands to species of conservation value such as badgers, otter, red squirrel, and birds would continue, provided that the current landscape management of parkland (of relatively low intensity) was maintained. Current threats to mobile fauna species visiting the subject lands would continue, and / or be exacerbated by future developments including those identified in Section 9.8. Examples of existing and / or future threats to ecological receptors occurring in the absence of the Proposed Scheme include disturbance to species from recreational use in the area, disturbance/destruction of otter habitat due to localised flooding of the rivers, and loss, fragmentation, or deterioration of bat and bird foraging and/or roosting habitats from residential refurbishments and other developments in the vicinity of the site.

9.5.2 Introduction to types of impacts

The Proposed Scheme could have a range of potential impacts upon significant ecological features during its construction and / or operation phases. A distinction is often made between direct and indirect impacts. Direct impacts occur where the changes to an ecological feature are directly attributable to an action associated with a given development, such as habitat loss. Indirect impacts usually arise as a ‘knock-on’ effect of a development, and would include aspects such as disturbance to bat activity as a result of habitat loss.

9.5.2.1 Construction phase

In the absence of mitigation measures, construction phase impacts have the potential to disturb a range of habitats and protected species throughout the construction programme. Significant potential impacts to biodiversity from the Proposed Scheme include habitat loss, noise and visual disturbance to hibernating, breeding, or foraging populations of fauna species, and the potential for suspended solids, oils, fuels, paints, or other contaminants to be carried into watercourses, particularly following topsoil stripping. A number of factors influence the potential significance (of impacts) including the particular features affected, the time of year when potential impacts occur, and the potential for unforeseen events such as extreme weather, or spread of invasive species into areas where they were not present pre-construction. A summary of the potential construction phase impacts is provided in Table 9.11.

Table 9.11: Potential construction phase impacts

Potential Impact	Duration	Direct (D) or Indirect (I)	Potential significance of impacts from proposed scheme alone
Physical damage / disturbance to breeding or resting sites of protected species (e.g. otter layup)	Difficult to predict duration of population-scale impacts, due to absence of scientific data for many protected species.	Both D & I (e.g. indirect disturbance from vibration)	Depends on the ecological value and estimated population sizes of protected species using habitats subject to disturbance.
Spread of invasive species	Medium to long-term, subject to control implementation / success.	Both D & I	Varies subject to habitats affected.
Noise and visual disturbance to protected species	Temporary to short-term.	D	Typically limited to local levels unless there are particularly sensitive features present (e.g. breeding or resting sites of European Protected Species such as bats, otter, certain birds, or nest sites of birds of prey sensitive to human disturbance etc.).
Disruption or displacement of protected species commuting routes	Temporary to short-term.	D	Varies subject to habitats affected.
Water quality impacts to aquatic features	Temporary to short-term.	I	Typically limited to local levels where a CEMP is implemented.
Air quality and dust deposition impacts to habitats	Temporary to short-term.	I	Typically limited to local levels where a CEMP is implemented.

9.5.2.2 Operation phase

Operational impacts consider the future impacts of the Proposed Scheme throughout its lifetime. Operation phase impacts include the habitat loss required to facilitate the scheme. Potential impacts to ecological receptors are most significant throughout the initial years of operation prior to the re-establishment and growth of removed vegetation, and regeneration of lost habitats, before the establishment of breeding and/or non-breeding populations of protected species in areas which have been disturbed or displaced. A summary of the types of potential operational phase impacts at the Proposed Scheme site are outlined in Table 9.12.

Table 9.12: Types of potential operation phase impacts

Type of Potential Impact	Duration	Direct (D) or Indirect (I)	Potential significance of impacts from proposed development alone (inherent mitigation in place)
Habitat damage and loss, and potential severance of habitat connectivity	Medium-term to permanent, depending on establishment time and provision (if any) of landscape planting.	D	Depends on ecological value of the habitat, the area of habitat lost, whether it is a temporary or permanent loss, and whether the habitat can be restored or recreated (compensated).
Spread of invasive species	Medium to long-term, subject to control implementation / success.	D / I	Varies subject to habitats affected.

9.5.3 Potential construction phase impacts

9.5.3.1 Sites with statutory designations for nature conservation

European sites
The Proposed Scheme does not overlap with or adjoin any European sites. There are, however, three European sites, namely Murlough SAC, Eastern Mournes SAC, and Carlingford Marine pSPA, which are potentially relevant to the Proposed Scheme due to hydrological links with the Shimna and Tullybrannigan River. Murlough SAC and Carlingford Marine pSPA both lie downstream of the Proposed Scheme, and are hydrologically linked via Shimna and Tullybrannigan rivers. Pollution or silt laden runoff from the site could potentially enter European sites via the Shimna River. Murlough SAC is designated for numerous Annex I habitats and marsh fritillary butterfly *Euphydryas aurina* as an Annex II species, while Carlingford Marine pSPA is designated for breeding and migratory waterfowl which depend on the lough for feeding and roosting. Any impact on water quality could cause a negative effect on breeding success / winter feeding of selection feature bird species by affecting ability to feed. Eastern Mournes SAC is upstream of the Proposed Scheme, and hence it is considered that the impact pathway between Eastern Mournes SAC and the scheme is not valid. An Appropriate Assessment (AA) Report has been prepared by AECOM on behalf of Department for Infrastructure to inform their determination as Competent Authority as to whether the Proposed Scheme could have likely significant effects on any European sites, both considering the proposed development alone and other plans and projects. It has concluded that with the mitigation measures in place, the construction of the flood defence walls would not significantly impact the selection features of any of the European Sites in the vicinity or beyond.

Nationally designated sites
There are four ASSIs, namely Shimna River ASSI, Murlough ASSI, Eastern Mournes ASSI, and Mournes Coast ASSI, which are potentially relevant to the Proposed Scheme. The scheme falls within Shimna River ASSI, which is designated for physical features of the river, naturalness of riverbanks and channels, associated riverine flora and fauna. Potential construction phase impacts on Shimna River ASSI comprise water quality impacts, which could cause a negative effect on aquatic features such as salmonid fish. Additional impacts include deposition of dust on foliage of associated riverine habitats, and disturbance of protected species via noise and vibration. Mournes Coast ASSI and Murlough ASSI are downstream of the Proposed Scheme. Pollution or silt-laden runoff from the site could potentially enter either of the ASSIs via the Shimna and Tullybrannigan rivers. Both of these sites are designated for habitats and fauna, including for overwintering wildfowl and waders and seabirds. Any impact on water quality could cause a negative effect on such species. Similar to Eastern Mournes SAC, Eastern Mournes ASSI is upstream of the Proposed Scheme, and hence it is considered that the impact pathway between Eastern Mournes ASSI and the Proposed Scheme is not valid. Such impacts on nationally designated sites are reversible in the medium-term and are anticipated to last for the duration of the construction phase. Impacts could be significant at a National geographic scale.

9.5.3.2 Sites with non-statutory designations for nature conservation

Two contiguous SLNCIs, named Shimna and Trassey Rivers, overlap the Proposed Scheme and are designated for river and woodland habitat. Potential construction phase impacts on these SLNCIs comprise negative water quality impacts and deposition of dust on foliage of associated riparian woodland habitats. Such impacts are reversible in the medium-term and are anticipated to last for the duration of the construction phase. Impacts could be significant at a County geographic scale.

9.5.3.3 Habitats (including invasive species)

Water pollution
The Proposed Scheme is in proximity to the Shimna River, and along the banks of the Tullybrannigan River. During construction there is an increased risk of pollution events due to construction, traffic and plant movement, accidental spillages, deposition of dust and other sediments, and runoff associated with construction activities.

A piling platform would be installed in the Tullybrannigan River (c. 140m in length) in order to install the flood wall on the river's northern bank. The piling platform would be filled with well-compacted, stabilised, clean granular material, and would result in a temporary river channel of approximately half

the width of the Tullybrannigan River. In the absence of mitigation, such activities could result in negative impacts to water quality. Such impacts would only occur for the duration of the construction period, and are reversible in the medium to long-term, depending on the extent of pollution events. Impacts could be significant at a County geographic scale.

Spread and impacts of invasive species
The advent of plant movement, increase of traffic, access on and off site during construction, and activities which would occur during construction, such as soil stripping, earth movement, and vegetation clearance, may result in the spread of invasive species which are known to be present on the site. All three invasive species (Japanese, Himalayan, and Giant knotweed) present within the site may radiate up to 7 m laterally from the parent plant, hence 7 m around stands is the possible risk area for spreading such species. The physical spread of invasive species could potentially occur as a short-term event, lasting for the duration of the construction period, however impacts of invasive species themselves on habitats may be medium to long-term, depending on the implementation and success of control measures. Impacts of invasive species on habitat include outcompeting of native flora, resulting in dense stands of knotweed. Impacts could be significant at a Local geographic scale.

Air quality and deposition of dust
Construction phase impacts on habitats comprise the negative impact of dust deposition and reduced air quality. Throughout the site, there is the potential to damage trees and other vegetation indirectly through the deposition of sediment on foliage, preventing the vegetation from functioning properly and may result in leaf shed or die-back. This is anticipated to be a short-term impact, only lasting for the duration of construction, and would only impact habitats during the growing season (loosely March to September). This would affect habitats within proximity of the construction and vegetation clearance areas. Deposition of sediment on foliage is reversible in the short-term, immediately following completion of construction or in wet conditions. Impacts could be significant at a Local geographic scale.

9.5.3.4 Protected species

Otter
One otter layup (i.e. resting place) was identified within the site and within the ZoI for otter. Numerous otter sprainting sites were identified, indicating use of the Shimna and Tullybrannigan rivers as commuting and foraging corridors by otter. In the absence of mitigation, construction phase impacts to otter include: potential destruction of a resting place due to vibration; disruption / displacement of otter by increased human presence, noise, vibrations, and fencing associated with site compounds and working areas; and injury or entrapment due to any unsecured open trenching / excavation pits. Potential impacts to otter in the absence of mitigation could be significant at a Local geographic scale for the duration of construction and a short-term period of time thereafter. Otter are active year-round; hence impacts to otter may occur year-round.

Badger
No badger setts were identified within the site or wider ZoI, although badger do forage and commute there. Anecdotal evidence of a sett in the wider area north of Tipperary Wood was received, and in addition, evidence of badger digging in Tipperary Wood was noted during survey. Construction phase impacts to badger include: disruption / displacement of badger by increased human presence, noise, vibrations, and fencing associated with site compounds and working areas; and injury or entrapment due to any unsecured open trenching / excavation pits. Potential impacts to badger in the absence of mitigation could be significant at a Local geographic scale for the duration of construction and a short-term period of time thereafter. Badger are active year-round, hence impacts to badger may occur at any time during construction.

Bats
Many trees within the site were identified as having Low suitability to host a bat roost; it is considered that such trees still have value in terms of roosting bats, even if they do not qualify for further survey. Where trees of Low suitability are retained, there is potential for machinery to compact roost systems of mature trees by driving over root protection zones, thus damaging trees and potentially disturbing roosting bats. Assuming bats may roost in Low suitability trees, further impacts may include disturbance to roosting bats through noise and vibration associated with construction. Whilst bats go into torpor during the winter months, trees are often used as hibernacula, and as such, bats may be considered to be “active” year-round, hence impacts to bats may occur at any time during

construction. Subject to the scale of bat population impacts which are difficult to quantify (and may not arise at all if bats are not present on the day trees are felled), the duration of these potential impacts could last from the short to medium-term. In the absence of mitigation, impacts could be significant at a Local geographic scale.

Red squirrel
No red squirrel-specific evidence was identified within the site or wider ZoI. However, anecdotal evidence of red squirrel sightings was received, and there are records of red squirrel in the area held by CEDaR. Ascertaining the presence of red squirrel during survey can be difficult; therefore it is assumed that red squirrel is present in the woodland. Construction phase impacts on red squirrel include: disruption / displacement of red squirrel by increased human presence, noise, and vibrations associated with site compounds and working areas; and injury or entrapment due to any unsecured open trenching / excavation pits. Potential impacts to red squirrel in the absence of mitigation could be significant at a Local geographic scale for the duration of construction and a short-term period of time thereafter. Red squirrel are active year-round, hence impacts to red squirrel may occur at any time during construction.

Breeding birds
No territories of birds of High Conservation Concern were identified within the survey area, whilst five individual goldcrest and one individual robin, both species of Medium Conservation Concern were noted displaying breeding behaviour. During the construction phase, birds may become displaced from the working areas and the immediate vicinity of the site as continuous disturbance from plant and personnel results in noise, vibration, and dust deposition. Potential impacts include disturbance and injury to adults and their eggs, young and nests, and could be significant at the Local geographic scale. Any impact to breeding birds is limited to the breeding season (considered to be March to August inclusive), however disturbance and displacement of birds can occur year-round. Subject to population-level impacts which are difficult to predict, duration of these potential impacts could last from the temporary (i.e. during construction phase) into the medium-term if seasonal mitigation is not implemented.

Fisheries and Aquatic Ecology
Impacts on fisheries and aquatic ecology are considered in (section 15 of this ES).

Other protected species
Kingfisher was noted during breeding bird surveys, however the species did not display any breeding behaviours. No burrows, or suitable habitat to contain burrows, were identified within either the Shimna or Tullybrannigan rivers; hence it is considered that there would be no impact to kingfisher burrows as a result of the construction phase of the Proposed Scheme. Other construction phase impacts which may affect kingfisher are the disruption or displacement of the species due to increased human presence, noise, vibrations, and general works taking place within or adjacent to suitable foraging habitat. Potential impacts to kingfisher could be significant at a Local geographic scale for the duration of the construction period. It is considered that the impact is reversible.

No evidence of pine marten was identified within the site or wider ZoI. There are, however, records held by CEDaR which suggests pine marten are present within the area. Assuming that pine marten are present, construction phase impacts include: disruption / displacement of pine marten by increased human presence, noise, vibrations, and fencing associated with site compounds and working areas; and injury or entrapment due to any unsecured open trenching / excavation pits. Potential impacts to pine marten, in the absence of mitigation, could be significant at a Local geographic scale for the duration of construction and a short-term period of time thereafter. Pine marten are active year-round, hence impacts to pine marten may occur at any time during construction.

9.5.4 Potential operation phase impacts

9.5.4.1 Sites with statutory designations for nature conservation

European sites
There are no potential operation phase impacts predicted that would impact any European site. This has been assessed through the Habitats Regulations Assessment process

Nationally designated sites
The site lies within the Shimna River ASSI; in order to facilitate the development, habitat clearance (including broadleaved semi-natural woodland and dense scrub) is required both within and bordering the ASSI boundary. Shimna River ASSI is designated, in part, for riverine habitats. Impacts associated with the operation phase on Shimna River ASSI comprise habitat loss, which includes the spread of invasive species. Shimna River ASSI covers an area of approximately 37.78 ha; the predicted habitat loss within the ASSI boundary is approximately 0.05 ha (0.1% of the total area of the ASSI), and comprises small pockets of broadleaved semi-natural woodland, dense/continuous scrub, and invasive species. This habitat loss is reversible in the medium to long-term, and would regenerate quickly from surrounding similar habitat. Potential impacts to national designated sites through habitat loss could be significant at a Local geographic scale. Invasive species, namely Japanese knotweed and Giant knotweed, are already present within and in proximity to, the boundary of Shimna River ASSI. Habitat clearance within 7 m of any plant of knotweed (both Japanese and Giant) may result in the further spread of the species within the ASSI. Invasive species have a deleterious effect on habitats, outcompeting native flora and reducing biodiversity; depending on the extent, impacts from spread of invasive species is reversible in the medium to long-term. Potential impacts to national designated sites through spread of invasive species could be significant at a Local geographic scale. There are no potential operation phase impacts predicted that would impact any other ASSI identified as potentially relevant to the Proposed Scheme.

9.5.4.2 Sites with non-statutory designations for nature conservation

The site lies within the Shimna and Trassey Rivers SLNCI (two contiguous SLNCI); in order to facilitate the scheme, habitat clearance is required both within and bordering the SLNCI boundary. Shimna and Trassey Rivers SLNCI is designated, in part, for river and woodland habitat. Impacts associated with the operation phase on Shimna and Trassey Rivers SLNCI comprise habitat loss, which includes the spread of invasive species. Shimna and Trassey Rivers SLNCI cover an area of approximately 63.6 ha; the predicted habitat loss within the SLNCI boundary is up to approximately 0.67 ha (1% of the total area of the SLNCI), and comprises small pockets of broadleaved semi-natural woodland habitat, dense scrub, amenity grassland, and invasive species. It should however be noted, that of the 0.67 ha of vegetation removal within the SLNCI, approximately 0.42 ha of this is amenity grassland associated with Islands Park. This habitat loss is reversible in the medium to long-term, and would regenerate from surrounding similar habitat. Potential impacts to national designated sites through habitat loss could be significant at a Local geographic scale. Invasive species, namely Japanese knotweed and Giant knotweed, are already present within and in proximity to, the boundary of Shimna and Trassey Rivers SLNCI. Habitat clearance within 7 m of any plant of knotweed (both Japanese and Giant) may result in the further spread of the species within the ASSI. Depending on the extent, impacts from spread of invasive species is reversible in the medium to long-term. In the absence of mitigation, potential impacts to non-statutory designated sites through spread of invasive species could be significant at a Local geographic scale.

9.5.4.3 Habitats (including invasive species)

Habitat loss
As a result of the Proposed Scheme, vegetation clearance is required across the site; habitat loss would facilitate the construction area of the flood wall itself, but also would facilitate contractor working areas and possible contractor compounds. Table 9.13 estimates areas of all habitats lost as a result of the Proposed Scheme. Potential habitat loss impacts would be greatest (in terms of geographic scale) in the case of broadleaved semi-natural woodland; these habitats were (with reference to the total resource within the ZoI of the Proposed Scheme) the only habitats collectively valued as of County importance. In terms of habitat clearance, broadleaf semi-natural woodland comprises approximately 12.5% of total habitat clearance, and pockets of semi-natural woodland would remain adjacent to areas cleared. Ample semi-natural woodland would remain in the vicinity of the site. This habitat loss is reversible in the medium to long-term (depending on the habitat in question), and would regenerate from surrounding similar habitat. The loss of broadleaved semi-natural woodland is assessed as significant at Local-County geographic scale, whilst all other potential habitat loss impacts are assessed at Local geographic scale.

Table 9.13: Estimated habitat loss to facilitate the Proposed Scheme (including vegetation clearance, potential site compounds, and contractor working areas)

Habitat type	Approximate area lost (ha)	Ecological value within ZoI	Potential scale of impact significance
A1.1.1 Broadleaved semi-natural woodland	0.22	County	Local-County
A1.1.2 Broadleaved plantation woodland	0.05	Local (Higher value)	Local
A1.2.2 Coniferous plantation woodland	0.17	Local (Higher value)	Local
A1.3.1 Mixed semi-natural woodland	0.09	Local (Higher value)	Local
A1.3.2 Mixed plantation woodland	0.14	Local (Higher value)	Local
A2.1 Dense scrub	0.14	Local (Higher value)	Local
B2.2 Semi-improved neutral grassland	0.02	Local (Higher value)	Local
C3.1 Tall ruderal	0.01	Local (Higher value)	Local
J1.2 Amenity grassland	0.92	Local (Lower value)	Local
Total:	***1.76***	*ha lost*	

Note: Habitats listed above include any scattered trees associated with that habitat.

Spread of invasive species

Japanese and Giant knotweed are both present within the site, whilst Himalayan knotweed is present within the wider survey area. Areas of habitat which would be lost to the scheme contain stands of invasive species. Habitat clearance within 7m of any plant of knotweed (both Japanese and Giant) may result in the further spread of the species within habitat across the site and wider area. Depending on the extent, impacts from the spread of invasive species is reversible in the medium to long-term. In the absence of mitigation, potential impacts to habitats within the site through spread of invasive species could be significant at a Local geographic scale.

9.5.4.4 Protected species

Otter

Potential impacts associated with the operation stage include the loss of otter commuting habitat and potential (terrestrial) breeding sites; otter breeding holts sometimes occur in woodland close to waterbodies/courses. These are notoriously difficult to identify. There is also the possibility of severance of habitat connectivity as a result of the proposed wall. The impact of habitat loss is considered reversible in the medium to long-term as some areas of lost habitat in the vicinity of the Shimna River regenerate, whilst possible habitat severance is a permanent impact. Otter are active year-round; hence impacts to otter may occur year-round. Potential impacts to otter in the absence of mitigation could be significant at a Local geographic scale for the duration of operation.

Badger

No badger setts were identified within the survey area, however there is anecdotal evidence of a badger sett in the wider Tipperary Wood area. Potential impacts associated with the operation stage include the loss of badger commuting and foraging habitat. There is also possibility of severance of this habitat connectivity as a result of the proposed wall. The impact of habitat loss is considered reversible in the medium to long-term as some areas of lost habitat regenerates during the operation phase, whilst possible habitat severance is a permanent impact. Badger are active year-round; hence impacts to badger may occur year-round. Potential impacts to badger in the absence of mitigation could be significant at a Local geographic scale for the duration of operation.

Bats

Two trees with Moderate suitability to host a bat roost would be felled in order to facilitate the Proposed Scheme. Furthermore, many trees within the site were identified as having Low suitability to host a bat roost; it is considered, therefore, that such trees still have value in terms of roosting bats, even if they do not qualify for further survey. Where trees of Low suitability are retained, there is potential for machinery to compact roost systems of mature trees by driving over root protection zones. Whilst bats go into torpor during the winter months, trees are often used as hibernacula, and as such, roosting bats may be considered to be “active” year-round. Subject to the scale of bat

population impacts which are difficult to quantify (and may not arise at all if bats are not present on the day trees are felled), the duration of these potential impacts could last from the short to medium-term. In the absence of mitigation, impacts on roosting bats could be significant at County geographic scale. Furthermore, the habitat loss associated with the Proposed Scheme may have indirect on bats, both by removing and disrupting/severing commuting and foraging habitat. Such an impact would only affect bats during activity period (spring to autumn), when conditions are suitable for bat activity. Such an impact is reversible in the medium-term, once vegetation has regenerated. Impacts of vegetation clearance on commuting and foraging corridors of bats could be significant at a Local geographic scale, as ample vegetation would be retained.

Red squirrel
Although no squirrel dreys were identified and no specific red squirrel evidence was identified during survey, they are assumed to be present within the site and wider area. Potential impacts associated with the operation stage include the loss of commuting and foraging habitat, and the loss of trees suitable as resting/breeding sites. The impact of habitat loss is considered reversible in the medium to long-term as some areas of lost habitat regenerates during the operation phase. Red squirrel are active year-round; hence impacts to red squirrel may occur year-round. Potential impacts to red squirrel in the absence of mitigation could be significant at a Local geographic scale for the duration of operation.

Breeding birds
Numerous bird species were noted across the site, many of which require woodland or scrub habitat for nesting; in the absence of mitigation, potential impacts include disturbance and injury to adults on nests, eggs, young and nests, and loss of potential nesting sites and foraging habitat. The impact of habitat loss is considered reversible in the medium to long-term, as some areas of lost habitat regenerate. No birds of High Conservation Concern were noted breeding within the site during surveys. Potential impacts could be significant at a Local geographic scale.

Fisheries and Aquatic Ecology
Impacts on fisheries and aquatic ecology are considered in Section 15 of this ES.

Other protected species
Whilst no evidence of pine marten was identified within the survey area, it is assumed that they are present. Potential impacts associated with the operation stage include the loss of pine marten foraging and commuting habitat and potential breeding sites; pine marten dens can comprise numerous features such as old bird nests, squirrel dreys, rock crevices, tree cavities, and log piles. The impact of habitat loss is considered reversible in the medium to long-term as some areas of lost habitat regenerate. Potential impacts to pine marten in the absence of mitigation could be significant at a Local geographic scale for the duration of operation. Pine marten are active year-round, and breed between in late summer, with kits born in March-April. Therefore, impacts to pine marten may occur at any time during operation. No potential operation phase impacts are anticipated that would impact any other protected species.

9.6 Mitigation measures

In this section, the minimum mitigation measures to be employed by the contractor during construction and operation are presented. Key themes underpinning the minimum mitigation requirements are:

- Pre-construction surveys for mammals to determine if any breeding or resting sites have become established in the period between baseline survey and works commencing, and warrant licensing supported by a mitigation plan; immediately prior to vegetation clearance (i.e. days leading up to clearance);
- Commission of an Ecological Clerk of Works (ECoW) to oversee and advise both contractors and site operators during times of major work within particularly sensitive habitats or particularly sensitive ecological windows (i.e. breeding bird season); and,
- Preparation and implementation of a Construction Environmental Management Plan (CEMP). As a minimum, the following mitigation measures must be included in the CEMP.

9.6.1 Identification of ecological constraints and recommendations

9.6.1.1 Approach to the identification of ecological constraints

Compliance with planning policy requires that the Proposed Scheme considers and engages the following mitigation hierarchy where there is potential for impacts on relevant ecological receptors:

i. Avoid features where possible;

ii. Minimise impact by design, method of working or other measures (mitigation) e.g. by enhancing existing features; and,

iii. Compensate for significant residual impacts, e.g. by providing suitable habitats elsewhere on the client-owned parts of the wider site (if applicable).

This hierarchy requires the highest level to be applied where possible. Only where this cannot reasonably be adopted should lower levels be considered. The rationale for the proposed mitigation and / or compensation should be provided with planning applications, including sufficient detail to show that these measures are feasible and would be provided.

There may be scope for ecological enhancement where existing habitat features could be improved or enhanced within the Proposed Scheme as designed, or with only minor amendment to the design of the scheme. The Wildlife and Natural Environment Act (Northern Ireland) 2011 (the WANE Act) places a statutory duty on public bodies to conserve biodiversity; as a public body, DfI has a duty to conserve biodiversity. DAERA has published a guidance document for public bodies, to assist them in fulfilling their biodiversity duty; this guidance document includes details of examples of best practice (DAERA, 2016), for example considering the needs of wildlife such as erecting bat boxes.

9.6.2 Sites with statutory designations for nature conservation

9.6.2.1 European and national sites

The Shimna River is both an ASSI and hydrologically linked to Murlough SAC and Carlingford Marine pSPA; the activities associated with the construction phase may cause impacts to these designated sites. Therefore during construction, to prevent potentially polluting discharge to the waterways, good practice drainage management would be implemented throughout the development process by the Contractor. Pollution Prevention Guidance –Standing Advice (DAERA Planning and Environment, 2016) and Discharges to the Water Environment – Standing Advice (DAERA Planning and Environment, 2017) must be adhered to, and suitably implemented into the CEMP, where relevant. Additionally, the following (if relevant) must be adopted and incorporated within the CEMP.

- Oil / fuel storage containers, must have a secondary containment system with 110% capacity to ensure that any leaking oil is contained and does not enter the aquatic environment.
- Oil interceptors may be required for refuelling areas; runoff from washing areas would contain detergents which may prevent oil interceptors from working correctly. Discharge from vehicle washing areas must be considered as trade effluent and therefore must discharged to fowl drainage system.
- During construction, any stockpiles of soil or overburden should be stored beyond 10m from the watercourses or protective features installed to prevent accidental sedimentation during prolonged rain events. Such features may include a bund or silt trap installed around the base of the stockpiles.
- Water to be discharged into the watercourse must be of sufficient quality to avoid pollution or siltation downstream.
- The installation of protective bunds along all watercourses and drains where possible, during construction will filter contaminants and prevent adverse runoff.
- In the case of vegetation clearance within an ASSI, any riparian stretch which is disturbed due to construction should have double that area (where possible) enhanced, upstream/downstream or both, so a net positive gain can be obtained. River habitat

restoration should include creation of riffles and pools and appropriate planting of bankside vegetation.

9.6.3 Sites with non-statutory designations for nature conservation

The Shimna River lies with Shimna and Trassey Rivers SLNCI. The same good practice recommendations as detailed above must be followed with regard to the SLNCI.

9.6.4 Habitats (including invasive species)

9.6.4.1 Habitats

Habitat loss should be kept to a minimum where possible. Vegetation clearance should be completed outside of the bird breeding season, or if this is not possible, then an ECoW should first check the area for ecological constraints, especially for nesting birds and roosting bats.

9.6.4.2 Invasive species

Japanese knotweed, Giant knotweed, and Himalayan knotweed are all invasive species listed under Schedule 9 part II under Article 15 of the Wildlife (Northern Ireland) Order 1985 (as amended). Article 15 of the Order states that "*if any person plants or otherwise causes to grow in the wild, plants which are included in Part II of Schedule 9, he shall be guilty of an offence*". The Order also states that persons must take all reasonable steps and must exercise due diligence to avoid committing an offence. In order to avoid breaking the law, steps for prevention of spread of the species must be implemented during construction and operation phases. A separate Invasive Species Management Plan for the scheme would be prepared and implemented during construction. It would be included as a sub-plan of the CEMP.

9.6.5 Protected species

9.6.5.1 Otter

Otters are a European protected species (EPS) and a Northern Ireland Priority Species. Development can cause disturbance or impact directly on their places of refuge or feeding areas. They are subject to a system of strict protection and are a material consideration during the planning process. They must be considered carefully for any scheme which has the potential to impact on them. Otter resting places (i.e. holts, layups) require a 30 m protection zone to protect otters from disturbance; no works of any kind including clearance of vegetation and storage of materials can take place within the protection zones, unless a licence has been issued permitting such activities. Only one otter resting place (a layup) was identified during the otter survey which was only accessible during low water periods, however it is possible that otter may establish new breeding or resting places prior to the scheme commencing. Therefore, a pre-construction survey for otter must be carried out within the proposed site and accessible environs within the ZoI (i.e. up to 150 m for natal holts) immediately prior to works commencing, to determine if any breeding or resting sites have become newly established since the surveys completed in summer 2018. Furthermore, in order to facilitate the Proposed Scheme, the relevant EPS licence must be acquired prior to any works within 30 m of the otter layup in the Shimna River. With regard to habitat loss, due to the limited nature of vegetation clearance in suitable terrestrial otter habitat, it is considered that there is ample suitable habitat for otter commuting and foraging, both within the site and the wider area. However, bearing in mind DfI's duty to conserve biodiversity under the WANE Act, any areas which are cleared of vegetation in order to facilitate temporary working areas or compounds should be reinstated with like-for-like native planting, thus minimising the impact of habitat severance and loss to otter.

The following mitigation must be adhered to avoid impacts on otter during the construction phase of the scheme:

- All works must be largely restricted to daylight hours, so as to cause as little disturbance as possible. The use of artificial lighting during the construction period should be limited and construction activities during hours of darkness should be avoided. Lighting should be kept to essential locations only, with the position and direction of lighting being designed to

minimise intrusion and disturbance to river corridors and their nature conservation value. Use of full cut-off lanterns would minimise light spillage onto adjacent areas;

- If noisy or large machinery is required within 30m of otter resting places, then use of such machinery must cease at least two hours before sunset;
- Drainage and attenuation ducts should restrict otter entry, and any temporary features which are liable to entrap wildlife should be covered or have a means of escape;
- Any excavation / trench must either be covered or fenced-off at the end of each working day. If this is not practicable, a means of escape for any animal which may fall in (e.g. mammal ladder or ramps) must be provided;
- Water sources which may be used by otter must be safeguarded (pollution guidance must be adhered to).

Post works, the site and wider area would continue to offer opportunities for future exploitation by otters.

9.6.5.2 Badger

Badger is a nationally protected species and they are susceptible to impacts from development such as disturbance or direct impacts on their places of refuge. They are therefore a material consideration during the planning process. There were no badger breeding or resting sites identified within the ZoI of the Proposed Scheme. However, badgers are present in the vicinity, and may establish new setts. Therefore, a pre-construction survey for badger must be carried out within the proposed site and accessible environs within the ZoI (i.e. 25 m) immediately prior to works commencing, to determine if any breeding or resting sites have become newly established since the surveys completed in summer 2018. With regard to habitat loss, due to the relatively limited nature of vegetation clearance in suitable badger habitat, it is considered that there is ample suitable habitat for badger commuting and foraging both within the site and the wider area. However, bearing in mind DfI's duty to conserve biodiversity under the WANE Act, any areas which are cleared of vegetation in order to facilitate temporary working areas or compounds should be reinstated with like-for-like native planting, thus minimising the impact of habitat severance and loss to badger. The mitigation presented in Section 9.6.5.1 is also relevant to badger.

9.6.5.3 Bats

All bats in Northern Ireland are EPS and some are Priority Species. They are subject to a system of strict protection and are a material consideration during the planning process. Development can cause disturbance to bats or impact directly on their places of refuge or feeding areas; therefore they must be considered carefully when determining any planning application which has the potential to impact on them. Two trees of Moderate suitability to host a bat roost, and numerous trees of Low suitability to host a bat roost would be felled in order to facilitate the scheme. It is an offence under the Conservation (Natural Habitats etc.) Regulations (Northern Ireland) 1995 (as amended) to damage or destroy a breeding site or resting place of such an animal, or deliberately disturb such an animal while it is occupying a structure or place which it uses for shelter or protection. Trees are often used opportunistically by bats in the summer as transient roosts, or in the winter as hibernacula. With this in mind, a suitable pre-construction survey (e.g. endoscoping under licence, emergence/re-entry survey) must be carried out immediately prior to felling, in order to inform a suitable mitigation strategy. In any case, to compensate for the loss of suitable roost sites, five no. woodcrete bat boxes suitable for bats of the *Pipistrellus* genus must be erected within the site, mounted on mature trees to be retained in areas away from disturbance and prior to work commencing on site. Bat boxes must be erected under the guidance of a suitably experienced ecologist / ECoW. With regard to habitat loss, due to the relatively limited nature of vegetation clearance in suitable bat habitat, it is considered that there is ample suitable habitat for bat commuting and foraging both within the site and the wider area. However, bearing in mind DfI's duty to conserve biodiversity under the WANE Act, any areas which are cleared of vegetation in order to facilitate temporary working areas or compounds should be reinstated with like-for-like native planting, thus minimising the impact of habitat severance and loss to the local bat population. Furthermore, bats are particularly sensitive to lighting, and mitigation regarding lighting mentioned in Section 9.6.5.1 is also relevant here.

9.6.5.4 Red squirrel

Red squirrel is a nationally protected species and they are susceptible to impacts from development such as disturbance or direct impacts on their places of refuge. They are therefore a material consideration during the planning process. There were no red squirrel dreys identified in the vicinity of the Proposed Scheme. However, despite a lack of survey evidence, red squirrel are known to be present in the vicinity, and may establish new dreys. Therefore, a pre-construction survey for red squirrel must be carried out within the proposed site immediately prior to works commencing, to determine if any breeding or resting sites have become newly established since the surveys completed in summer 2018. No further mitigation is recommended.

9.6.5.5 Breeding birds

Vegetation clearance must be restricted to the non-breeding season (i.e. carried out from September to February inclusive). For the avoidance of doubt, it should be noted that birds may nest in grass and low scrub, in addition to trees. Any vegetation clearance work which is required within the bird breeding season must be approved by a suitably experienced ecologist / ECoW, who will make a detailed check of any suitable vegetation for nests prior to vegetation / tree removal, and advise the contractor of any exclusion zones around potential or confirmed nests. As a result of the Proposed Scheme, there would be extensive loss of woodland and scrub nesting habitat. Therefore, a range of bird box styles, suited to various different species found on site are recommended to compensate for the loss of suitable nest sites. Bird boxes must be mounted on mature trees to be retained in areas away from disturbance and prior to work commencing on site. Artificial bird nesting boxes should be provided for in sufficient numbers for the receiving environment and should be installed at appropriate locations under the direction of a suitably experienced ecologist (e.g. on mature trees; orientated north or eastwards, away from prevailing winds; at a height to allow access and egress by flying birds; concealed from potential vandalism; and protected from light spill and incidental damage during construction or operation).

9.6.5.6 Fisheries and Aquatic Ecology

Mitigation measures for fisheries and aquatic ecology are considered in Section 15 of this ES.

9.6.5.7 Other protected species

Pine marten is a nationally protected species and is susceptible to impacts from development such as disturbance or direct impacts on their places of refuge. There was no evidence of pine marten within the site or wider area, however the species is assumed to be present, and may establish breeding dens in the interim period between baseline surveys and commencement of works. Pre-construction surveys as advised for badger, otter, and red squirrel, which are thorough and cover the site and surrounding zone of influence, can determine if any breeding or resting sites have become newly established since the surveys completed in summer 2018. No further mitigation is recommended.

9.7 Residual Impacts

This section should be read in conjunction with the summary tables of potential impacts in Section 9.9. With regard to designated sites, habitats, and protected species, assuming successful implementation of mitigation measures, residual impacts would be significant at Local level (or non-significant).

9.8 Cumulative Impacts

The cumulative impact of the proposed flood walls on the surrounding environment has been considered in relation to a number of plans and projects in the vicinity of the Scheme, including existing developments, permitted developments and developments for which planning has been applied, but not yet granted.

9.8.1 Planning application search

A search was conducted of planning applications within the vicinity of the Proposed Scheme, using the Planning Portal Northern Ireland website. The search was limited to the five-year period preceding the date of publication of this ES. Excluding withdrawn and refused applications, the following approved or proposed applications were identified as having potential to act in-combination with the Proposed Scheme:

- Numerous permissions granted to carryout minor works, such as adding extensions to existing properties;
- Consultations have been issued for a new bowling club pavilion adjacent to Castle Park; and,
- Permission has been granted, or consultations issued, for several new dwellings in the vicinity of the Proposed Scheme.

While it is considered unlikely that these developments would cause detrimental impacts by themselves, these developments are all within the vicinity of the Proposed Scheme, and, if works are taking place at the same time, can cause a cumulative effect on the local ecological environment. This can either be through noise or light pollution, vibration, or the extensive clearance of vegetation with the possibility of further fragmenting the existing habitats. There are further concerns due to the number of water bodies in the area and the current flood risk. Unstable ground from numerous developments may have the possibility to discharge soil into waterways, potentially polluting a SLNCI and with the possibility to travel hydrologically to other designated sites.

9.8.2 Local Area Development Plans

The current regional development strategy for Ards and Down, which became operative in 2009, follows strategic planning guidelines to conserve the built and natural environment and to respond to the implications of climate change (The Planning Service, 2009a).

Areas of Newcastle, some of which overlap with the proposed site, are designated under Policy CON 2 as Local Landscape Policy Areas. The Shimna River corridor is one of these areas with the following features noted as contributing to its environmental quality, integrity and / or character;

- Substantially wooded corridor of high environmental quality and visual amenity;
- River significant for salmon fishing and breeding and local nature conservation interest;
- Public access alongside Tipperary Wood linking to Tipperary Lane with potential for extension and linkage with Tollymore Forest Park; and,
- Landform backdrop to the river emphasises the visual significance of the area.

Planning permission will not be granted to development proposals which would be liable to adversely affect the environmental quality, integrity or character of these areas. A section of the proposed flood wall runs along the Shimna River corridor. Areas of amenity open space and recreation are designated in accordance with Planning and Policy Statement 8 (The Planning Service, 2004); this includes Islands and Castle Parks, both likely to be affected by the Proposed Scheme through vegetation clearance, wall construction, and access for construction vehicles.

Depending on when construction of the Proposed Scheme would commence, the new Newry, Mourne and Down Local Development Plan 2030 may have been implemented (Newry, Mourne and Down District Council, 2018). Objectives of this plan relative to the natural environment include:

- Protect and enhance the natural and built environment to achieve biodiversity, quality design, enhanced leisure and economic opportunity and promote health and wellbeing;
- Protect built heritage assets and promote their sensitive re-use;
- Conserve Conservation Areas and Areas of Townscape Character;
- Protect sensitive upland landscapes from inappropriate development; and,
- Reduce vulnerability to climate change and prevent inappropriate new development in areas known to be at risk of flooding or coastal erosion.

Some of these objectives are more likely to affect the plan than others. Areas of Townscape character and Special Countryside Areas are set to be reviewed and changed as necessary. These changes may alter the protections offered to the areas in the vicinity of the Proposed Scheme. Flood risk management is a key objective and particularly relevant to this scheme. Under the new Local Development Plan (LDP), the development of green infrastructure and the use of SuDS (Sustainable urban Drainage Systems) is proposed in order to reduce flood risk and improve water quality. The LDP was still open for public comment at the time of writing this section and, while it assumed that few alterations will be made that will change the areas highlighted in this section, it is something to be mindful of.

9.9 Summary of potential impacts

Table 9.14 and Table 9.15 summarise the geographic scale of potential impact significance at construction and operation for the Proposed Scheme on ecological receptors. A combined residual impact significance, and cumulative impact significance is also provided.

.

Table 9.14: Summary of potential impacts from the proposed development for designated sites and habitats.

Ecological feature	Valuation	Potential construction phase impacts	Significance of potential construction phase impact	Potential operation phase impacts	Significance of potential operation phase impact	Mitigation proposed	Residual impact significance	Cumulative residual impact significance
European (SAC, pSPA)	International	Pollution; Spread of invasive species.	Not significant	None	Not significant	Yes	Not significant	Not significant
National sites (ASSI)	National	Pollution; Spread of invasive species; Disturbance / displacement of riverine fauna; Indirect damage to riverine habitats.	National	Impacts of invasive species	Not significant	Yes	Not significant	Not significant
Non-statutory designated sites (SLNCI)	County	Pollution; Spread of invasive species; Indirect damage to riverine habitats.	County	Impacts of invasive species	Not significant	Yes	Not significant	Not significant
A1.1.1 Broadleaved semi-natural woodland	County	Spread of invasive species Indirect habitat damage	County	Direct habitat loss; Impacts of invasive species.	Local-County	Yes	Local	Local
A1.1.2 Broadleaved plantation woodland	Local (Higher value)	Spread of invasive species; Indirect habitat damage.	Local-County	Direct habitat loss; Impacts of invasive species.	Local	Yes	Local	Local
A1.2.2 Coniferous plantation woodland	Local (Higher value)	Spread of invasive species; Indirect habitat damage.	Local	Direct habitat loss; Impacts of invasive species.	Local	Yes	Local	Local
A1.3.1 Mixed semi-natural woodland	Local (Higher value)	Spread of invasive species; Indirect habitat damage.	Local	Direct habitat loss; Impacts of invasive species.	Local	Yes	Local	Local
A1.3.2 Mixed plantation woodland	Local (Higher value)	Spread of invasive species; Indirect habitat damage.	Local	Direct habitat loss; Impacts of invasive species.	Local	Yes	Local	Local

Ecological feature	Valuation	Potential construction phase impacts	Significance of potential construction phase impact	Potential operation phase impacts	Significance of potential operation phase impact	Mitigation proposed	Residual impact significance	Cumulative residual impact significance
A2.2 Scattered scrub	Local (Higher value)	Spread of invasive species; Indirect habitat damage.	Local	None predicted	Not significant	No	Local	Local
A3.3 Mixed scattered trees	Local (Higher value)	Spread of invasive species; Indirect habitat damage.	Local	Direct habitat loss; Impacts of invasive species.	Local	Yes	Local	Local
B2.2 Semi-improved neutral grassland	Local (Higher value)	Spread of invasive species; Indirect habitat damage.	Local	Direct habitat loss; Impacts of invasive species.	Local	Yes	Local	Local
B6 Poor semi-improved grassland	Local (Higher value)	Spread of invasive species; Indirect habitat damage.	Local	None predicted	Not significant	No	Local	Local
C3.1 Tall ruderal	Local (Higher value)	Pollution; Spread of invasive species; Indirect habitat damage.	Local	Direct habitat loss; Impacts of invasive species.	Local	Yes	Local	Local
G2 Running water	County	Spread of invasive species; Indirect habitat damage.	Local-County	Impact of invasive species.	Local	No	Local	Local
J1.3 Ephemeral / short perennial	County	Spread of invasive species; Indirect habitat damage.	Local	None predicted	Not significant	No	Local	Local

Table 9.15: Summary of potential impacts from the proposed development for protected species.

Ecological feature	Valuation	Potential construction phase impacts	Significance of potential construction phase impact	Potential operation phase impacts	Significance of potential operation phase impact	Mitigation proposed	Residual impact significance	Cumulative residual impact significance
Otter	County	Mortality or injury; Disturbance / displacement; Indirect disturbance / disruption of resting place.	Local	Direct loss of habitat; Habitat severance.	Local	Yes	Local	Local
Badger	Local (Higher value)	Mortality or injury; Disturbance / displacement.	Local	Direct loss of habitat; Habitat severance.	Local	Yes	Local	Local
Bats	County*	Mortality or injury; Disturbance / displacement of roosting bats; Disturbance / displacement of foraging / commuting bats.	Local	Direct loss of potential roosting habitat; Direct loss of commuting and foraging habitat.	County-Local	Yes	Local	Local
Red squirrel	County	Mortality or injury; Disturbance / displacement	Local	Direct loss of habitat	Local	Yes	Local	Local
Breeding birds	Local (Higher value)	Mortality or injury; Disturbance / displacement.	Local	Direct loss of nesting sites	Local	Yes	Local	Local
Kingfisher	Local (Higher value)	Disturbance / displacement.	Local	None predicted	Not significant	No	Local	Local
Pine marten	Local (Higher value)	Mortality or injury; Disturbance / displacement.	Local	Direct loss of habitat	Local	Yes	Local	Local

10. Landscape & Visual

10.1 Introduction

This section describes the landscape and visual effects of the proposed flood alleviation measures to reduce the risk of flooding from the Shimna River to 312 existing properties in Newcastle currently at risk of flooding during a 1% AEP flood event. Section 4 of this ES gives a detailed description of the scheme. This section has been prepared in accordance with the relevant Guidelines and general national and European best practice guidelines in relation to the preparation of Landscape and Visual Impact Assessments.

10.2 Methodology

10.2.1 Guidance and other Information used in the Landscape and Visual Impact Assessment

The following sources and guidelines were used in the assessment:

- 'Guidelines for Landscape and Visual Impact Assessment' (GLVIA), 3rd Edition, 2013, Landscape Institute & IEMA;
- 'Guidelines for Landscape and Visual Impact Assessment' (GLVIA), 2nd Edition, 2002, Landscape Institute & IEMA;
- 'Photography and Photomontage in Landscape and Visual Impact Assessment', Landscape Institute Advice Note 01/2011;
- Ards and Down Area Plan 2015;
- Regional Landscape Character Areas Assessment – Northern Ireland Environment Agency / Department of Agriculture, Environment and Rural Affairs;
- Northern Ireland Landscape Character Assessment 2000 – Northern Ireland Environment Agency / Department of Agriculture, Environment and Rural Affairs;
- 1:50,000 Discovery Series Ordnance Survey of Northern Ireland mapping;
- http://www.walkni.com/ - walking, cycling and driving routes in Northern Ireland; and
- Description and layout drawings of the Proposed Scheme.

10.2.2 Landscape and Visual Impact Assessment Criteria

This assessment meets the requirements for an ES as outlined in the relevant National and EU legislation[1], considered here as best practice. This section has been prepared in accordance with best practice guidance, such as the "*Guidelines for Landscape and Visual Impact Assessment, 3rd Edition, 2013, Landscape Institute (UK) & IEMA*". The Landscape Institute guidelines require the assessment to identify, predict and evaluate the significance of potential effects to landscape characteristics and established views. The assessment is based on an evaluation of the sensitivity to change and the magnitude of change for each landscape or visual receptor. For clarity, and in accordance with best practice, the assessment of potential effects on landscape character and visual amenity, although closely related, are undertaken separately.

The significance of an effect is determined by two distinct considerations:

The nature of the RECEPTOR likely to be affected, namely:

- The **susceptibility** of the receptor to the type of change arising from the proposed scheme; and

[1]Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment

- The **sensitivity** to change is related to the **value** attached to the receptor.

The nature or magnitude of the EFFECT likely to occur, namely:

- The **size and scale** of the landscape and visual effect (for example, whether there is a complete or minor loss of a particular landscape element);
- The **geographical extent** of the areas that would be affected;
- The **duration** of the effect and its **reversibility**; and
- The **quality** of the effect – whether it is neutral, beneficial or adverse.

10.2.3 Assessment Process

The assessment is undertaken based on the following key tasks and structure:

- Establishment of the Baseline or receiving environment;
- Appreciation of the Proposed Scheme; and
- Assessment of effects.

10.2.4 Establishment of the Receiving Environment

A baseline study has been undertaken through a combination of desk-based research and site appraisal in order to establish the existing conditions of the landscape and visual resources of the study area. Desk-based research has involved a review of mapping and aerial photography, relevant planning and policy documents, existing Landscape Character Assessments and other relevant documents and publications.

10.2.5 Appreciation of the Proposed Scheme

In order to be able to accurately assess the full extent of likely effects on landscape character and visual amenity, it is essential to develop a thorough and detailed knowledge of the Proposed Scheme. This includes a comprehensive understanding of its location, nature and scale and is achieved through a review of detailed descriptions of the proposals and drawings (as illustrated on **Figure 1.1** and **Figure 4.1**) and an on-site appraisal.

The landscape and visual impact assessment has considered all elements of the Proposed Scheme. Reference should be made to Section 4 (Scheme Description) for a detailed description of individual scheme elements.

10.2.6 Assessment of Effects

The landscape and visual impact assessment seeks to identify, predict and evaluate the significance of potential effects to landscape characteristics and established views. The assessments are based on an evaluation of the sensitivity to change and the magnitude of change for each landscape or visual receptor.

The assessment acknowledges that landscape and visual effects change over time as the existing landscape evolves and proposed planting establishes and matures. The assessment therefore reports on potential effects during both construction/operation and completion of the Proposed Scheme. The prominence of the Proposed Scheme in the landscape or view will vary according to the existing screening effects of local topography, structures and buildings, intervening existing vegetation and type and height of the proposed structures.

10.2.7 Scope

10.2.7.1 Study Area

A study area buffer of 250m has been set from the proposed alignment of the flood walls for the assessment of landscape and visual effects. The extent of the study area is based on initial findings of the desktop study which was later verified on site during fieldwork survey.

It is acknowledged that the Proposed Scheme may be visible from locations beyond 250m and as such, it is important to note that the study area defines the area within which potential effects could be significant, rather than defining the extent of visibility.

10.2.7.2 Effects Scoped Out

The Proposed Scheme would become a permanent feature in the landscape following the completion and implementation of landscape mitigation measures. The assessment takes account of this in the determination of residual landscape and visual effects.

Effects arising from the process of decommissioning of the Proposed Scheme are considered to be of a similar nature and duration to those arising from the construction process and therefore have not been considered separately in this section. Where this assessment refers to potential construction effects of buildings, these are also representative of predicted decommissioning effects.

10.2.8 Landscape Effects

Landscape effects describe the impact on the fabric or structure of a landscape or landscape character.

The assessment of landscape effects firstly requires identification of the components of the landscape. The landscape components are also described as landscape receptors and comprise the following:

- Individual landscape elements or features;
- Specific aesthetic or perceptual aspects; and
- Landscape character, or the distinct, recognisable and consistent pattern of elements (natural and man-made) in the landscape that makes one landscape different from another.

The assessment will identify the interaction between these components and the Proposed Scheme during construction and operational phases. The condition of the landscape and any evidence of current pressures causing change in the landscape will also be documented and described.

Landscape Value

Landscape value is frequently addressed by reference to international, national, regional and local designations, determined by statutory and planning agencies. However, absence of such a designation does not necessarily imply a lack of quality or value. Factors such as accessibility and local scarcity can render areas of nationally unremarkable quality, highly valuable as a local resource. The quality and condition is also considered in the determination of the value of a landscape. The evaluation of landscape value is undertaken with reference to the definitions stated in Table 10.1.

Table 10.1: Landscape Value Criteria

LANDSCAPE VALUE	*CLASSIFICATION CRITERIA*
High	Nationally designated or iconic, unspoilt landscape with few, if any, degrading elements.
Medium	Regionally or locally designated landscape, or an undesignated landscape with locally important landmark features and some detracting elements.
Low	Undesignated landscape with few if any distinct features or with several degrading elements.

Landscape Susceptibility

Landscape susceptibility relates to the ability of a particular landscape to accommodate the Proposed Scheme. Landscape susceptibility is appraised through consideration of the baseline characteristics of the landscape, and in particular the scale or complexity of a given landscape.

The evaluation of landscape susceptibility is undertaken with reference to a three-point scale, as outlined in Table 10.2.

Table 10.2: Landscape Susceptibility Criteria

LANDSCAPE SUSCEPTIBILITY	*CLASSIFICATION CRITERIA*
High	Small scale, intimate or complex landscape considered to be intolerant of even minor change.
Medium	Medium scale, more open or less complex landscape considered tolerant to some degree of change.
Low	Large scale, simple landscape considered tolerant of a large degree of change.

Landscape Sensitivity

Landscape sensitivity to change is determined by employing professional judgment to combine and analyse the identified landscape value, quality and susceptibility and is defined with reference to the scale outlined in Table 10.3.

Table 10.3: Landscape Sensitivity to Change Criteria

LANDSCAPE SENSITIVITY	*CLASSIFICATION CRITERIA*
High	Landscape characteristics or features with little or no capacity to absorb change without fundamentally altering their present character. Landscape designated for its international or national landscape value or with highly valued features. Outstanding example in the area of well cared for landscape or set of features that combine to give a particularly distinctive sense of place. Few detracting or incongruous elements.
Medium-high	Landscape characteristics or features with a low capacity to absorb change without fundamentally altering their present character. Landscape designated for regional or county-wide landscape value where the characteristics or qualities that provided the basis for their designation are apparent or a landscape with highly valued features locally. Good example in the area of a well-cared for landscape or set of features that combine to give a clearly defined sense of place.
Medium	Landscape characteristics or features with moderate capacity to absorb change without fundamentally altering their present character.

LANDSCAPE SENSITIVITY	*CLASSIFICATION CRITERIA*
	Landscape designated for its local landscape value or a regional designated landscape where the characteristics and qualities that led to the designation of the area are less apparent or are partially eroded or an undesignated landscape which may be valued locally – for example an important open space. An example of a landscape or a set of features which is relatively coherent, with a good but not exceptional sense of place - occasional buildings and spaces may lack quality and cohesion.
Medium-Low	Landscape characteristics or features which are reasonably tolerant of change without determent to their present character. No designation present or of little local value. An example of an un-stimulating landscape or set of features; with some areas lacking a sense of place and identity.
Low	Landscape characteristics or features which are tolerant of change without determent to their present character. An area with a weak sense of place and/or poorly defined character /identity. No designation present or of low local value or in poor condition. An example of monotonous unattractive visually conflicting or degraded landscape or set of features.

Magnitude of Landscape Change

Magnitude of change is an expression of the size or scale of change in the landscape, the geographical extent of the area influenced and the duration and reversibility of the resultant effect. The variables involved are described below:

- The extent of existing landscape elements that will be lost, the proportion of the total extent that this represents and the contribution of that element to the character of the landscape;
- The extent to which aesthetic or perceptual aspects of the landscape are altered either by removal of existing components of the landscape or by addition of new ones;
- Whether the effect changes the key characteristics of the landscape, which are integral to its distinctive character;
- The geographic area over which the landscape effects will be felt (within the proposed development site itself; the immediate setting of the proposed development site; at the scale of the landscape type or character area; on a larger scale influencing several landscape types or character areas); and
- The duration of the effects (short-term, medium-term or long-term) and the reversibility of the effect (whether it is permanent, temporary or partially reversible).

Changes to landscape characteristics can be both direct and indirect. **Direct change** occurs where the proposed development will result in a physical change to the landscape within or adjacent to the proposed development site. **Indirect changes** are a consequence of the direct changes resulting from the proposed development. They can often occur away from the proposed development site (for example, off-site construction staff parking) and may be a result of a sequence of interrelationships or a complex pathway (for example, a new road or footpath construction may increase public access and associated problems e.g. littering). They may be separated by distance or in time from the source of the effects. The magnitude of change affecting the baseline landscape resource is based on an interpretation of a combination of the criteria set out in Table 10.4.

Table 10.4: Magnitude of Landscape Change Criteria (Landscape Effects)

MAGNITUDE	*CLASSIFICATION CRITERIA*
None	No change.
Negligible	Little perceptible change.
Low	Minor change, affecting some characteristics and the experience of the landscape to an extent; and Introduction of elements that are not uncharacteristic.
Moderate	Noticeable change, affecting some key characteristics and the experience of the landscape; and Introduction of some uncharacteristic elements.
High	Noticeable change, affecting many key characteristics and the experience of the landscape; and Introduction of many incongruous developments.
Very High	Highly noticeable change, affecting most key characteristics and dominating the experience of the landscape; and Introduction of highly incongruous development.

10.2.9 Visual Effects

Visual effects are determined by the extent of visibility and the nature of the visibility (i.e. how a development is seen within the landscape); for example, whether it appears integrated and balanced within the visual composition of a view or whether it creates a focal point.

Negative visual effects may occur through the intrusion of new elements into established views, which are out of keeping with the existing structure, scale and composition of the view. Visual effects may also be beneficial, where an attractive focus is created in a previously unremarkable view or the influence of previously detracting features is reduced. The significance of effects will vary, depending on the nature and degree of change experienced and the perceived value and composition of the existing view.

Receptors

For there to be a visual impact, there is the need for a viewer. Views experienced from locations such as settlements, recognised routes and popular vantage points used by the public have been included in the assessment. Receptors are the viewers at these locations. The degree to which receptors, i.e. people, will be affected by changes as a result of the Proposed Scheme depends on a number of factors, including:

- Receptor activities, such as taking part in leisure, recreational and sporting activities, travelling or working;
- Whether receptors are likely to be stationary or moving and how long they will be exposed to the change at any one time;
- The importance of the location, as reflected by designations, inclusion in guidebooks or other travel literature, or the facilities provided for visitors;
- The extent of the route or area over which the changes will be visible;
- Whether receptors will be exposed to the change daily, frequently, occasionally or rarely;
- The orientation of receptors in relation to the proposed development and whether views are open or intermittent;
- Proportion of the developments that will be visible (full, sections or none);
- Viewing direction, distance (i.e. short-, medium- and long-distance views) and elevation;

- Nature of the viewing experience (for example, static views, views from settlements and views from sequential points along routes);
- Accessibility of viewpoint (public or private, ease of access);
- Nature of changes (for example, changes in the existing skyline profile, creation of a new visual focus in the view, introduction of new man-made objects, changes in visual simplicity or complexity, alteration of visual scale, landform and change to the degree of visual enclosure);
- Nature of visual receptors (type, potential number and sensitivity of viewers who may be affected).

Value of the View

Value of the view is an appraisal of the value attached to views and is often informed by the appearance on Ordnance Survey or tourist maps and guidebooks, literature or art. Value can also be indicated by the provision of parking or services and signage and interpretation. The nature and composition of the view is also an indicator. The value of the view is determined with reference to the definitions outlined in Table 10.5 below.

Table 10.5: Value of the View

VALUE	*CLASSIFICATION CRITERIA*
High	Nationally recognised view of the landscape, with no detracting elements.
Medium	Regionally or locally recognised view, or unrecognised but pleasing and well composed view, with few detracting elements.
Low	Typical or poorly composed view often with numerous detracting elements.

Visual Susceptibility

The GLVIA guidelines identify that the susceptibility of visual receptors to changes in views and visual amenity is a function of:

- The occupation or activity of people experiencing the view at a particular location; and
- The extent to which their attention or interest may therefore be focused on the views and visual amenity they experience at particular locations.

For example, residents in their home, walkers whose interest is likely to be focused on the landscape or a particular view, or visitors at an attraction where views are an important part of the experience often indicate a higher level of susceptibility. Whereas receptors occupied in outdoor sport, where views are not important, or at their place of work, are often considered less susceptible to change. Visual susceptibility is determined with reference to the three-point scale and criteria outlined in Table 10.6.

Table 10.6: Visual Susceptibility

SUSCEPTIBILITY	*CLASSIFICATION CRITERIA*
High	Receptors for which the view is of primary importance and are likely to notice even minor change.
Medium	Receptors for which the view is important but not the primary focus and are tolerant of some change.
Low	Receptors for which the view is incidental or unimportant and is tolerant of a high degree of change.

Visual Sensitivity

Sensitivity to change considers the nature of the receptor; for example a person occupying a residential dwelling is generally more sensitive to change than someone working in a factory unit. The importance of the view experienced by the receptor also contributes to an understanding of the susceptibility of the visual receptor to change as well as the value attached to the view.

A judgement is also made on the value attached to the views experienced. This takes account of:

- Recognition of the value attached to particular views, for example in relation to heritage assets, or through planning designations;
- Indicators of the value attached to views by visitors, for example through appearance in guidebooks or on tourist maps, provision of facilities for their enjoyment (sign boards, interpretive material) and references to them in literature or art; and
- Possible local value; it is important to note that the absence of view recognition does not preclude local value, as a view may be important as a resource in the local or immediate environment due to its relative rarity or local importance.

The visual sensitivity to change is based on interpretation of a combination of all or some of the criteria outlined in Table 10.7 below.

Table 10.7: Sensitivity to Change Criteria

VISUAL SENSITIVITY	*CLASSIFICATION CRITERIA*
High	Users of outdoor recreational facilities, on recognised national cycling or walking routes or in nationally designated landscapes. Residential buildings.
Medium-high	Users of outdoor recreational facilities, in highly valued landscapes or locally designated Landscapes, or on local recreational routes that are well publicised in guide books. Road and rail users in nationally designated landscapes or on recognised scenic routes, likely to be travelling to enjoy the view.
Medium	Users of outdoor recreational facilities including public open space in moderately valued landscapes. Users of primary transport road network, orientated towards the proposed development, likely to be travelling for other purposes than just the view.
Medium-Low	People engaged in active outdoor sports or recreation and less likely to focus on the view. Primary transport road network and rail users likely to be travelling to work with oblique views of the project or users of minor road network.
Low	People engaged in work activities indoors, with limited opportunity for views of the proposed development.

Magnitude of Visual Change

Visual effects are direct effects as the magnitude of change within an existing view will be determined by the extent of visibility of the proposed development. The magnitude of the visual effect resulting from the development at any particular viewpoint or receptor is based on the size or scale of change in the view, the geographical extent of the area influenced and its duration and reversibility. The variables involved are described below.

- The scale of the change in the view with respect to the loss or addition of features in the view and changes in its composition, including the proportion of the view occupied by the development;
- The degree of contrast or integration of any new features or changes in the landscape form, scale, mass, line, height, skylining, back-grounding, visual clues, focal points, colour and texture;

- The nature of the view of the proposed development, in relation to the amount of time over which it will be experienced and whether views will be full, partial or glimpses;
- The angle of view in relation to the main activity of the receptor, distance of the viewpoint from the development and the extent of the area over which the changes will be visible; and
- The duration of the effects (short term, medium term or long term) and the reversibility of the effect (whether it is permanent, temporary or partially reversible).

The magnitude of visual effect resulting from the development at any particular viewpoint or receptor is based on the interpretation of the above range of factors and is set out in Table 10.8.

Table 10.8: Magnitude of Visual Change Criteria (Visual effects)

MAGNITUDE	*CLASSIFICATION CRITERIA*
None	No change in the existing view.
Negligible	The development will cause a barely discernible change in the existing view.
Low	The development will cause very minor changes to the view over a wide area or minor changes over a limited area.
Moderate	The development will cause modest changes to the existing view over a wide area or noticeable change over a limited area.
High	The development will cause a considerable change in the existing view over a wide area or a significant change over a limited area.
Very High	The development will cause significant changes in the existing view over a wide area or a change which will dominate over a limited area.

10.2.10 Duration and Quality of Effects

The table below provides the definition of the duration of landscape and visual effects.

Table 10.9: Definition of Duration of Effects

DURATION	*DESCRIPTION*
Temporary	Effects lasting one year or less.
Short Term	Effects lasting one to seven years.
Medium Term	Effects lasting seven to fifteen years.
Long Term	Effects lasting fifteen to sixty years.
Permanent	Effects lasting over sixty years.

The quality of both, landscape and visual effects, can be Beneficial (Positive), Adverse (Negative) or Neutral according to the definitions set out in Table 10.10.

Table 10.10: Definition of Quality of Effects

QUALITY OF EFFECTS	*DESCRIPTION*
Neutral	This will neither enhance nor detract from the landscape character or view.
Beneficial (Positive)	This will improve or enhance the landscape character or view.
Adverse (Negative)	This will reduce the quality of the existing landscape character or view.

10.2.11 Significance Criteria

The objective of the assessment process is to identify and evaluate the potentially significant effects arising from the Proposed Scheme. The assessment will identify the residual effects likely to arise from the finalised design, taking into account mitigation measures and change over time.

The significance of effects will be assessed by considering the sensitivity of the receptor and the predicted magnitude of effect in relation to the baseline conditions in accordance with definitions set out in Table 10.11.

Table 10.11: Categories of Significance of Landscape and Visual Effects

SIGNIFICANCE CATEGORY	*DESCRIPTION OF EFFECT*
Major Beneficial Effect	The project will: • Greatly enhance the character (including quality and value) of the landscape; • Enable the restoration of characteristic features and elements lost as a result of changes from inappropriate management or development; • Enable a sense of place to be created or greatly enhanced; and • Cause a very noticeable improvement in the existing view; and open up a new view of local landscape dominating the future view.
Moderate Beneficial Effect	The project will: • Enhance the character (including quality and value) of the landscape; • Enable the restoration of characteristic features and elements partially lost or diminished as a result of changes from inappropriate management or development; • Enable a sense of place to be restored; and • Cause a noticeable improvement in the existing view.
Minor Beneficial Effect	The project will: • Complement the character (including quality and value) of the landscape; • Maintain or enhance characteristic features and elements; • Enable some sense of place to be restored; and • Cause a barely perceptible improvement in the existing view. This will typically occur where the viewer is at some distance from the development and the development newly appears in the view, but not as a point of principal focus. It will also occur where the development is closely located to the viewpoint but is seen at an acute angle and at the extremity of the overall view.
None	No change resulting from the development.
Negligible Effect (applies to both, adverse and beneficial)	The project will: • Maintain the character (including quality and value) of the landscape; • Blend in with characteristic features and elements; • Enable a sense of place to be retained; and • Not result in a discernible improvement or deterioration in the existing view.
Minor Adverse Effect	The project will: • Not quite fit the character (including quality and value) of the landscape; • Be at variance with characteristic features and elements;

SIGNIFICANCE CATEGORY	DESCRIPTION OF EFFECT
	• Detract from a sense of place; and • Cause a barely perceptible deterioration in the existing view. This will typically occur where the viewer is at some distance from the development and the development newly appears in the view, but not as a point of principal focus. It will also occur where the development is closely located to the viewpoint but is seen at an acute angle and at the extremity of the overall view.
Moderate Adverse Effect	The project will: • Conflict with the character (including quality and value) of the landscape; • Have an adverse impact on characteristic features or elements; and • Diminish a sense of place; and cause a noticeable deterioration in the existing view.
Major Adverse Effect	The project will: • Be at complete variance with the character (including quality and value) of the landscape; • Degrade or diminish the integrity of a range of characteristic features and elements; • Damage a sense of place or cause a sense of place to be lost; • Cause the integrity of characteristic features and elements to be lost; and • Cause a very noticeable deterioration in the existing view; and obstruct an existing view of local landscape and the development will dominate the future view.

The significance of the effects is determined by the matrix shown in Table 10.12.

Table 10.12: Significance of Effects Matrix[2]

SIGNIFICANCE OF EFFECTS (effects rated Moderate & above are considered significant)		SENSITIVITY				
		High	**Medium-High**	**Medium**	**Medium-Low**	**Low**
MAGNITUDE OF CHANGE	**Very High**	Major	Major	Moderate-Major	Moderate	Moderate
	High	Major	Moderate-Major	Moderate-Major	Moderate	Minor-Moderate
	Moderate	Moderate-Major	Moderate	Moderate	Minor-Moderate	Minor
	Low	Moderate	Moderate	Minor-Moderate	Minor	Minor-Negligible
	Negligible	Minor	Minor-Negligible	Minor-Negligible	Negligible	Negligible

Effects will be assessed for all phases of the Proposed Scheme. Construction effects are considered to be temporary, short-term effects which occur during the construction / decommissioning phase only. Operational / residual effects are those long-term effects, which will occur as a result of the presence or operation of the scheme.

The quality of each effect is based on the ability of the landscape character or visual receptor to accommodate the proposed development, and the impact of the scheme within the receiving context. Once this is done, the quality of the effect is then is assessed as being neutral, beneficial or adverse. A change to the landscape or visual resource is not considered to be adverse simply because it constitutes an alteration to the existing situation.

[2] *Note that the matrix is a guide - the determination of significance of effects also requires an element of professional judgement*

10.2.12 Fieldwork

A site survey was carried out on 10th July 2018 and identified the potential visibility of the Proposed Scheme within the study area and the wider landscape, taking into account topography, existing screening vegetation and other localised factors. Viewpoint photography was taken in July 2018. Deciduous trees in full foliage do not illustrate the full winter season scenario without foliage, i.e. worst case scenario. However, existing screening provided by foliage has been accounted for when determining the magnitude of change of landscape and visual effects.

10.2.13 Selection of Viewpoints

Viewpoint selection has been carried out in accordance with the current best practice standards and the following industry guidelines:

- Photography and Photomontage in Landscape and Visual Impact Assessment, Landscape Institute Advice Note 01/2011.

The viewpoints have been selected to represent the nature of visibility at various distances and in various contexts within the study area; therefore, views from selected locations are deemed as representative views. The selection process of representative viewpoint locations is as follows:

- The location of viewpoints within the study area is informed by desktop and site surveys;
- Identification and selection of representative viewpoints showing typical open or intermittent views within a local area, which will be frequently experienced by a range of viewers; and
- Identification and selection of specific viewpoints from key viewpoints in the landscape such as routes or locations valued for their scenic amenity, residential areas etc.

10.2.14 Photomontages of the Proposed Scheme

Photomontages were not produced for this assessment. The assessment was based on a review of design drawings depicting the alignment, associated works, materials and visual appearance of the Proposed Scheme, along with on-site appraisals of likely effects.

10.2.15 Zone of Theoretical Visibility (ZTV)

ZTV mapping does not take into account the screening effects of vegetation or built structures and can omit topographical variations of up to 10m. Considering the nature of the proposed development, and the existing structures, topography and tree cover within the study area, the production of ZTV mapping would not be useful in the appraisal of likely effects. The assessment is based therefore on a comprehensive site survey to establish the nature of visibility within the study area and to identify key viewpoint locations.

10.3 Regulatory & Policy Framework

A hierarchy of strategies, policies and legislation operates to underpin the management of both land and landscape. Some of these enable statutory designation at national level and others provide for local designations and appropriate management, with the aim of conserving and protecting the quality of the landscape.

10.3.1 European Landscape Convention (2000)

The UK Government is a signatory to the European Landscape Convention. The Convention (also known as the Florence Convention) aims to encourage public authorities within Member States to adopt policies and measures for the protection, management and planning of all landscapes, whether outstanding or ordinary, that determine the quality of people's living environment. The Convention specially encourages local authorities to introduce exemplary and long-lasting polices or measures to protect, manage and plan landscapes.

The GLVIA 2nd Edition defines 'landscape character' as: *"a distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another, rather than better or worse."*

Landscape Character Assessment (LCA) is a tool that allows landscape character to be understood, explained and described in a transparent and robust way. It does this by mapping and describing the variations in physical, natural and cultural attributes and experiential characteristics that make one area distinctive from another at a range of spatial scales. LCA also considers how landscapes have changed over time, and acknowledges the influences that human activities and the impacts of economic development have in shaping and changing landscapes. A better understanding of landscapes provided by LCAs (their diversity, character and distinctiveness, evolution, sensitivity to change and their management needs) is essential to effective spatial planning.

10.3.2 The Nature Conservation and Amenity Lands (Northern Ireland) Order 1985

Under Part IV of the Order (National Parks and Areas of Outstanding Natural Beauty (AONB), where the DAERA considers an area (not being an area within a National Park) to be of such outstanding natural beauty that it is desirable that the provisions of this Article should apply to the area, the Department may make an Order designating it as an AONB. This designation is designed to protect and enhance the qualities of each area and to promote their enjoyment by the public. It is the only designation currently in use in Northern Ireland to identify areas of high landscape quality. Although there is provision for the designation of National Parks, none currently exist in Northern Ireland.

10.3.3 The Planning (Northern Ireland) Order 1991

The Planning (Northern Ireland) Order 1991 ("the 1991 Order") requires the DAERA to *"formulate and co-ordinate policy for securing the orderly and consistent development of land and the planning of that development."*

The DAERA's main functions under the 1991 Order are the preparation of planning policy and Development Plans, controlling development through planning permission and consent procedures, and taking enforcement action against breaches of planning control. These functions were extended by the Planning (Amendment) (Northern Ireland) Order 2003 and the Planning Reform (Northern Ireland) Order 2006.

The Planning Bill was introduced to the NI Assembly in 2013. The primary objective of the Bill was to accelerate the implementation of a number of reforms contained within the Planning Act (Northern Ireland) 2011. The key provisions in the Bill were to aim to deliver:

- measures to strengthen the planning system in promoting economic development;
- measures to further sustainable development and enhance the environment;
- faster processing of planning applications;
- faster and fairer planning appeals system;
- enhanced community involvement; and
- simpler and tougher enforcement.

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

One of the aims of the RDS is to *"Protect and enhance the environment for its own sake"*. The RDS states that:

"Protecting the environment is essential for enhancing the quality of life of current and future generations. Northern Ireland's environment is one of its greatest assets, with its stunning landscapes, an outstanding coastline, a complex variety of wildlife, and a rich built and cultural heritage for the ecosystem services it provides, and its sense of place and history for all."

Chapter 3 of the RDS outlines two types of strategic guidance:

- Regional Guidance (RG) – This applies to everywhere in the region and is presented under the three sustainable development themes of Economy, Society and Environment; and
- Spatial Framework Guidance (SFG) - This is additional to the region-wide guidance and is tailored to each of the five elements of the Spatial Framework.

The RDS sets out Regional Guidance in relation to the built and natural environment under RG11.

"RG11 - Conserve, protect and, where possible, enhance our built heritage and our natural environment"

In relation to landscape effects associated with the Scheme, RG11 provides guidance under a number of headings:

- identify, protect and conserve the built heritage, including archaeological sites and monuments and historic buildings;
- identify, protect and conserve the character and built heritage assets within cities, towns and villages;
- maintain the integrity of built heritage assets, including historic landscapes;
- sustain and enhance biodiversity;
- identify, establish, protect and manage ecological networks;
- protect and encourage green and blue infrastructure within urban areas;
- protect and manage important geological and geomorphological features;
- protect, enhance and manage the coast;
- protect, enhance and restore the quality of inland water bodies;
- recognise and promote the conservation of local identity and distinctive landscape character;
- conserve, protect and where possible enhance areas recognised for their landscape quality;
- protect designated areas of countryside from inappropriate development (either directly or indirectly) and continue to assess areas for designation; and
- consider the establishment of one or more National Parks.

The RDS highlights the importance of the rich variety of landscapes within Northern Ireland. In particular, it states that *"The Northern Ireland Landscape Character Assessment 2000 provides valuable guidance on local landscape character and scenic quality."* [3]

The RDS also recognises the need for the protection of designated landscapes and continued assessment of areas for designation.

10.3.5 A Sustainable Development Strategy for Northern Ireland 2006

Chapter 2 of the Sustainable Development Strategy (Natural Resource Protection and Environmental Enhancement) focuses on protection and enhancement of the environment. One of the five key strategic objectives for the protection of the environment is to '*conserve our landscape and manage it in a more sustainable way*'.

The key targets in relation to the landscape are:

- complete the review of AONBs and programme of designation by 2016;
- introduce enabling legislation for the designation of National Parks by 2009; and
- increase Northern Ireland's forested area by at least 500 hectares per annum in line with the published 'Forestry Strategy – A Strategy for Sustainability and Growth' (DARD 2006).

[3] Note that an updated Regional Landscape Character Assessment was published in 2014

10.3.6 PPS 2 – Natural Heritage (July 2013)

PPS 2 sets out DAERA's land-use planning policies for the conservation, protection and enhancement of our natural heritage.

Development Plans

PPS 2 states that *"The development plan should consider the natural and cultural components of the landscape and promote opportunities for the enhancement or restoration of degraded landscapes, particularly those affecting communities."*

PPS 2 highlights the importance of Countryside Assessments as an integral part of the Development Plan making process and notes that "*local designations arising from the plan should be identified and policies brought forward for their protection and, where possible their enhancement."*

Trees and Woodlands

PPS 2 outlines the statutory framework for the protection of trees and woodland. It also states that development plans should seek to identify and promote green and blue infrastructure *"where this will add value to the provision, enhancement and connection of open space and habitats in and around settlements."* Green infrastructure is defined as parks, green spaces and street trees; blue infrastructure includes ponds, streams and lakes.

10.3.7 PPS 6 - Planning, Archaeology and The Built Heritage (March 1999)

PPS 6 states that development plans will, where appropriate, designate Local Landscape Policy Areas (LLPAs) and contain local policies and guidance to maintain the intrinsic environmental value and character of these areas. LLPAs consist 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 protection from undesirable or damaging development.

LLPAs may include:

- archaeological sites and monuments and their surroundings;
- listed and other locally important buildings and their surroundings;
- river banks and shore lines and associated public access;
- attractive vistas, localised hills and other areas of local amenity importance; and
- areas of local nature conservation interest, including areas of woodland and important tree groups.

10.3.8 The Northern Ireland Regional Landscape Character Assessment (2014)

The purpose of the Northern Ireland Regional Landscape Character Assessment (NIRLCA) is to provide an evidence base which can be used equally by planners, developers and the public. It will enable people to make informed decisions concerning the planning, management and protection of Northern Ireland's landscapes. It provides a strategic overview of the landscape, which can be complemented by more detailed local studies in future. The NIRLCA aims to draw together information on people and place, and the combinations of nature, culture and perception which make each part of Northern Ireland unique. This local identity can be referred to by the Irish term '*dinnseanchas'*, meaning "*the spirit of a place*". This spirit results from the interactions of natural and human processes over time – processes which continue today since landscape must be viewed as a dynamic entity. The NIRLCA has been developed to meet commitments set out in Northern Ireland's Landscape Charter.

10.3.9 Northern Ireland Landscape Character Assessment 2000

The NILCA 2000 contains landscape briefs for each of 130 local Landscape Character Areas in Northern Ireland surveyed in 1999. It provides a baseline description of the landscape at a point in time based upon local patterns of geology, landform, land use, cultural and ecological features. This base information is still a valuable resource and has informed the 26 regional Landscape Character Areas of the NIRLCA. However, there has been substantial development in both rural and urban areas of Northern Ireland since the NILCA 2000 was surveyed, which has impacted on many of its local landscape character areas.

10.3.10 Ards and Down Area Plan 2015

The Ards and Down Area Plan 2015 is a development plan prepared under the provisions of Part III of the Planning (Northern Ireland) Order 1991 by the then DOE.

The overall aim of the Plan is to provide a planning framework which is in broad conformity with the RDS in facilitating sustainable growth and a high quality of development in Ards and Down Area throughout the Plan period, whilst protecting and where appropriate, enhancing the natural and man-made environment of the Plan area.

The Plan includes a number of landscape designations which are set out in Section 10.4.

10.4 Baseline Conditions

10.4.1 Areas of Designated Landscape Importance or Value

Areas of designated landscape importance or value are set out in the Ards and Down Area Plan 2015, the relevant Statutory Development Plan for the area.

The study area for this assessment includes the areas directly affected by the proposed works (construction site) and extends 250m from the location of the proposed structures and works. It extends from the Boating Lake in the centre of town and stretches towards Marguerite Park northwards, Rathcillan Wood westwards and Slievenamaddy Avenue southwards. The area includes the Shimna River Corridor, areas of woodland along the river valley, open space recreation areas between Bryansford Avenue and Bryansford Road and surrounding residential areas (**Figure 10.2**).

The study area (as well as the entire town) lies within the designated Mourne Area of Outstanding Natural Beauty (Mourne AONB). The Mourne AONB was designated in 1986 under the Nature Conservation and Amenity Lands Order (Northern Ireland) 1985 in recognition of its ‘exceptional scenic quality’.

Three designated Local Landscape Policy Areas (LLPAs) fall within the study area. These are:

- LLPA1 – Burren River Corridor;
- LLPA 2 – Shimna River Corridor; and
- LLPA 4 - Tullybrannigan River Corridor.

The features in LLPA1 - Burren River Corridor are described as follows:

- “River and shorelines provide local nature conservation interest and potential for public access linking countryside within open space within the town centre; and

- includes lands retained as flood pondage, following implementation of flood alleviation scheme.

The characteristics of the Shimna River Corridor (LLPA 2) have been described as including:

- “areas of woodland and important tree groups – substantially wooded corridor of high environmental quality and visual amenity provides a good visual entrance feature into town”;

- “original character defined by low density housing and areas of fine wooded landscape”;

- "public access along river alongside Tipperary Wood linking to Tipperary Lane with potential for extension and linkage with Tollymore Forest Park; and"

- "landform backdrop to river emphasises the visual significance of the area".

The Tullybrannigan River Corridor (LLPA 4) states that the *"river valley corridor provides local wildlife habitat and nature conservation interest; mature trees and riverside vegetation are of local amenity value; and water quality is important for fishing".*

The majority of the proposed flood alleviation structures are located within lands designated as "Existing Amenity Open Space and Recreation".

The Shimna River Corridor is designated as an Area of Special Scientific Interest (ASSI245) which is connected at its eastern end with the Murlough Area of Special Scientific Interest (ASSI089) spreading across the coast and into the Dundrum Bay. The Shimna River is also zoned as a Site of Local Nature Conservation Importance (SLNCI).

Designated Walking, Cycling and Driving Routes

There is one designated walking route within the study area:

- Saint Patrick's Way – The Pilgrims Walk, Section E – Rostrevor to Newcastle

This section of the walk starts at the public car park outside the Donard Hotel and follows the Lecale Way walking route (outside of the study area) to the Newcastle Tourist Information Centre at which point it crosses the A2 Main Street and follows the Shimna River Corridor until Tipperary Lane, west of the study area.

There are a number of walking routes within Tollymore Forest Park which at its nearest part is located approximately 1.5km from the centre of the scheme; therefore it is outside of the study area.

Outside of the study area, the Mourne Coastal Driving Route runs along the A2 Central Promenade in the centre of Newcastle and the Saint Patrick's Trail Driving Route follows the Hilltown Road and Ballyhafry Road to the north-west.

10.4.2 Landscape Character, Description and Value of Study Area

NI Regional Landscape Character Assessment (NIRLCA)

The study area lies within the Mourne and Slieve Croob Regional Landscape Character Area (RLCA 25) which is a *"distinctive upland area that emerges above, and overlooks the Strangford, Ards and Lecale (RLCA 26) to the east, the Down Drumlins and Holywood Hills (RLCA 22) to the north, and the Newry Valley and Upper Bann (RLCA 23) to the west."*

"The seascape adjacent to this area has been characterised as Dundrum Bay (SCA 18) between Newcastle and Annalong; …"

The following site-specific influences on the Landscape Character are referenced in the NIRLCA:

Natural Influences

- Many of the watercourses, including the Newry River, follow fault lines, and have eroded these to form valleys.
- The lowlands are undulating with moraine deposits in the form of drumlins further north, and moraine ridges to the south.
- Coastal erosion patterns in the past have led to raised beach landscapes, clearest where the mountains drop into the sea, along the east of the Mourne Mountains, between Newcastle and Annalong, and around Killowen along Carlingford Lough. Beaches are of sand or coarser material where moraines meet the coast.

- There is relatively little woodland in this RLCA, much of which is made up of forest plantations at the fringes. These include stands of hardwoods, Scots pine, larch and fir as well as Sitka spruce. The Mourne Mountains are one of the few places in Northern Ireland where juniper is found in the wild.

Cultural Influences

- The area holds numerous raths and cashels; prominent examples include 'White Fort' in Tollymore Forest Park, and Drumena Cashel.
- The area has a rich industrial heritage with Mourne granite claimed to have 'paved Lancashire', while in London the Albert Memorial sits on a piece of granite quarried at Ballymagreehan near Castlewellan. Evidence for this can be seen in the remains of 18th and 19th century millstone quarries, smithing huts and other industrial features throughout the landscape.
- The Mourne Wall is a cut dry-stone wall constructed to enclose a reservoir's catchment area and stretches for 22 miles over the highest summits. It was built between 1904 and 1922 to enclose and isolate the catchment area from the effects of cattle and sheep and forms a prominent landmark within uplands of this area. In the past there was an annual walk along the wall, although this has been discontinued.
- The rocky indented coastline of this area has long associations with smugglers who would use routes such as The Brandy Pad to trek their goods through the mountains and evade taxes.
- Access to the coast means that fishing has always been an important industry. Many local boats were owned by farmers, shopkeepers, stone workers and other tradesmen who fished on a seasonal basis, while farming the plain and foothills and working the mountains for stone.
- Tollymore Forest Park is located within this area. It includes a grand landscaped park with impressive gothic-style gate arches which show the influence of their highly individualistic designer, Thomas Wright of Durham. Oak wood from Tollymore was the preferred material for the interiors of the White Star liners including the 'Titanic' which was built in Belfast.
- Newcastle retains much of its character as a Victorian seaside resort, reminiscent of the days when people would arrive by train from Belfast to holiday in its hotels and seaside villas. It remains popular as a tourist centre with its promenade and golf courses.

Perceptual Influences

- The area is generally characterised by an open, exposed, wilderness mountain landscape and its distinctive character is reflected by its designation as an Area of Outstanding Natural Beauty. The Eastern Mournes are also designated as an ASSI, as a result of their geological and physiographical features as well as heathland and upland flora.
- The landscape is in particularly good condition and much of it is designated as an Area of Outstanding Natural Beauty in recognition of its scenic importance.
- The southern slopes of the Mourne Mountains, down to the sea, comprise good agricultural land with many stone walls, and are known locally as the Kingdom of Mourne.
- Open rugged hill and mountain summits form distinctive skylines when viewed from the surrounding landscape.
- Unsettled character of upland slopes hills and glens means that this area is unlit at night, and is an area of 'dark skies'.
- Panoramic views from high ground and passes, several of which are marked as viewpoints on OS maps, including Windy Gap, Deers Meadow and Slievenaslat.
- Tourism is an important industry in the area since the early 19th century. In recent times Cranfield, near Kilkeel, has become popular for its fine sandy beach and is well served with camping and caravan parks.

Past, present and future forces for change

- Climate change: …. coastal erosion will threaten the soft coastal edge, with potential impacts for communities and visitors, and for agricultural land. The coastal settlements including Newcastle may be subject to coastal squeeze, and changing coastal processes may affect the dune systems at Dundrum Bay. Warmer summers may attract more tourists, with further expansion of caravan parks and other facilities.
- Tourism: Development for tourists and recreational users is largely located around the edges of the Mournes, in towns such as Newcastle, Kilkeel and Rostrevor. Caravan parks are prominent features in coastal areas, particularly where they can be seen from higher ground. Greater tourist numbers will bring more pressure for infrastructure in the area.
- Coastal processes: The coastlines of Dundrum Bay and Carlingford Lough are dynamic environments, with a range of natural coastal processes continuously in action. Coastal erosion is occurring to a significant degree in some parts of the coast, where softer glacial till is exposed. Natural processes are integral to the sustainability of coastal landscapes, and their functioning should be safeguarded as this will have benefits for biodiversity and other services.
- Management plans: The presence of the AONB designation places the Mourne Mountains among Northern Ireland's most valued landscapes. Successful implementation of the Mourne AONB Management Plan and Landscape Conservation Action Plan will have a positive impact on the AONB landscape in the future. A long-standing desire to see the Mournes as Northern Ireland's first National Park has seen opposition, and a decision has been repeatedly delayed.
- Flood regulation: Upland peat and forests reduce run off by absorbing or intercepting rainfall, reducing downstream flooding; intertidal areas mitigate the impact of coastal flooding on low-lying coasts around Carlingford Lough.
- Erosion regulation: Vegetation on upland slopes, including forests, reduce erosion rates; vegetated river banks and riparian woodland restrict erosion of pasture land; coastal processes ensure that coastlines are relatively stable although sea defences have been erected in places.
- Access, recreation and tourism: The Mourne AONB is a major attraction within Northern Ireland and highly popular for outdoor recreation; many opportunities for walking, cycling, climbing and more; recreational boating in Carlingford Lough and along the coast to Newcastle; Kilkeel and Newcastle are tourist centres; accessible locations include Castlewellan, Tollymore and Rostrevor Forests.
- Archaeological heritage: Important concentrations of monuments in the Mourne Mountains; prominent examples of cashels; Norman mottes and castles at Clough and Dundrum; industrial heritage of quarrying; demesne landscapes and country houses; Victorian townscape of Newcastle.
- Inspiration and aesthetic values: Attractive upland landscape designated as AONB for its scenic value; important visual relationship with the coast and Dundrum Bay; depicted in many works of visual and literary art.
- Sense of place: Views of the mountains lend a strong sense of place to this area, whether in the upland or in adjacent places such as Dundrum Bay; Newcastle has a recognised identity as a holiday resort, while Kilkeel is known as a fishing port; the Mourne Mountains are among the best known of Northern Ireland's landscapes.

Northern Ireland Landscape Character Assessment 2000

The entire study area is contained within the Newcastle Valleys Northern Ireland Landscape Character Area (NILCA 85) as shown on **Figure 10.1**.

The Newcastle Valleys is an area of rolling ridges of pasture which links the Mourne Foothills to the Tyrella Coastal Dunes. Hedgerow trees and shelterbelts around farms add some tree cover and the mature linear woodlands along some parts of the river corridors provide a visual link to the more extensive wooded landscapes of the Tollymore Forest Park to the north.

Newcastle is located on the low ground within this area and sheltered by uplands and mountain peaks such as Slieve Donard and Slievenacloy. The sensitivity of the landscape is highest along the ridges and skylines in predominantly rural areas, while the valleys are less sensitive in visual terms but are valuable wildlife corridors. Valleys may accommodate some forms of development if woodlands provide screening and integration. The majority of this area falls within the Mourne AONB and areas overlooked from the Mournes are particularly sensitive to change.

Overall tree / woodland cover accounts for approximately 4% land cover of this NILCA; on a smaller scale, there are small areas of woodland in the study area which extend further west along the Shimna River Corridor and into Tollymore Forest. Landscape management of this asset should be orientated towards conservation, preservation and enhancement of the woodland cover.

Value of the study area

The study area is fully contained within the Mourne AONB; a large portion of the study area is made up of the Shimna River Corridor and adjacent open space amenity and recreation areas. The river corridor is under LLPA 2 and designated as an Area of Special Scientific Interest and zoned as a Site of Local Nature Conservation Importance.

Due to the aforementioned factors, the Landscape Value of the study area is considered to be **Medium**, Landscape Susceptibility is considered to be **High**, and Landscape Sensitivity to change is considered to be **Medium-High.**

10.5 Likely Future Receiving Environment / Do-Nothing Scenario

All components of the baseline are constantly changing due to a combination of natural and human processes. When predicting likely direct and indirect effects, it is important to remember that there are two available for comparison: the existing baseline environment and the future baseline environment without implementation of the Proposed Scheme but considering natural changes only.

In landscape terms, if the scheme did not go ahead, the proposed development site would remain as a riverine and amenity area covered with riparian vegetation and susceptible to flooding.

In visual terms, available views of the proposed development site would remain similar although changes would occur to existing vegetation due to maturing, pruning or natural decay. Intermittent flooding of houses and amenity areas would have temporary visual effects.

10.6 Predicted Impacts

10.6.1 Operation

Potential visual effects, direct and indirect landscape effects, and the duration and nature of effects arising from the Proposed Scheme have been identified. Plates 10.1 to 10.7 illustrate the existing views experienced from locations selected as Representative Viewpoints for the assessment of landscape and visual effects of the proposed flood alleviation scheme.

10.6.1.1 Landscape Effects

The following potential direct and indirect landscape effects have been identified, (along with their duration and nature) arising from the Proposed Scheme. Direct or indirect landscape effects on the fabric of the landscape and its receptors are closely related to the nature and extent of visibility.

The proposed flood alleviation scheme is located in the Mourne and Slieve Croob Regional Landscape Character Area (RLCA 25) and Newcastle Valleys Northern Ireland Landscape Character Area (NILCA 85). The landscape effects of the Proposed Scheme would be limited to those associated with the removal of mature vegetation within construction working areas to accommodate the scheme. This would have a direct impact on the tree cover in the area, although the design aims to minimise the effects on riparian vegetation immediately adjacent to the river's edge.

The introduction of new, but not uncommon to the area, man-made structures would slightly increase the built-up character. The Proposed Scheme design aims to replace existing built boundaries where possible to reduce this effect. At sections, the introduction of new flood protection infrastructure would be seen in conjunction with exiting flood alleviation measures along the Burren River. These localised effects would be limited to the immediate surroundings of the scheme and would cause a permanent and direct change to the existing landscape. The Landscape Value of the study area is considered to be Medium, Landscape Susceptibility is considered to be High, and Landscape Sensitivity to change is considered to be Medium-High. The magnitude of change is considered to be low at the site, and would reduce to negligible with increased distance in the wider area and in the context of the RLCA and NILCA as a whole.

Due to the Medium Landscape Value of the study area, and the Landscape Susceptibility and Landscape Sensitivity to change ranging from Medium-High to High, the significance of effects at smaller scale (study area) is considered to range from **Minor Adverse to Moderate Adverse** mostly in areas where well-established existing mature vegetation is proposed to be removed. The significance of effects will reduce to negligible in the wider area.

A summary of landscape effects on receptors located within the study area is provided in Table 10.13.

Table 10.13: Summary of Landscape Effects

RECEPTOR	*SUSCEPTIBILITY*	*SENSITIVITY*	*MAGNITUDE*	*DIRECT/INDIRECT*	*SIGNIFICANCE*
Landscape character of Mourne and Slieve Croob RLCA at Proposed Scheme location	High	Medium-High	Low	Direct	Minor to Moderate Adverse
Landscape character of Mourne and Slieve Croob RLCA within 250m of Proposed Scheme location	High	Medium-High	Low	Direct	Minor Adverse
Landscape character of Mourne and Slieve Croob RLCA beyond 250m of Proposed Scheme location	High	Medium-High	Negligible	Indirect	Negligible
Landscape character of Newcastle Valleys NILCA at Proposed Scheme location	High	Medium-High	Low	Direct	Minor to Moderate Adverse
Landscape character of Newcastle Valleys NILCA within 250m of Proposed Scheme location	High	Medium-High	Low	Direct	Minor Adverse
Landscape character of Newcastle Valleys NILCA beyond 250m of Proposed Scheme location	High	Medium-High	Negligible	Indirect	Negligible

10.6.1.2 Visual Effects

The Proposed Scheme is located within a river valley corridor with some gentle undulations. A network of existing mature vegetation along the river banks, as well as in surrounding areas, result in generally good screening within the open space sections of the study area. Views from the public road network located in built-up sections of the study area are mostly screened by existing residential developments and intervening vegetation. The locations with potential intermittent and open views of the Proposed Scheme elements have been identified at the desktop research stage and were further confirmed during the visual impact assessment on site. Plates 10.1 to 10.7 below illustrate the existing views from the selected Representative Viewpoints and the nature of visibility and potential visual effects are described.

Views from public roads and residential areas in close proximity to Proposed Scheme, within the 250m study area

The majority of open and intermittent views of the Proposed Scheme from public roads would occur in close proximity to the scheme, mainly within the study area of 250m. These views concentrate along the Bryansford Road in the west, and Shimna Road in the east of the study area. In many locations, existing buildings and intervening vegetation would screen the majority of the scheme, however the scheme would be fully visible from the bridges and adjacent sections of Bryansford Road and Shimna Road. The visibility would decrease with increased distance.

A description of representative views and associated visual effects from selected viewpoints located within this area is given below.

Plate 10.1: Viewpoint 1 - View south-east from Bryansford Road, located approximately 25m north of Beers Bridge

The view in Plate 10.1 is mainly experienced by pedestrians walking across the Beers Bridge, road users, as well as residents of the adjacent properties. The mature vegetation provides a visual barrier

to the adjacent open space recreation area and partly screens views of the nearby tennis courts and its associated lighting.

The value of this view is considered **medium**, and sensitivity of this or similar views in the area is considered **high** due to the proximity of residential properties. The susceptibility is also considered **high** as local residents would be the primary receptor of views of the Proposed Scheme. Changes in views, even minor changes, would likely be noticed as the view would be experienced daily.

The existing vegetation seen in Plate 10.1 would be significantly altered by the Proposed Scheme, especially for receptors at the adjacent property. It is proposed to remove the mature vegetation located on the banks of Tullybrannigan River, seen in the background of the above photograph.

On completion of construction works, the view would be open towards the open space recreation area and tennis courts located on the south bank of the Tullybrannigan River. The proposed wall, as seen in this view, would be approximately 1m high and visual effects would be mainly associated with the removal of existing mature vegetation. The view would open to views of the river and open space but also to views of the tennis courts fence and lighting. The magnitude of change in visual effects is considered **moderate**. The resulting significance of visual effects is considered **Moderate Adverse.**

Plate 10.2: Viewpoint 2 - View north-west from Bryansford Road bridge

This view is mainly experienced by road users, pedestrians, and residents of the adjacent properties. The view comprises the road seen against a backdrop of mature dense woodland.

The value of this view is considered **medium**, and sensitivity of this or similar views in the area is considered **high** due to the proximity of residential properties. The susceptibility is also considered **high** as local residents would be the primary receptor of views of the Proposed Scheme. Changes in views, even minor changes, would likely be noticed as the view would be experienced daily.

The existing vegetation seen in this view should not be significantly altered by the Proposed Scheme. It is proposed to construct a flood alleviation wall at this location, along the western road edge of approximately 0.6m in height.

On completion of construction works, the vegetation seen in this view would be partially screened to approximately 0.6m in height. Providing no major vegetation removal takes place at this location, the magnitude of change in this view is considered to be **low** and the resulting significance of effects is considered **Minor Adverse.**

Plate 10.3: Viewpoint 3 - View west from Bryansford Road / Riverside Park towards Tipperary Lane, located approximately 25m south of Bryansford Road bridge

The walkway in Plate 10.3 runs along the Shimna River corridor and provides an important recreation facility in the locality. The view is well composed and comprises views of the river and adjacent mature riparian vegetation. It is located on the verge of the residential area of Riverside Park. This view is mainly experienced by recreational users and residents of adjacent properties.

The value of this view is considered **medium,** and the sensitivity of this or similar views in the area is considered **high** due to the proximity of residential properties. The susceptibility is also considered **high** as local residents would be the primary receptor of views of the Proposed Scheme. Changes in views, even minor changes, would likely be noticed as the view would be experienced daily.

The existing vegetation seen in this view would be significantly affected by the Proposed Scheme. The proposed flood protection wall, ranging in height from 1.52m to 2.19m above existing ground level, would be located at the riverside verge of the existing footpath with a second flood protection wall of smaller height (0.63m) located closer to the river. A 1.4m high flood gate would be installed where the Proposed Scheme stops, approximately at a location where the existing garden boundary wall ends.

On completion of construction works, views of the river corridor would be almost completely blocked in views from Tipperary Lane along the length of the proposed wall on the riverside verge of the footpath. The majority of the existing mature trees along the river bank would be felled and therefore tree cover in this area would be significantly reduced.

The magnitude of change in this and similar views from Tipperary Lane is considered **moderate** and the resulting significance of visual effects is considered to be **Moderate Adverse.**

Views from open space recreation and amenity areas in close proximity to Proposed Scheme, within the 250m study area

The majority of open and intermittent views of the Proposed Scheme from open space in proximity to it would occur within the study area of 250m. These views concentrate along the existing footpaths / towpaths along the river corridor, footbridges and other areas affected by the scheme. Existing and retained riparian vegetation on the river banks would screen much of the scheme, however the scheme would be fully visible from areas where removal of vegetation is required. Visibility would decrease with increased distance.

A description of representative views and associated visual effects from selected viewpoints located within this area is given below.

Plate 10.4: Viewpoint 4 - View west from footpath along the Tullybrannigan River corridor, approximately 100m east of Bryansford Road bridge

The view in Plate 10.4 comprises a path along the river corridor in the foreground, the northern bank of the Tullybrannigan River with its existing mature vegetation, and glimpsed views of upper parts of adjacent existing buildings in the middle ground and existing Beers Bridge on Bryansford Road in the background. The backdrop consists of the upland areas of Tollymore Forest Park. The view is well composed and typical of areas adjacent to river corridors within the open space recreation areas.

The value of this view is considered **medium**, and sensitivity of this or similar views in the area is considered **medium-high**. The susceptibility is considered **medium**, as the main receptors of this view would be tolerant of some change.

The proposed flood protection wall would be located on top of the northern bank of the river and would wrap around the back garden boundary of the adjacent two properties. The proposed wall would range in height from 1.82m at the back garden boundary to 0.97m height above existing ground level at the road bridge. The Proposed Scheme would significantly affect existing vegetation as seen in this view. It is proposed to clear all of the vegetation from the river bank along the length of the wall at this location.

On completion of construction works, the existing densely vegetated river bank would be clear of vegetation which would adversely affect this view. The removal of natural screening would reduce the tree cover in the area and open-up views of the residential properties leaving a bare earth bank in view. The proposed wall would be seen as a new built structure in this view and would detract from the natural appearance of this riverine environment, transforming it into a more engineered and man-made landscape. However, the proposals for cladding would help integrate this new built structure into its surroundings.

The magnitude of change in this and similar views from adjacent areas within this open space is considered to be **moderate** and resulting significance of visual effects is considered to be **Moderate Adverse.**

Plate 10.5: Viewpoint 5 - View west, from footbridge within the open space recreation area between Shimna Road and Bryansford Road, looking over Shimna River

The view depicts a natural riverine environment typical to landscapes seen along the river edges in rural areas. The view is well composed and contains the river with densely vegetated river banks.

The value of this view is considered **medium**, and sensitivity of this or similar views in the area is considered **medium-high**. The susceptibility is considered **high**, as the view is of primary importance for the receptors.

The proposed flood protection wall would be located behind the existing mature vegetation on the western side of the river in the background of the photo where the river bends northwards. The wall would be approximately 1m high. It is proposed to clear the vegetation from areas adjacent to the wall location but every effort to retain the mature tree cover on the river bank would be made.

On completion of construction works, the existing and retained densely vegetated river bank would screen the majority or all of the wall from this viewpoint.

The magnitude of change in this and similar views from adjacent areas within this open space is considered to be **none to negligible** and resulting significance of visual effects is considered to be **Negligible to Minor Adverse.**

Plate 10.6: Viewpoint 6 - View north from pathway in the parkland, in vicinity of existing play area

This view is of a typical scene within the open space recreation area within the parkland, with a view towards the existing play area. Typical park elements are contained within this view such as paths, lawns, trees and play area.

The value of this view is considered **medium,** and sensitivity of this or similar views in the area is also considered **medium.** The susceptibility is considered **medium**, as the main receptors of this view would be tolerant to some change, as the view would not be of primary importance to them.

The proposed flood protection wall would be located along the eastern edge of the existing footpath and would vary in height from approximately 1m in the foreground to approximately 1.5m height at the end of the play area fence, seen in the back of this photograph.

On completion of construction works, the wall would be perceived as a new park element and careful selection of cladding materials would help ameliorate with the parkland environment. The wall would be approximately 1.5m height along the adjacent western boundary of the existing play area. It is also proposed to realign existing footpaths to improve permeability within the park and create a new picnic area on the eastern side of the wall.

Very little or none of the existing mature vegetation would be affected by the proposed works as the proposed alignment generally avoids trees in this location.

The proposed wall would be seen as a new element in this landscape and careful choice of materials would help merge the proposals with the existing baseline conditions.

The magnitude of change in this and similar views from adjacent areas within this open space is considered to be **moderate** and resulting significance of visual effects is considered **Moderate Neutral.**

Plate 10.7: Viewpoint 7 - View east from edge of Tipperary Wood, close to proposed alignment of flood defence wall

This photograph was taken from the woodland area of Tipperary Wood. It is orientated towards the property boundary wall and proposed location of the flood defence wall. This view shows an overgrown area of scrub within this broadleaf woodland and while being part of a Woodland Park, it is not easily accessible to the recreational users due to overgrowth and lack of maintenance.

The wall at this location would be approximately 1m above existing ground level, rising to over 2.8m in height at locations closer to the Shimna River corridor.

The value of this view is considered **low** and sensitivity of this, or similar views in the area, is considered **low**. The susceptibility is also considered **low** as views of the proposed wall would be obscured to receptors.

On completion of construction works, the vegetation seen in this view would be partially removed to accommodate the proposed wall, however it would not significantly affect the view. The wall itself would be barely perceived as a change, as there is an existing wall of similar height at the boundary of existing residential properties and the area is not easily accessible to the general public; therefore the number of receptors is limited. The proposed wall may improve the view in this area by providing clearer sightlines, improving tidiness and the overall look of this woodland fringe.

The magnitude of change in this and similar views from adjacent areas within this area of woodland open space is considered to be **low** resulting in **Negligible to Minor Beneficial** visual effects.

A summary of visual effects on receptors located within the study area is provided in Table 10.14.

Table 10.14: Summary of Potential Visual Effects

excluding mitigation

RECEPTOR	SUSCEPTIBILITY	SENSITIVITY	MAGNITUDE	SIGNIFICANCE
Viewpoint 1	High	High	Moderate	Moderate Adverse
Viewpoint 2	High	High	Low	Minor Adverse
Viewpoint 3	Medium	High	Moderate	Moderate Adverse
Viewpoint 4	Medium	Medium - High	Moderate	Moderate Adverse
Viewpoint 5	Medium	Medium - High	Negligible	Negligible to Minor Adverse
Viewpoint 6	Medium	Medium	Moderate	Moderate Neutral
Viewpoint 7	Low	Low	Low	Negligible to Minor Beneficial

10.6.1.3 Planning Policy Designation Impacts

Mourne Area of Outstanding Natural Beauty (Mourne AONB) – The Proposed Scheme would have negligible to minor adverse effects on the Mourne AONB as a whole; the scheme would be perceived as a noticeable change in available views from areas within 250m of it. Due to topography and existing tree cover within the area, the effects would quickly reduce with increased distance from the scheme.

LLPA 1 - Burren River Corridor – the banks of the Burren River has seen implementation of similar flood alleviation measures, therefore are considered as baseline conditions. Apart from potential visibility of two schemes in conjunction in views from some areas in close proximity, the scheme is located outside LLPA 1 and no direct change would come as a result of the proposed Shimna River flood alleviation scheme.

LLPA 2 - Shimna River Corridor – the Proposed Scheme would generally have Moderate Adverse effects on *"woodland and important tree groups"* features described under the policy and located along the river corridor at the scheme location. Due to vegetation clearance, the tree cover would reduce in places, however with implementation of proposed mitigation measures as well as with increased distance from the site, the effects would reduce.

The effects on *"public access along river alongside Tipperary Wood linking to Tipperary Lane..."* would generally vary from Negligible to Moderate Adverse in views from viewpoints located alongside designated walking routes at the scheme location. These would reduce with implementation of the proposed mitigation measures as well as with increased distance from the site.

LLPA 4 - Tullybrannigan River Corridor – the Proposed Scheme would generally have Moderate Adverse effects on *"mature trees"* features described under the policy and located along the river corridor at the site. Due to vegetation clearance, the tree cover would reduce in places, however with implementation of proposed mitigation measures as well as with increased distance from the site, the effects would reduce.

Existing Amenity Open Space and Recreation - the effects in views from this area would generally vary from Negligible to Moderate Adverse in views from viewpoints located within this area. The effects would reduce with implementation of the proposed mitigation measures as well as with increased distance from the site.

Area of Special Scientific Interest (ASSI245) - the Proposed Scheme would generally have Negligible to Moderate Adverse effects on features described under this designation and located along the river corridor at the scheme location. This relates mainly to removal of bankside vegetation to accommodate the scheme and disturbance of habitats.

Saint Patrick's Way – The Pilgrims Walk, Section E – Rostrevor to Newcastle – The effects in views from locations along this walking route would generally vary from Negligible to Moderate Adverse in views at the scheme location. The effects would reduce with implementation of the proposed mitigation measures as well as with increased distance from the site.

The Mourne Coastal Driving Route – This would not be significantly affected by the Proposed Scheme.

10.6.1.4 Temporary Storage Compounds

It is proposed that potentially two temporary storage compound areas would be utilised during the construction phase of the scheme. Both areas are located within *"Existing Amenity Open Space and Recreation".* One may be located in an area between the Shimna River and Tullybrannigan River, behind residential properties near Beers Bridge on Bryansford Road, and the other would be at the existing play area within Islands Park.

The compounds would be a new, temporary feature in views from a limited number of properties and other publicly-accessible areas. The visual sensitivity is high, as both areas are located close to residential properties. The magnitude of change is considered moderate and the resulting significance of the visual effects is considered to be Moderate to Major Adverse; however, these effects would be temporary in nature as the areas would be returned to their previous uses upon completion of the scheme.

10.6.2 Construction

Effects arising from the process of constructing the Proposed Scheme are considered to be of a similar nature and duration to those arising from the decommissioning process and therefore have not been considered separately. Where this assessment refers to potential construction effects, these are also representative of predicted decommissioning effects.

Landscape and visual effects during the construction stage would be experienced in the vicinity of the development site, from locations with views of the proposed works and along the roads where construction traffic would travel. Existing intervening vegetation would (partially) screen the site clearance, earthworks, compound, construction works and the associated machines moving on the construction site. The removal of vegetation during site clearance and earthworks would be a permanent effect, and the appearance would be likely equally visually obtrusive during the construction phase and the operation, as screen vegetation would be removed. During construction, portions of the proposed works, associated machinery and plant machinery would be visible from a number of viewpoints within the study area and potentially from beyond the study area. Due to the movements of construction staff and equipment, it may be more noticeable to a receptor in comparison to a relatively static site at operation.

The effects arising during construction would result from machinery, personnel, excavations and traffic movements. Landscape and visual effects would be greatest within 500m of the works area. The visibility of construction works within the wider area (beyond 500m from the centre of the proposed development site) is limited and may include the upper sections of machinery (for example cranes or containers). The landscape and visual effects and their significance at construction stage would be temporary, adverse and range from Minor Adverse in the wider area to Moderate – Major Adverse for areas in close proximity, (i.e. up to 500m from the centre of the proposed development site).

10.7 Mitigation & Enhancement Measures

Mitigation measures are measures to help reduce the negative impacts arising from the visual change caused by the Proposed Scheme. Mitigation measures were considered at the design stage and would be implemented as part of the design, to reduce the potential visual effects at the outset. In addition, a series of remedial works is to be carried out upon scheme completion to ameliorate the negative effects. The following mitigation measures are proposed.

10.7.1 Construction Phase

- External materials chosen for flood wall cladding to be of similar colour, size and scale to existing walls within the locality. Walls, where visible at roadsides and bridges, to be masonry stone

faced. Walls within the parkland to be constructed of appropriate natural stone and where required, capped with appropriate capping;

- Temporary storage heaps associated with infill materials and soil not to exceed 1m height;
- Storage compound areas to be reinstated to former use upon completion of the works;
- Vehicles exiting compound areas would be subject to wheel wash facilities, or road sweepers shall be used in order to maintain clean roads;
- Any lighting used would be kept to a minimum, providing for site safety only and shall be directed into the compound and away from adjacent residential properties. Lighting shall be shielded to avoid light spill onto adjacent properties and roads.
- Fencing used around site offices, welfare units and parking within the compound areas shall be carefully chosen in order to merge with surrounding landscape.
- The earthen embankments constructed to reduce the height of visible walls would be planted with grass;
- Landscape mitigation / restoration plan to be drawn-up to ameliorate the Proposed Scheme into the existing environment. Plan should indicate measures in attempt of restoring the banks and surrounding areas to its original qualities and provide for replacement of removed vegetation upon agreement with relevant stakeholders. Plan to include maintenance regime for operational phase of the scheme;
- Existing trees to be retained and protected would be protected in accordance with BS 5837:2012. The services of a qualified arborist would be sought to perform a tree survey of the Proposed Scheme. The trees should be assessed to quantify their age, condition and amenity value and tagged with metal tags. Prior to commencement of construction, existing trees which are to be retained would be protected by erection of timber post & wire fence to BS 5837:2012 to ensure no works are carried out under reach of their canopies. Unstable trees should be removed under direction of the arborist.

10.7.2 Operational Phase

- Ensuring the landscape management programme / restoration plan identified previously is implemented during the lifetime of the Proposed Scheme to protect and reinforce bank side vegetation with the aim of ensuring landscape framework remains dominant;
- Ongoing landscape maintenance and debris cleaning from river channel and adjacent areas; and
- Ongoing maintenance and replacement of failing elements within the proposed wall and other associated structures forming part of the scheme.

10.8 Residual Effects

Effective implementation and establishment of the proposed mitigation measures would have a positive impact and help ‘soften’ landscape and visual effects associated with the Proposed Scheme, particularly for areas located in proximity to the proposed development site. In the medium to long-term, the perception of adverse landscape and visual effects would reduce in tandem with the maturing of proposed planting. Sensitive design of proposed restoration contained within the landscape / restoration plan would gradually integrate the Proposed Scheme into the surrounding environment.

10.8.1 Construction Phase

10.8.1.1 Landscape effects

Implementation of mitigation measures at construction phase would not significantly reduce the impacts of construction as the key effects would arise from the removal of vegetation, therefore residual effects during the construction stage on the landscape would remain as Minor Adverse in the

wider area and Moderate – Major Adverse within the site itself. The protection of existing vegetation to be retained in accordance with BS 5837:2012 and use of existing roads where feasible would minimise landscape effects at construction stage.

10.8.1.2 Visual effects

The main receptors of visual effects would be residents of the nearest dwellings with views of the proposed working areas and temporary storage compounds, as well as motorists travelling along the road network in the near vicinity of the site. The visual effects would arise as a result of machinery, increased traffic and work carried out in the working areas. These effects would be temporary and would vary in significance from Minor Adverse in the wider area to Moderate – Major Adverse in close proximity to the site.

10.8.2 Operational phase

10.8.2.1 Landscape effects

The residual effect on the landscape and landscape character, following establishment of mitigation measures, would reduce to Minor Adverse and not significant. The use of stone cladding to walls, retention of existing vegetation along river banks, and replacement of the removed vegetation would help integrate the Proposed Scheme with the existing environment. The Proposed Scheme would be read as part of the wider landscape where similar embankments and walls are an existing feature.

10.8.2.2 Visual effects

Upon implementation of the mitigation measures contained within this section and landscape mitigation / restoration plan to be developed as the scheme progresses, the visual effects would reduce in their significance. Residual visual effects for identified representative viewpoints assessed in this section are described below.

Viewpoint 1 - View south-east from Bryansford Road, located approximately 25m north of Beers Bridge (Plate 10.1).

It is recommended to replace the existing vegetation cleared during the construction phase with new native planting (subject to agreed landscape restoration plan with appropriate maintenance regime) similar to what is seen in the existing photograph. Upon establishment and maturity of the replacement planting, the significance of visual effects associated with the Proposed Scheme would reduce to **Minor Adverse.**

Viewpoint 2 - View north-west from Bryansford Road bridge (Plate 10.2).

The proposed flood defence wall would be clad with natural stone, matching the stone used for existing road bridge walls. The retention and protection of existing vegetation outside of the working area would reduce the impacts on woodland seen in this view. Implementation of the mitigation measures would result in visual effects in this view which are **Minor Adverse**.

Viewpoint 3 - View west from Bryansford Road / Riverside Park towards Tipperary Lane, located approximately 25m south of the Bryansford Road bridge (Plate 10.3).

The proposed flood defence wall would be clad with natural stone matching the stone used for the existing nearby road bridge. The retention and protection of existing vegetation outside the working area would reduce the impacts on woodland seen in this view. The existing vegetation cleared during the construction phase would be replaced where possible with new native planting similar to what is seen in the existing photograph. Upon implementation of the mitigation measures, the significance of visual effects associated with the Proposed Scheme would be **Moderate Adverse.**

Viewpoint 4 - View west from footpath along the Tullybrannigan River corridor, approximately 100m east of the Bryansford Road bridge (Plate 10.4).

The existing vegetation cleared during the construction phase would be replaced with new native planting similar to what is seen in the existing photograph. Upon establishment and maturity of the replacement planting, the significance of visual effects associated with the Proposed Scheme would reduce to **Minor Adverse.**

Viewpoint 5 - View west, from footbridge within the open space recreation area between Shimna Road and Bryansford Road, looking over the Shimna River (Plate 10.5).

The retention and protection of existing vegetation outside the working area would reduce the impacts on woodland seen in this view. The existing vegetation cleared during the construction phase would be replaced with new native planting similar to what is seen in the existing photograph. Upon implementation of the mitigation measures, the significance of visual effects associated with the Proposed Scheme would be **Negligible to Minor Adverse.**

Viewpoint 6 - View north from a pathway in the parkland, in vicinity of the existing play area (Plate 10.6).

The proposed flood defence wall would be clad with natural stone matching other stone material used throughout the parkland to match and enhance the visual appearance of the wall in this landscape. The wall would be topped with a concrete capping. The proposal to create a picnic area, new areas of planting and to re-align and refurbish the existing footpaths would enhance the amenity quality of this area. Upon implementation of the mitigation measures, the significance of visual effects in this view would be **Moderate Neutral.**

Viewpoint 7 - View east from the edge of Tipperary Wood, in proximity to the proposed alignment of the flood defence wall (Plate 10.7).

The retention and protection of existing vegetation outside the working area would reduce the impacts on woodland seen in this view. The existing vegetation cleared during the construction phase would be replaced with new native planting, similar to what is seen in the existing photograph. Upon implementation of the mitigation measures and assuming an ongoing maintenance regime, the significance of visual effects associated with the Proposed Scheme would be **Negligible to Minor Beneficial.**

A summary of residual visual effects on receptors located within the study area is provided in Table 10.15.

Table 10.15: Summary of Residual Visual Effects

Inclusive of mitigation

RECEPTOR	*SUSCEPTIBILITY*	*SENSITIVITY*	*MAGNITUDE*	*SIGNIFICANCE*
Viewpoint 1	High	High	Low	Minor Adverse
Viewpoint 2	High	High	Low	Minor Adverse
Viewpoint 3	Medium	High	Moderate	Moderate Adverse
Viewpoint 4	Medium	Medium - High	Low	Minor Adverse
Viewpoint 5	Medium	Medium - High	Negligible	Negligible to Minor Adverse
Viewpoint 6	Medium	Medium	Moderate	Moderate Neutral
Viewpoint 7	Low	Low	Low	Negligible to Minor Beneficial

10.9 Summary & Conclusions

The proposed Shimna River Flood Alleviation Scheme is located within the Mourne and Slieve Croob Regional Landscape Character Area and the Newcastle Valleys Northern Ireland Landscape Character Area. During the construction period, the temporary landscape and visual effects would vary from Minor Adverse for areas beyond 500m from the scheme, to Moderate – Major Adverse in close proximity of the proposed works. All construction impacts would be temporary in duration, as the

working areas and storage compound areas would be restored to their previous state following completion of the works.

The potential localised landscape effects at the site would range from Minor Adverse to Moderate Adverse, mostly in areas where well-established existing mature vegetation is proposed to be removed. The significance of effects in the wider area is considered to be Negligible, when assessing the landscape character as a whole. Following implementation of the mitigation measures, including replanting and effective establishment of vegetation, the significance of the localised residual landscape effects would reduce to Negligible in areas affected by significant vegetation clearance.

The potential visual effects associated with the Proposed Scheme would range from Negligible to Moderate Adverse, the latter of which would occur mainly in locations where extensive vegetation clearance is required. During assessment of views from representative viewpoints, it was established that three out of seven viewpoints would potentially experience localised Moderate Adverse effects in the operational phase of the scheme. These viewpoints are referred to in the text as Viewpoints 1, 3 and 4. Following implementation of the mitigation measures, including replanting of vegetation, the significance of the localised residual landscape effects would reduce to Minor Adverse in two views (Viewpoints 1 and 4). The effect on Viewpoint 3 remains Moderate, due to the fact that two of the new walls would be visible at this particular location. Beneficial effects have been identified where path and picnic area improvements are proposed to the existing amenity area.

11. Population & Human Health

11.1 Introduction

This section assesses the likely significant effects of the Proposed Scheme on people and communities (including human health and socio-economic effects). As stated previously, the ES shall include such of the information referred to in Schedule 2A of the Drainage (Environmental Impact Assessment) Regulations (Northern Ireland) 2017. The EIA shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of the Proposed Scheme upon Population and Human Health.

As detailed in with the North-Eastern FRMP (2015), the effects of flooding are wide ranging, impacting on the economy and social wellbeing. For individuals and communities, the impact can be significant in terms of personal suffering and financial loss. Essential services such as mains water, electricity and transport can be disrupted. Property and possessions can be damaged and most seriously, flooding can result in injury and death.

As per the Department's legal obligations, the objective of the Proposed Scheme is to protect the Newcastle community from the devastating impact that flooding can have through the provision of structural measures in the form of flood alleviation walls and embankments, thus reducing potential adverse consequences of significant floods on human health and economic activity. In contrast to this, whilst providing obvious benefits to the community that would be affected both directly and indirectly by such an event, such a scheme may also have adverse impacts for example demolition, private land loss and loss of amenity.

This section therefore 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 this sensitive environment.

11.2 Methodology

11.2.1 Scope of the Assessment

In the absence of local guidance for the assessment of population and human health, this assessment has been undertaken in accordance with SEPA supporting guidance '*Assessing the Significance of Impacts - Social, Economic, Environmental*' (2015) and other relevant guidance as necessary.

Under the general heading of Population and Human Health, the following topics are considered as part of this assessment and have been considered in this order throughout the section:

- **Socio-economics**: will the Proposed Scheme stimulate additional development and/or reduce economic activity, and if either, what type, how much and where? Will the Proposed Scheme change the intensity of patterns and types of activity and land use?;
- **Land Use**: will the Proposed Scheme result in severance, loss of rights of way or amenities, conflicts, or other changes likely to ultimately alter the character and use of the surroundings?;
- **Tourism**: will the Proposed Scheme affect the tourism profile of the area?; and
- **Health, Safety & Wellbeing:** have the vectors through which human health impacts could be caused been assessed, including adequate consideration of inter relationships between those assessments?

A desktop analysis of the local area and its facilities was also undertaken, as well as a walkover survey to verify findings and to ground truth certain issues.

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 (including the latest census information)

and social research on Northern Ireland. These statistics and research inform public policy and associated debate in the wider society.

11.2.1.1 Assessing the Significance of Effects

The focus of the section is to establish the potential for impacts on population, health, and economic activity in the area and on potential impacts to the community, including the resident, working and visiting community. It is not sufficient to assess only the size and probability of possible impacts; their significance should also be assessed. The significance of the effect is formulated as a function of the receptor or resource's environmental value (or sensitivity) and the magnitude of project impact (change). In other words, significance criteria are used to report the effect of the impact.

In undertaking the assessment of the impact of the proposal on human beings, land use, community and the local socio-economic environment, the following impact criteria was employed (as set out in tables below). In terms of land use impacts, there may be a significant degree of ambiguity with regards to the non-monetary valuation of land and property, and the importance of its primary usage. Therefore, significance criteria used to assess impacts is based on professional judgement and used loosely.

Firstly, to assess the overall significance of potential effects, an assessment has been made of the sensitivity of the resource and magnitude of potential impacts using the general criteria contained in **Tables 11.1** & **11.2** for guidance.

Table 11.1: Estimating the Importance of Attribute/Asset

Importance	Criteria
High	Existing beneficial land uses (i.e. active property, private land associated with an active property, community lands and woodlands).
Medium	Areas designated for future usage with a developer interest (i.e. land use planning policy designations contained within the Area Plan), access lanes, farm outbuildings.
Low	Existing land uses of less beneficial nature and without developer interest (i.e. inactive/derelict property, brownfield land associated with an inactive property).

Table 11.2: Estimating the Magnitude of Impact on an Attribute/Asset

Magnitude	Criteria
Major	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements. Demolition of property. Landtake from property and/or severance which would preclude or significantly affect current or future use. Loss of community resource and/or quality and integrity of community resource. People are likely to be deterred from trips to an extent sufficient to induce a re-organisation of their habits (Adverse). Large scale or major improvement to community resource quality; extensive restoration or enhancement (Beneficial).
Moderate	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements. Landtake from property which would moderately affect current or future use. Loss of community resource, but not adversely affecting quality and integrity. Some residents, particularly children and elderly people, are likely to be dissuaded from making trips. Other trips will be made longer or less attractive, for example (Adverse). Benefit to, or addition of, key characteristics of community resource, features or elements (Beneficial).
Minor	Some measurable change in attribute's quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements. Landtake from property which would slightly affect current or future use. Some measurable change in attributes of community resource, quality or integrity. In general, the current journey pattern is likely to be maintained, but there will probably be some hindrance to movement, for example (Adverse).

	Minor benefit or addition to a community resource / NMU provision (Beneficial).
Negligible	No perceptible change to baseline conditions.

Table 11.3 outlines a suggested means of estimating the significance of potential effects, based upon the magnitude of impact and sensitivity of the receptor. Professional judgement and awareness of the relative balance of importance between sensitivity and magnitude allows the overall significance of impact to be assessed. The significance of impact is assessed with mitigation to define residual effects.

Table 11.3: Estimating the Significance of Potential Effects

Importance of Attribute					
	High	Neutral	Moderate/Large	Large/Very Large	Very Large
	Medium	Neutral	Slight/Moderate	Moderate/Large	Large/Very Large
	Low	Neutral	Slight	Moderate	Large
		Negligible	**Minor**	**Moderate**	**Major**
			Magnitude of Impact		

Other issues that are of relevance to the themes of this section, but addressed elsewhere in this ES, include:

- Public Consultation (Section 6);
- Air Quality & Climate (Section 7);
- Cultural Heritage (Section 8);
- Biodiversity – Terrestrial Ecology (Section 9);
- Landscape & Visual (Section 10);
- Noise & Vibration (Section 12);
- Drainage and the Water Environment (Section 13); and
- Geology & Soils, including Contaminated land (Section 14).

11.3 Regulatory & Policy Framework

11.3.1 The Drainage (Northern Ireland) Order 1973 [as amended]

Article 10 of The Drainage (Northern Ireland) Order 1973 [as amended] subject to approval allows the Department 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.

Where the Department desires to acquire otherwise than by agreement any land which it considers necessary for the purpose aforesaid, it may make an order (in this Order referred to as a "Vesting Order") vesting such land.

11.3.2 The Access to the Countryside (Northern Ireland) Order 1983

Newry, Mourne and Down District Council (NMDDC) has a statutory responsibility for provision of public open space and recreation facilities within Newcastle and its hinterland to the west ('the study area'). 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.

Under The Access to the Countryside (Northern Ireland) Order 1983, NMDDC 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.

11.4 Baseline Conditions

11.4.1 Socio-economics

As detailed within the North-Eastern FRMP (2015), according to the Preliminary Flood Risk Assessment (Dec 2011), the town of Newcastle in terms of the potential adverse consequences of flooding, is ranked eighth of the twenty Significant Flood Risk Areas (SFRA) within Northern Ireland. On the basis of this initial assessment, which was undertaken using the Strategic Flood Maps, the flood risk to the town was considered to arise almost exclusively from fluvial flooding with in excess of 1300 properties estimated to fall within the predicted 1-in-100 year strategic floodplain outlines. Although Newcastle is a seaside town, it is not considered to be at significant risk from tidal inundation as there is nothing more than the toilet block in Castle Park exposed to flooding at a 1-in-200 year event.

Since the introduction of the flooding hardship payment scheme in 2007, there have been in excess of 70 payments issued to homeowners in the Newcastle SFRA. The majority of the payments (53) relate to properties that flooded during the August 2008 event. A further 13 of the payments relate to an extreme rainfall flood event in June 2012 which overwhelmed the urban drainage systems and led to the flooding of properties in and around the Mourneview housing development. Many similar flood events have occurred in this area prior to the introduction of the 2007 scheme and this area is listed in the interagency Flood Liaison Group's 'Flooding Hotspots' register.

As noted previously, in October 2016, RPS prepared the '*Shimna River, Newcastle Flood Risk Assessment Economic Appraisal*'. As detailed within this report, a hydraulic analysis of the Shimna River identified that 292 residential and 20 commercial buildings would be affected during a 1% AEP flood event. The areas identified as being at risk of flooding include Bryansford Road, Bryansford Avenue, Beechfield Park, Shimna Vale, Shimna Road, Castlewellan Road, Shimna Mile and Riverside Park.

From a socio-economic perspective, financial damage to property, disruption to communications and business losses are regularly typical of flood impacts. As detailed within '*Exploring the Social Impacts of Flood Risk and Flooding in Scotland*' (Scottish Executive 2007), the social disruption caused by floods can seriously undermine the quality of life of individuals and impact on the fabric of affected communities. As well as the physical and health dangers of flood waters, the psychological impact of the emergency and aftermath causes longer term effects that may be exacerbated by stresses such as having to move out of the home, cleaning-up, negotiating with insurers and getting damage repaired and goods replaced. Even when the 'recovery' phase is over, there may be difficulties caused by living with the ongoing risk, obtaining and paying for insurance, and the effect on house prices and community cohesion.

The Scottish Executive report provided a range of personal accounts of being flooded. In terms of tangible impacts, most participants to this report reported a downturn in the property market immediately after the flood and problems in recovering additional day-to-day expenses such as meals in hotels and restaurants. Most loss adjusters and insurance companies were prompt and efficient in agreeing and settling claims, but the settling of relatively minor sums was occasionally contentious. Extensive delays were claimed on behalf of some social tenants in being re-housed and returned to

their original homes. Loss of no-claims bonuses and high flooding excesses became an unexpected issue for some participants.

11.4.1.1 Northern Ireland Multiple Deprivation Measure 2017

The Northern Ireland Multiple Deprivation Measure (NIMDM) provides a mechanism for ranking areas within Northern Ireland in the order of the most deprived to the least deprived. In terms of multiple depravation rank, as shown on Plate 11.1, the study area is generally within the lower third of least most deprived areas in Northern Ireland.

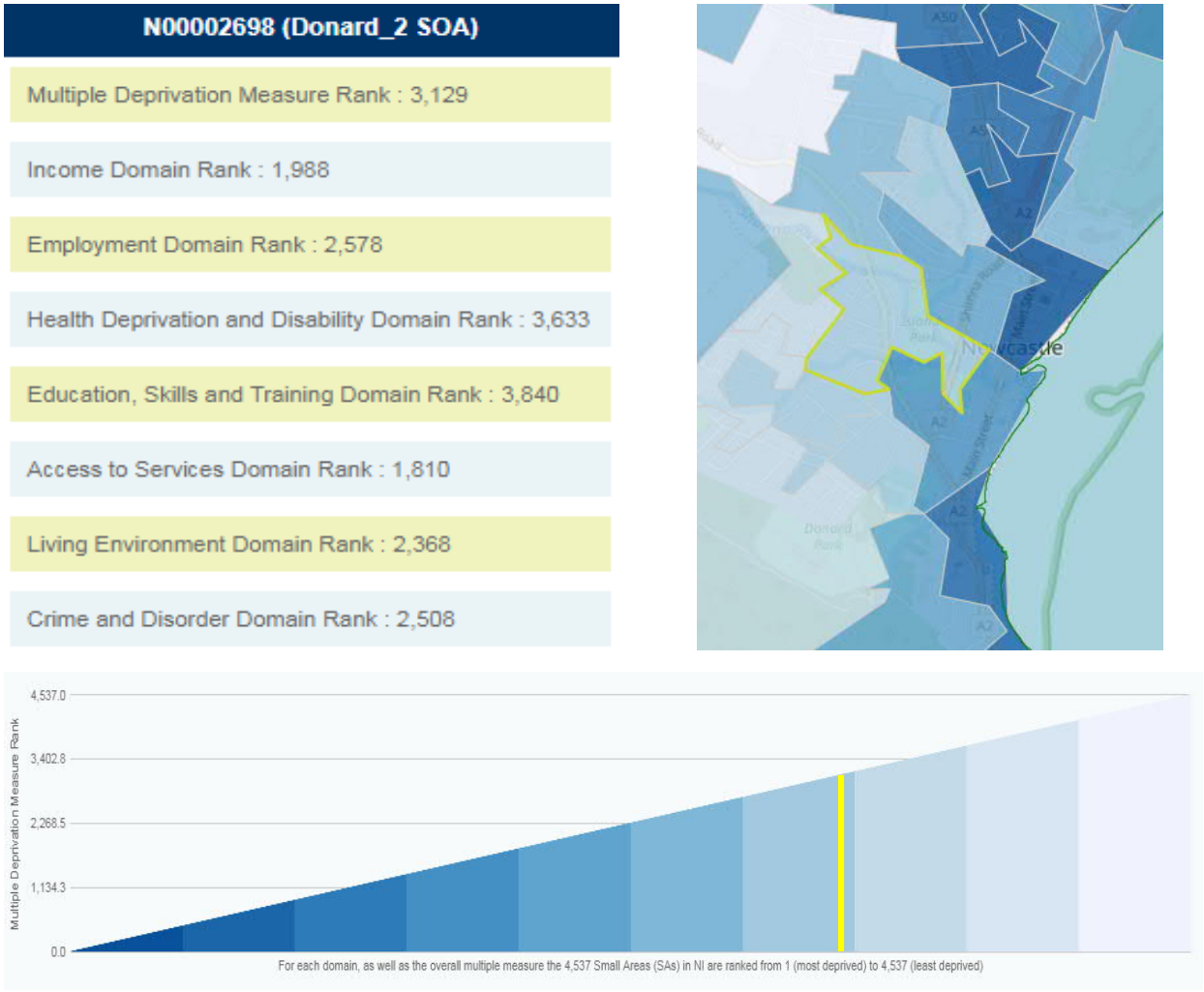


Plate 11.1: Northern Ireland Multiple Deprivation Measure for Donard Super Output Area (SOA)
Source: Northern Ireland Statistics and Research Agency (NISRA)

11.4.1.2 Demographics and Key Statistics

As of the most recent Census Day (27th March 2011), Newcastle had a population of 7,672 (0.42% of the Northern Irish total) and is classified as a small town. In terms of specific demographics and key statistics for the study area, these are set out on a Ward-by-Ward basis (also referred to as Electoral Wards) below. As delineated by the Shimna River, the study area (as shown on Plates 11.2 and 11.3) is located within the:

- Shimna Ward; and
- Donard Ward.

11.4.1.2.1 Electoral Ward information for Shimna

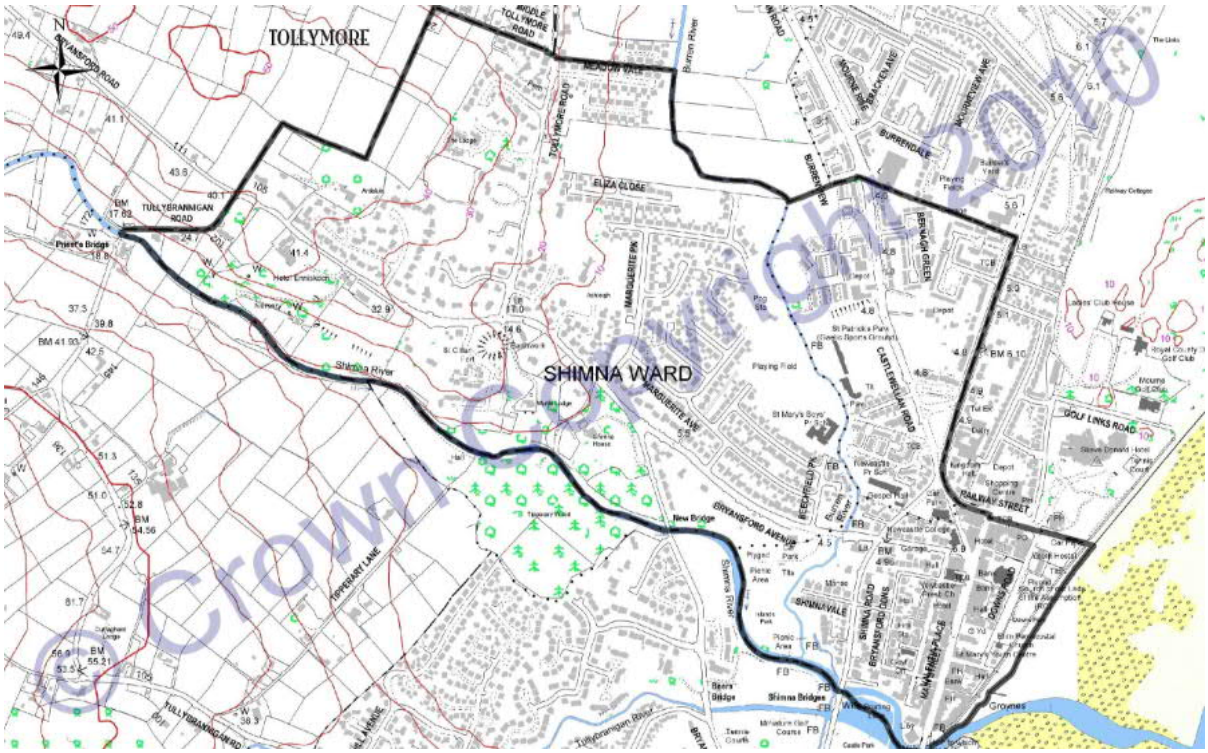


Plate 11.2: Shimna Ward

Source: Northern Ireland Statistics and Research Agency (NISRA)

Shimna Ward can be defined as Urban and is situated in the Down Local Government District, the South Down Assembly Area and is within the South Eastern Health and Social Care Trust. It neighbours Murlough, Tollymore and Donard wards.

11.4.1.2.1.1 Population Estimates for Shimna Ward

With reference to the NISRA electoral ward information for Shimna, the estimated population at 30th June 2017 was **2,821**, of which **1,326** (47.0%) were male and **1,495** (53.0%) were female. This was made up of:

- **522** children aged 0-15 years;
- **769** people aged 16-39 years;
- **926** people aged 40-64 years; and
- **604** people 65 years and older.

Between 2007 and 2017, the population of Shimna Ward increased by **140** people or 5.2%.

11.4.1.2.1.2 Census 2011 Population Statistics for Shimna Ward

With reference to the NISRA electoral ward information for Shimna, on Census Day (27th March 2011) the usually resident population of Shimna Ward was **2,687** accounting for 0.15% of the Northern Irish total.

In terms of households, on Census Day there were **2,680** people (99.74% of the usually resident population) living in **1,151** households, giving an average household size of **2.33**.

In terms of Demography, **18.83%** were aged under 16 years and **20.54%** were aged 65 and over; **46.41%** of the usually resident population were male and **53.59%** were female; and **43** years was the average (median) age of the population.

In terms of Health, on Census Day:

- **24.38%** of people had a long-term health problem or disability that limited their day-to-day activities;

- **78.45%** of people stated their general health was either good or very good; and
- **13.81%** of people stated that they provided unpaid care to family, friends, neighbours or others.

In terms of Housing and Accommodation, on Census Day:

- **68.81%** of households were owner occupied and **27.45%** were rented;
- **39.36%** of households were owned outright;
- **17.55%** of households were comprised of a single person aged 65+ years;
- **7.04%** were lone parent households with dependent children; and
- **24.07%** of households did not have access to a car or van.

In terms of the labour market, on Census Day, considering the population aged 16 to 74 years old:

- **63.19%** were economically active, **36.81%** were economically inactive;
- **53.23%** were in paid employment; and
- **5.93%** were unemployed.

11.4.1.2.2 Electoral Ward information for Donard

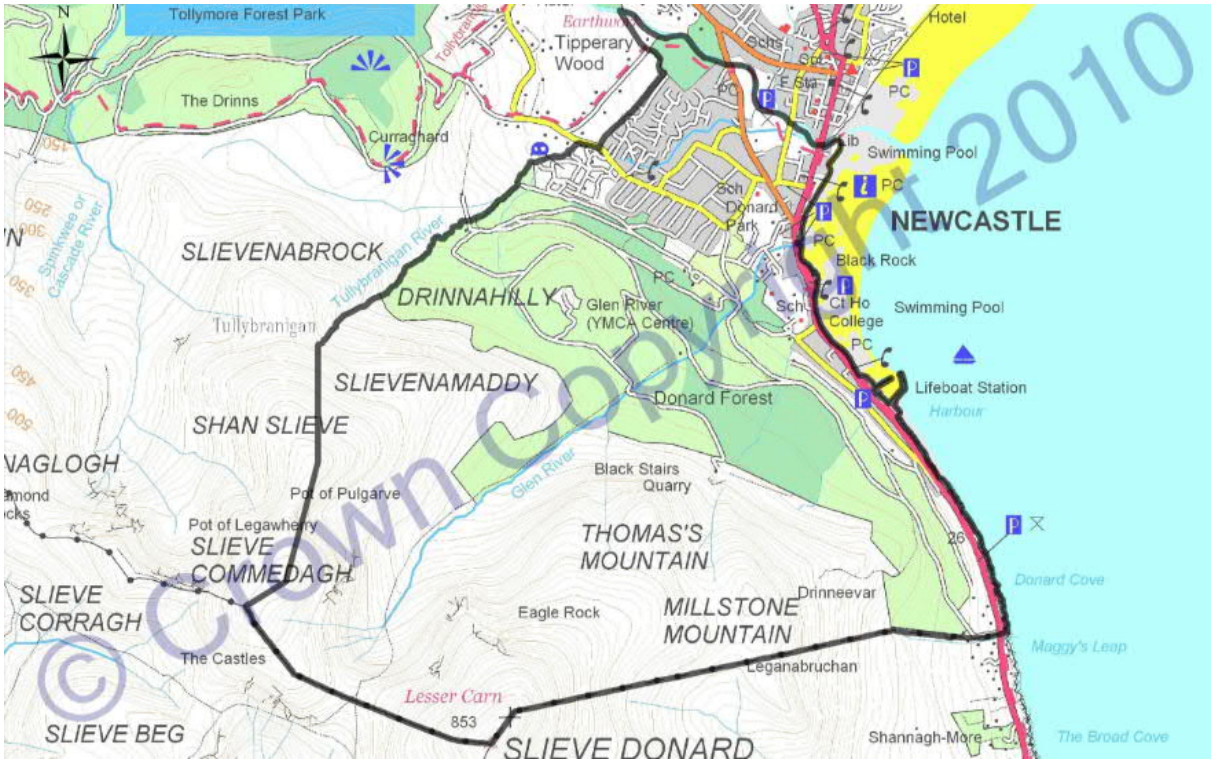


Plate 11.3: Donard Ward

Source: Northern Ireland Statistics and Research Agency (NISRA)

Donard Ward can be defined as Urban and is situated in the Down Local Government District, the South Down Assembly Area and is within the South Eastern Health and Social Care Trust. It neighbours Annalong, Binnian, Tollymore and Shimna wards.

11.4.1.2.2.1 Population Estimates for Donard Ward

With reference to the NISRA electoral ward information for Donard, the estimated population at 30th June 2017 was **3,061**, of which **1,492** (48.7%) were male and **1,570** (51.3%) were female. This was made up of:

- **553** children aged 0-15 years;

- **717** people aged 16-39 years;
- **1,025** people aged 40-64 years; and
- **767** people 65 years and older.

Between 2007 and 2017, the population of Donard Ward decreased by **84** people or 2.7%.

11.4.1.2.2.2 Census 2011 Population Statistics for Donard Ward

With reference to the NISRA electoral ward information for Donard, on Census Day (27th March 2011) the usually resident population of Donard Ward was **3,193** accounting for 0.18% of the Northern Irish total.

In terms of households, on Census Day there were **3,111** people (97.43% of the usually resident population) living in **1,290** households, giving an average household size of **2.41**.

In terms of Demography, **19.39%** were aged under 16 years and **19.82%** were aged 65 and over; **48.98%** of the usually resident population were male and **51.02%** were female; and **43** years was the average (median) age of the population.

In terms of Health, on Census Day:

- **22.05%** of people had a long-term health problem or disability that limited their day-to-day activities;
- **79.14%** of people stated their general health was either good or very good; and
- **12.68%** of people stated that they provided unpaid care to family, friends, neighbours or others.

In terms of Housing and Accommodation, on Census Day:

- **71.86%** of households were owner occupied and **26.05%** were rented;
- **38.22%** of households were owned outright;
- **16.12%** of households were comprised of a single person aged 65+ years;
- **7.52%** were lone parent households with dependent children; and
- **16.36%** of households did not have access to a car or van.

In terms of the labour market, on Census Day, considering the population aged 16 to 74 years old:

- **63.02%** were economically active, **36.98%** were economically inactive;
- **55.31%** were in paid employment; and
- **4.19%** were unemployed.

11.4.2 Land Use

11.4.2.1 Newcastle

As detailed within the Ards Down Area Plan 2015, Newcastle is located 19 kilometres from Downpatrick and 51 kilometres from Belfast. The settlement originated at a bridging point at the mouth of the Shimna River, once the site of the Magennis Castle, which was demolished in 1831 to make way for a hotel and is now the Annesley Buildings.

Its early growth was related to the granite and fishing industries centred on the Harbour and foreshore at the southern end of the town in an area known as The Ballagh. Its development as a major holiday resort followed with the extension of the railway to the town in 1869. This period saw the construction of the late 19th Century Victorian stuccoed domestic terraces now concentrated on the inland side of Main Street.

Today, Newcastle is a service centre for the surrounding rural hinterland, a commuter settlement and a holiday and retirement resort. It remains one of the main centres for tourism in Northern Ireland due

primarily to the beauty of its natural setting and provides a range of tourist accommodation, in particular caravan parks. Local service and recreation facilities include churches, schools, a library, golf courses, Gaelic football and soccer pitches, outdoor swimming pools and playing fields. The service sector is the main source of employment, much of which is associated with the tourist industry and general professional services.

The town and its setting contain a number of listed buildings, archaeological monuments and sites of nature conservation interest. It retains many examples of late 19th Century architecture, associated with its development as a resort, particularly in Main Street and on South Promenade and King Street.

The Northern Ireland Landscape Character Assessment describes the town's dramatic mountain setting and the strong contrasts between the mountains, the flat dune landscape at the shore and the series of river valleys which radiate inland from the town. It refers to areas of locally distinctive landscape within the town, including the Shimna valley, Tipperary Wood and Donard Park and the river corridors associated with the Glen, the Tullybrannigan and the Burren rivers. Flooding is a constraint to development adjacent to some of the main rivers.

11.4.2.2 Land Use within the Study Area

Within the study area, the Shimna River corridor and the area that surrounds it has many existing land uses and is very much representative of the convergence and tension between the natural and human environment with the meeting of the riparian corridors of the converging Shimna, Tullybrannigan and Burren rivers (and associated wetlands) with the residential and amenity areas of Newcastle Town.

As noted previously, the study area centres on the Shimna River which serves as a valuable and diverse area of landscape and ecological importance. The study area forms a locally distinctive landscape within the town and includes the Shimna valley, Tipperary Wood and the river corridors associated with the Tullybrannigan and Burren rivers. The Shimna River is significant for salmon fishing and breeding and is of local nature conservation interest, with the river and trees supporting a range of habitats and species.

As shown on **Plate 11.4**, **Figure 11.1** and **Figure 11.2**, the main existing land uses that surround the riparian corridors of the three rivers are amenity and residential.

Plate 11.4: Existing Land Use Display Panel

Islands Park is the predominant land use which is considered a valuable area of active open space and recreation for Newcastle, as designated within the Ards Down Area Plan 2015. It includes grassed open space areas, children's playground, parking area, toilet block, wildflower meadow, numerous footways (which facilitate long distance walking routes such as the Ulster Way, Mourne

Way and the Newcastle Way), pedestrian bridges, footgolf (currently closed), and tennis courts. The walking routes along the river are a valuable tourism asset within the Newcastle area, which forms a hub point for services and hospitality on a range of rambling and walking routes through the Mourne Mountains.

During the site visit, whilst it is evident that Islands Park is of high value to the local community and was subject to significant usage, there were numerous areas where evidence of anti-social behaviour was observed, which included:

- Discarded waste such as empty alcohol bottles, plastics and paper;
- Fire-damaged trees and vegetation;
- Graffiti; and
- Illegal fly-tipping.

As shown on **Plate 11.4** and **Figure 11.1**, the riparian corridor of the Shimna River and amenity area is backed onto by a number of low density residential areas (shown in grey). These include private residences along Bryansford Avenue, Bryansford Road, River Side Park and more modern housing developments within Shimnamile and Alfred Crescent (located off Bryansford Road). As shown on **Figure 11.2**, there are a number of areas zoned for housing (NE 06 (1) & NE 06 (2)). As detailed with the Area Plan, these are lands identified for housing and include approved housing sites developed since the commencement of the preparation of the Plan, or now in the process of being developed. It must be noted that these lands do however partially fall within the existing Q_{100} modelled floodplain, as shown on **Figure 11.4** and with development within NE 06 (1) currently stalled, with a large number of properties remaining at subfloor level.

As shown on **Figure 11.1,** upstream of Bryansford Road Bridge includes Tipperary Wood on the south bank of the Shimna River and a new housing development within the grounds of the former Shimna House on the north bank. Tipperary Wood is a DAERA – Forest Service plantation woodland, heavily utilised by the community for walking (with direct links to Tollymore Forest), biking, etc. It is also utilised as a scout camp.

The housing development within the grounds of the former Shimna House has been approved for residential and associated development comprising the erection of 7 detached houses, 20 semi-detached houses, 7 terraced houses, 30 apartments, and conversion of an existing house to 4 apartments. It is note however located upon land zoned for housing, as shown on **Figure 11.2**.

As also shown on **Figure 11.1**, a supported living facility (Autism Initiatives) is located between Bryansford Road and Islands Park, on the north bank of the Tullybrannigan River. This is a particularly sensitive facility which provides support and encourages independent daily living of patrons with special needs. There are a number of living units within this facility, and includes a horticultural garden within the rear of the property, tended to by its patrons. Further to this, on Monday 12th June 2017, Autism Initiatives and NMDDC officially announced a project to see Newcastle recognised as Northern Ireland's first Autism-friendly town.

11.4.2.3 Recreation and Amenity

As designated within the Ards Down Area Plan 2015 and shown on **Figure 11.2**, the study area is located within the Shimna and Trassey Rivers Site of Local Nature Conservation Importance (SLNCI) and Bryansford Road – Enniskeen Hotel and large houses and Shimna River Corridor Local Landscape Policy Area (LLPA) 2, which is designated for:

- areas of woodland and important tree groups - substantially wooded corridor of high environmental quality and visual amenity provides a good visual entrance feature into town;
- original character defined by low density housing and areas of fine wooded landscape;
- river significant for salmon fishing and breeding and local nature conservation interest - river and trees support a range of habitats and species; and

- public access along river alongside Tipperary Wood linking to Tipperary Lane with potential for extension and linkage with Tollymore Forest Park; and landform backdrop to river emphasises visual significance of the area.

These designations largely encompass the key community usage of the study area and how it is locally and regionally important for its recreational and amenity value.

11.4.2.3.1 Walking

Plate 11.5: Walking Route Signage within the Study Area

As noted previously, several walking/rambling routes pass along the river corridor and through the indicative study area, including the Ulster Way, Mourne Way, Newcastle Way, and the Newcastle Challenge Trail. Furthermore, there are a multitude of local walking routes through Islands Park and Castle Park.

As noted previously, the walking routes along the river are a valuable community and tourism asset within the Newcastle area, which forms a hub point for services and hospitality on a range of rambling and walking routes through the Mourne Mountains.

11.4.2.3.2 Angling

The Shimna River provides excellent habitat for spawning salmonids, with populations of Atlantic salmon, brown trout and sea trout present. Other species inhabiting the system include minnow, stone loach, 3-spined stickleback and eel. On this basis, it is also a very popular river for angling under the control and operation of the Shimna Angling Club. Up to 4km of the river can be fished under licence, permit and/or day/weekly tickets from the angling club, with the season commencing on the 1st March and ending on 31st October. Methods of angling include fly fishing, spinning and worm fishing.

11.4.3 Tourism

11.4.3.1 Newry, Mourne and Down Tourism Strategy 2017-2021

With reference to the '*Newry, Mourne and Down Tourism Strategy 2017-2021*' (2017), Newcastle is a gateway to the Mournes and Ring of Gullion destination experience, and for many visitors it is a core hub of the Mourne Coastal Experience. The town has a long history as a summer holiday resort for Northern Irish residents and a day-trip location for short visits. It has international recognition as the setting for the Royal County Down Golf Club, and the Slieve Donard Hotel has become an iconic hotel in Northern Ireland.

In terms of pre-existing issues, the town is heavily reliant on good weather. As a result of limited wet-weather facilities, it has a high degree of seasonality. Of particular relevance to the study area, it offers a starting point for many visitors that are on day hikes. However, despite the high number of day trippers, the expenditure left behind is limited. The activity base and available opportunities for spontaneous participation in outdoor land and marine-based activities is less sophisticated than the Causeway Coastal Route.

In terms of Council priorities, the destination appeal and the level of expenditure within the community could be significantly enhanced through the development of new amenities. In particular, a signature access attraction to the Mournes (i.e. an uplift facility) would be a game-changer for the town and should be regarded as both a local and regional priority.

Wet weather facilities and enhanced recreational and family leisure amenities have been identified in two masterplans as potential projects for Donard Park and Newcastle Islands Park (the latter of which is within the study area). Again, these new facilities along with the access attraction, would motivate longer stays and a greater level of expenditure, and would likely attract new markets and increased visitor numbers, while also offsetting many of the issues associated with seasonality.

11.4.3.2 South East Coast Masterplan for Newcastle 2013

As noted above, the South East Coast Masterplan for Newcastle is intended to build on the town's strengths as a tourist destination. The plan seeks to further the town's reputation as a high quality 21st Century seaside resort which acts as the gateway to the Mournes and is known for the range of activities it has to offer. The plan also seeks to develop Newcastle's tourism potential with a view of complementing the towns of Kilkeel and Warrenpoint.

Within the context of the study area, this Masterplan identified that the pitch & putt facility within Islands Park (which changed in usage to a footgolf facility and has subsequently closed), could be re-developed into a new outdoor leisure development with the potential to attract more families and tourists into the heart of the town. There may also be potential for indoor leisure space within the park area which would help to increase visitor numbers in the winter months or during poor weather. The proposals for the park include a number of different zones, catering for different age groups and interests. A Family Zone, Adventure Zone, and an Eco Zone are possible ideas. An Adventure Play Dome could act as the centre piece of the new park situated in the heart of the town centre. A re-developed Castle/Islands Park, coupled with the re-development of the Annesley building, would transform this area of Newcastle attracting large numbers into the centre of the town.

As the recognised eastern 'Gateway to the Mournes', attention in the town will be given to supporting the range of activities available on the Mourne Mountains, particularly walking and cycling through a dedicated programme for welcoming these interest groups to be undertaken by accommodation providers, catering establishments, and retail units. Moreover, effort will also be made to draw attention to existing and potential coastal activities and attractions, from the mainstream and well-established activities such as golf and 'easy to do' watersports; through the more nice health and wellness sector. As noted above, the proposed uplift facility (Donard Gondola), as a premier visitor attraction for both the Mournes and the South East Coast, will allow all visitors to be able to experience and enjoy the Mourne Mountains from Newcastle.

Ultimately, the combination of the dual gateway role of Newcastle (to the coast and to the Mourne Mountains) will generate increased demand for new and existing services in the town. New and existing businesses will be supported, particularly in terms of retail, activity centres, catering enterprises and ideally accommodation. In this respect, hotel accommodation in particular has been identified as a development opportunity to both support and indeed to drive visitors to the town. This will mean that Newcastle can be extensively packaged and promoted to a variety of different audience groups seeking to experience and enjoy both a coastal and/or mountainous experience in a vibrant and welcoming setting.

11.4.4 Health, Safety & Well-being

As detailed within the North-Eastern FRMP (2015), flooding to Newcastle from both the Shimna River and Burren River has happened on many occasions in the past. A report produced by the then Rivers Agency in 2003 titled '*Newcastle Urban Area Assessment of the Flood Levels'* contains references to newspaper reports of flood events in 1968, 1978, 1978, 1987, 1988 and 1994 and in addition, other significant events are known to have occurred in 1982, 1986, 1990 and 1997. Much of this historical flooding has emanated from the Burren River and, as consequence, the Department undertook the Burren Flood Alleviation Scheme in 2007.

Following completion of the Burren Flood Alleviation Scheme, another major flood event occurred in Newcastle on 16th August 2008. On this occasion, the flooding largely emanated from the Shimna River and caused flood damage to approximately 40 properties mostly located in and around Bryansford Avenue and Shimna Road. Unfortunately, on this occasion floodwater from the Shimna River 'jumped its catchment' and spilled into an area behind the recently constructed flood defences on the Burren River. This was a particular disappointment to the owners of flooded properties in Shimna Road and Shimna Vale who, understandably, believed that they would be protected from flooding by the Burren River defences.

With reference to '*Exploring the Social Impacts of Flood Risk and Flooding in Scotland*' (Scottish Executive 2007), the personal accounts noted that the trauma of being flooded and its immediate aftermath was by far the most significant intangible impact reported in the focus groups, disproportionately felt by the elderly and most vulnerable. Anxiety and stress often peaked after the flood, when the scale of disruption became clearer and initial coping strategies dwindled.

Physical and mental ill-health impacts also became more apparent, exacerbating existing chronic conditions. Dealing with building contractors and monitoring the timing and quality of repair work proved especially stressful. The loss of family photos and mementoes was particularly acute for the elderly for whom these items were amongst their most cherished possessions. Some participants reported how difficult it was to maintain family cohesion when children live in hotels or stay with grandparents and schooling suffers. Relationships within the family were also severely tested by living in temporary accommodation and simultaneously dealing with tradesmen in short supply and checking on the quality of their work.

Physical health impacts of floods include shock, gastrointestinal illnesses (particularly if flood waters were contaminated with sewage) and respiratory illnesses, though this aspect is not that common with floods in the UK.

11.5 Predicted Impacts

This section assesses the impacts of the Proposed Scheme upon the population of Newcastle and the people that utilise this river corridor. It also considers the potential for long-term effects associated with the scheme's construction and operation on local economy, health, safety and well-being, and recreation and amenity features.

11.5.1 Do-Nothing Scenario

The Do-Nothing scenario is shown on **Plate 11.6** and **Figure 11.4,** which illustrates the predicted flood risk in Newcastle posed by the 1% AEP flood event on the Shimna River. Under a 'Do-Nothing' scenario, the flood relief works would not be undertaken and the area would not benefit from a reduction in flooding risk to properties. Consequently, at least 312 properties would remain at risk of inundation by a 1% AEP flood event. The majority of properties at risk are on the left (north) bank of the river. Initial flooding begins around Bryansford Road Bridge. The flood water then flows across Bryansford Avenue into Beechfield Park and towards the Bryansford Avenue Bridge. The Bryansford Avenue Bridge acts as an aqueduct and conveys water over the Burren River to the eastern part of Newcastle, causing flooding along Shimna Road and Shimna Vale. These mechanisms were seen during the August 2008 flood event. The Burren River flood defences do not get overtopped from the 1% AEP event in the Shimna River.

A smaller number of properties on the right (south) bank of the Shimna River are also at risk from flooding. These are in Shimna Mile, Riverside Park and Bryansford Road.

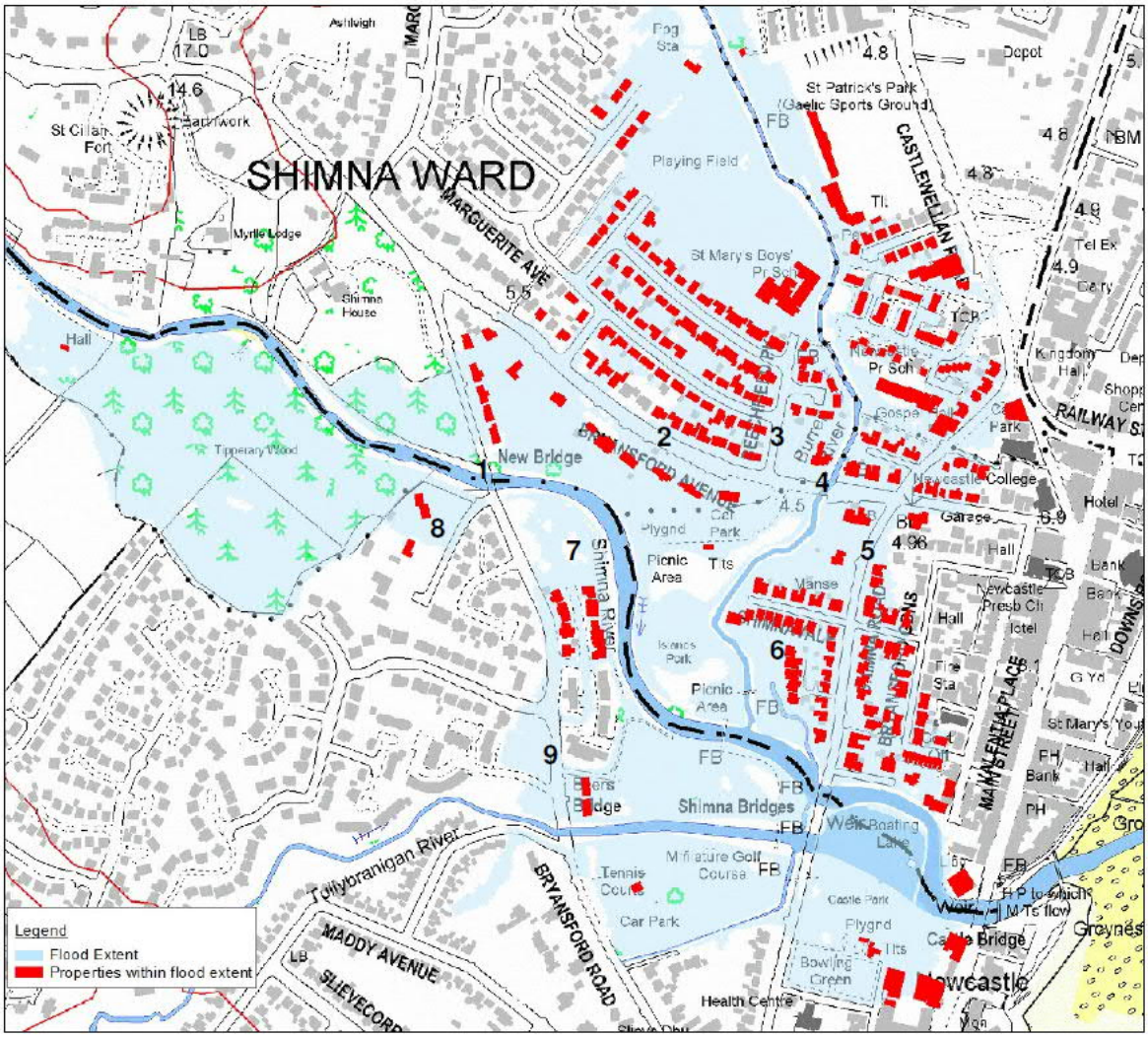


Plate 11.6: Shimna River, Newcastle 1% AEP Flood Extents

Source: 'Shimna River, Newcastle Feasibility Study for Flood Risk Investigation' (RPS 2015).

As can be seen from **Plate 11.6**, a multitude of transportation routes would be cut off by the flood waters including the main road to Bryansford. There would also be the associated flooding impacts upon services and utilities and potential range of effects as discussed in Sub-Section 11.4.

11.5.2 Operational Phase

11.5.2.1 Socio-economics

The '*Shimna River, Newcastle Flood Risk Assessment Economic Appraisal*' (RPS 2016) was undertaken in part to appraise whether the Proposed Scheme would reduce the threat to people and their property and deliver the greatest environmental, social and economic benefits in line with the Government's sustainable development principles. This involved quantifying as far as is possible, the benefits that would accrue by the avoidance of flood damage associated with various return period flood events.

As with many construction projects, there are non-monetary impacts which must be taken into account to allow a full assessment to be completed. These non-monetary impacts such as environmental, social, political, aesthetic and disruption effects should not be assumed to be any less

important than the monetary aspects of an appraisal. The non-monetary benefits of the Proposed Scheme were assessed under a number of criteria, as set out below:

- Reduction in risk/ fear of flooding;
- Reduced fear of loss of livelihood;
- Reduction in risk to transport links;
- Ensure continued use as a public amenity;
- Protect flora and fauna and enhance biodiversity; and
- Protect and enhance landscape character and visual amenity.

As detailed within the appraisal report, the Proposed Scheme would provide significant benefits through a reduction in the risk/fear of flooding to properties, businesses and transport links as 1% AEP flood protection would be provided.

From a socio-economic perspective, reducing the likelihood and fear of financial damage to property, disruption to communications and business losses would be of significant benefit to the local community. Of note, at least 312 properties would no longer be at risk of inundation as a result of a 1% AEP flood event. This would provide not only relief from the risks associated with the physical and health dangers of flood waters, but also the psychological impact of the emergency and the aftermath (i.e. having to move out of the home, cleaning-up, negotiating with insurers and getting damage repaired, goods replaced etc.). This should also relieve the current issues associated with getting insurance, the effect on house prices and general community cohesion.

In terms of demographics and key statistics, it is likely that the Proposed Scheme would locally boost population numbers and the economy through construction of new houses by potentially releasing land for development within the plan period, as prescribed within the Ards Down Area Plan 2015. It may therefore provide the opportunity for the Shimnamile development with zoned NE 06(1) lands (as shown on **Figure 11.2**)

As the Proposed Scheme would minimise the risk of roads being inundated/cut-off and associated impacts upon utilities and services, this would provide a boost to the local economy by increasing the likelihood of normal operation of the town during such an extreme event. Whilst flooding does bring economic benefits (i.e. associated with repair work), the economic appraisal has demonstrated that the benefit/cost ratio for the scheme is positive in spite of this.

11.5.2.2 Land Use

From an operational phase perspective, the Proposed Scheme would not have a significant impact in terms of changes to land use. As detailed below, the Proposed Scheme would require construction of flood alleviation measures to reduce the risk of flooding from the Shimna River to protect existing properties in the town. The Proposed Scheme would extend both upstream (into Tipperary Wood) and downstream (into Islands Park) from New Bridge on the Bryansford Road as indicated on **Plate 11.7**. The key land use changes are as follows:

- Demolition of a number of property boundary walls and fences;
- Felling of a number of mature trees;
- Relocation of one drainage ditch;
- 1430m of brick/concrete clad sheet piles or sheet pile core embankments;
- Construction of a new pathway;
- Realignment of existing pathways; and
- Erection of one floodgate.

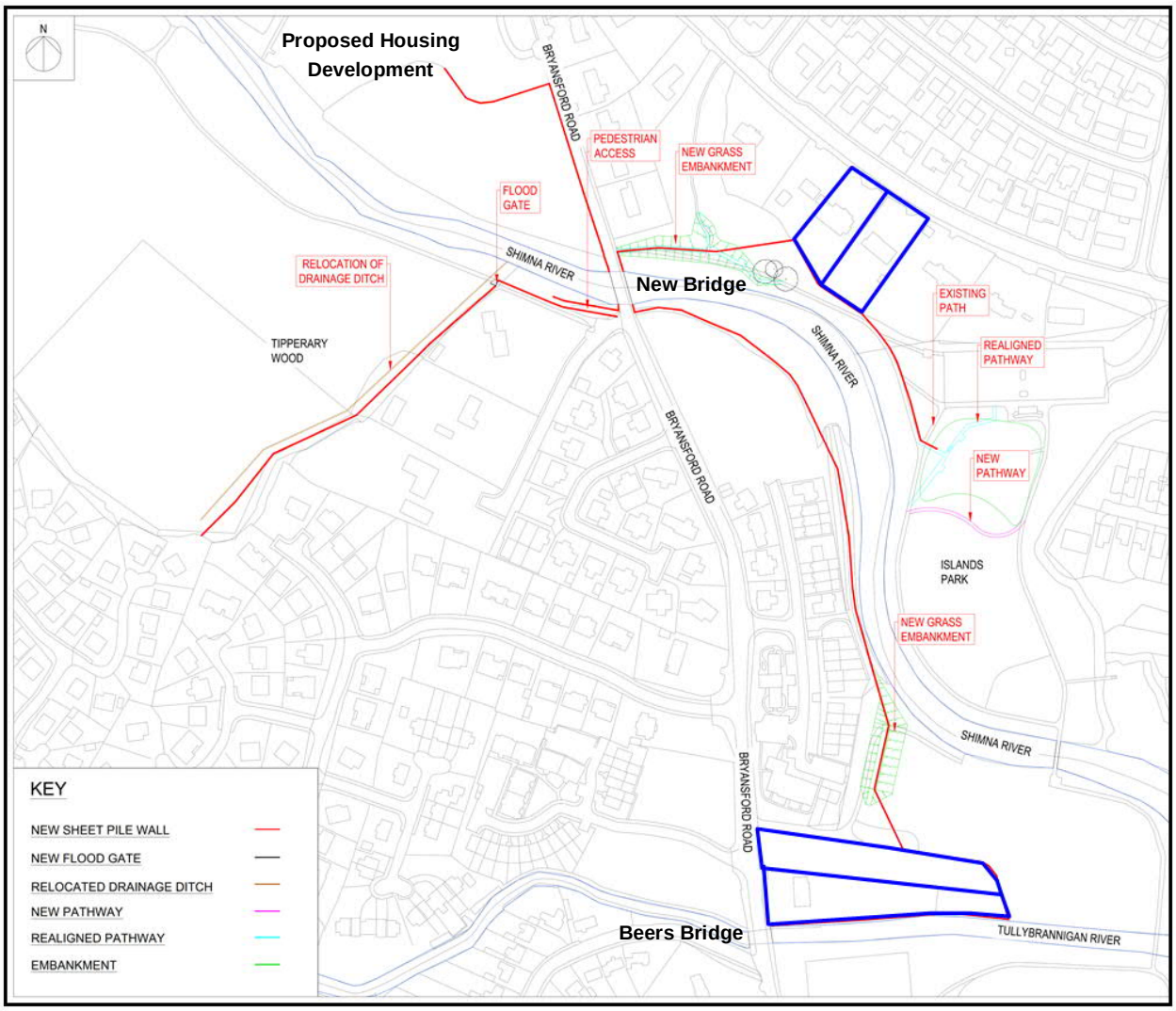


Plate 11.7: The Proposed Scheme (Opertaional Layout)

The road bridge on the Bryansford Road (New Bridge) is the hub point of the scheme. The scheme proposes construction of four separate flood defences, each starting at the bridge.

11.5.2.2.1 North bank of the Shimna River – upstream from Bryansford Road Bridge (New Bridge)

On the north bank of the Shimna River, there would be construction of a flood defence from Bryansford Road Bridge (New Bridge), running parallel to the Bryansford Road for approximately 115m, then turning and running perpendicular to the road, for approximately 70m. From a land loss perspective, the majority of this wall would effectively contain the Bryansford Road and would not infringe upon any existing land uses. In terms of future land uses, as shown on **Plate 11.7**, a planning application has been approved for residential and associated development comprising the erection of 7 detached houses, 20 semi-detached houses, 7 terraced houses, 30 apartments, and conversion of an existing house to 4 apartments. Whilst only part of the site has been developed, there is the possibility that the flood wall may impact upon the site layout and affect current development proposals. However, as shown on **Figure 11.4**, this site is within the existing modelled Q_{100} floodplain, and thus there is a restriction on development from this perspective. On this basis, the area affected by the flood defence would not likely be utilised for any upstanding development and the Proposed Scheme would have a negligible impact as the area would remain within the defended modelled Q_{100} floodplain, as shown on **Figure 11.5**.

11.5.2.2.2 North bank of the Shimna River – downstream from Bryansford Road Bridge (New Bridge)

On the north bank of the Shimna River, there would be construction of a flood defence from New Bridge, running downstream and parallel to Shimna River within Islands Park over approximately 265m. This would result in land loss from Islands Park, severing the footway to Bryansford Road, the footway to Bryansford Avenue and two sections of footway (adjacent to the Shimna River) that lead to the play park and car park. Whilst this would have a significant impact upon the continued usage of this portion of the park, particularly from a non-motorised user (NMU) perspective, the design and layout of the flood defences shall accommodate the continued through movements of NMUs, by the realignment and re-grading of the footways as necessary (as shown on **Plate 11.7**). This section also requires construction of a flood wall embankment to naturalise the flood defences as much as possible within this part of the sensitive riparian corridor. A number of the footways shall be conveyed across this embankment through a gradient that is suitable for all NMUs to negotiate.

This section of the flood defence would also result in land loss from two properties outlined in blue on Bryansford Road Avenue, as shown on **Plate 11.7**. In terms of losses, the physical impact upon each property would be minimal, as the scheme would only result in the loss of the property boundary, which would be replaced by a new sheet pile wall, cladded to the choice of the landowner (which shall be determined as part of the accommodation works through ongoing liaison). There would also be amenity impacts upon these properties (and adjacent properties) as a result of the loss of mature vegetation within the park and as a result of the height of the wall to the rear of these properties, which is up to 2m at points to provide sufficient flood protection. From a landscape and visual perspective, this aspect has been addressed further within Section 10 (Landscape & Visual) of this ES.

11.5.2.2.3 South bank of the Shimna River – upstream from Bryansford Road Bridge (New Bridge)

On the south bank of the Shimna River, there would be construction of a flood defence from New Bridge, running upstream, parallel for approximately 72m, then perpendicular to the Shimna River for approximately 225m. This area would also include a smaller section of flood defence running parallel to the river for approximately 42m. The footway adjacent to the Shimna River and through Tipperary Wood shall be kept open as a through route (as it would be severed by the scheme), though it shall be closed-off by way of a floodgate to ensure properties are not inundated during an extreme flood event. This gate shall be manually operated by NMUs to ensure continued through movements.

The section of wall perpendicular to the river would run very close to the rear boundary of a number of properties in Riverside Park, however would not directly affect them. It would however result in the minor loss of trees from the plantation woodland. The scheme would have no bearing on the continued usage of this woodland for walking (with direct links to Tollymore Forest), biking, etc. and as a scout camp.

11.5.2.2.4 South bank of the Shimna River – downstream from Bryansford Road Bridge (New Bridge)

On the south bank of the Shimna River, there would be construction of a flood defence from New Bridge, running downstream and parallel to Shimna River over approximately 645m across to Beers Bridge on the Bryansford Road.

From a land loss perspective, the flood defence wall would be set back from both the boundaries of the existing properties within the Shimnamile development and the future boundaries of the properties currently either at subfloor level or yet to be constructed to the north of this development. As noted previously, as this land would be protected from flooding with the Proposed Scheme (as shown on **Figure 11.5**), it may be able to be developed in the future. On this basis, the impact would be minimal and largely limited to reduced amenity.

The flood defence wall would also be set back from the river's edge which would greatly reduce the potential for woodland loss within this riparian corridor and minimise the potential for adverse impact upon the Shimna and Trassey Rivers SLNCI and Bryansford Road – Enniskeen Hotel and large houses and Shimna River Corridor LLPA 2. This is the section of the scheme that would result in the greatest loss of existing vegetation.

This section of the flood defence would also result in land loss from two properties outlined in blue on Bryansford Road, as shown on **Plate 11.7**, In terms of losses, the physical impact upon each property would be minimal, as the scheme would only result in the loss of the property boundary, which would be replaced by a new sheet pile wall, cladded to the choice of the landowner (which shall be determined as part of the accommodation works through ongoing liaison). The amenity impacts upon these properties could subjectively be deemed significant as the scheme would result in the felling of some mature amenity planting that surround these properties, however would open-up each to attractive background views. The amenity impact from the flood defence wall would be minimised as the wall height would be between 1m and 1.5m. From a landscape and visual perspective, this aspect has been addressed further within Section 10 (Landscape & Visual) of this ES.

11.5.2.3 Recreation and Amenity

The multitude of walking/rambling routes (Ulster Way, Mourne Way, Newcastle Way, Newcastle Challenge Trail, etc.) that pass along the river corridor and through the works area would be maintained as through routes as a result of some realignment and re-grading of the existing footways (as shown on **Plate 11.7**). Whilst there would be some loss of amenity as a result of physical presence of the flood walls in this natural riparian corridor, the scheme is unlikely to be a deterrent to continued usage of these routes.

As noted previously, the walking routes along the river are a valuable tourism asset within the Newcastle area, which forms a hub point for services and hospitality on a range of rambling and walking routes through the Mourne Mountains.

11.5.2.3.1 Angling

As noted previously, the Shimna River provides excellent habitat for spawning salmonids, with populations of Atlantic salmon, brown trout and sea trout and presents a valuable angling resource within the area. Scheme operation would have no significant bearing on the usage of this stretch of the Shimna River from an angling perspective as all bank sides, upstream and downstream of New Bridge would remain accessible with scheme implementation. The greatest risk of reduced access to the river would be on the south bank, upstream of New Bridge, as the flood wall would be located closest to the river's edge over approximately 42m. In all other locations, the flood wall would be set well back from it.

Concerns had been raised in correspondence with the Shimna Angling Club regarding potential light pollution associated with the Proposed Scheme. There is no intention to artificially illuminate the flood defences and as these would be set back from the river's edge, the vast majority of the existing riparian bankside vegetation would be retained and thus there would be no perceptible change in light or shading of the river when compared to the 'Do-Nothing' scenario.

11.5.2.4 Tourism

The Proposed Scheme would have limited impact upon the promotion of Newcastle as a gateway to the Mournes and Ring of Gullion destination experience. Vital to ensuring Newcastle's status is maintained from this perspective, is that walking and cycling opportunities are maintained or enhanced. As described above, the multitude of walking/rambling routes (Ulster Way, Mourne Way, Newcastle Way, Newcastle Challenge Trail, etc.) that pass along the river corridor and through the works area would be maintained as through routes as a result of some realignment and re-grading of the existing footways (as shown on **Plate 11.7**), thus maintaining Newcastle's tourism profile in this regard.

In terms of developing tourism potential, as noted previously, the community could be significantly enhanced through the development of new amenities. The South East Coast Masterplan for Newcastle identified that the pitch & putt facility within Islands Park (which changed in usage to a footgolf facility and has subsequently closed), could be redeveloped into a new outdoor leisure development with the potential to attract more families and tourists into the heart of the town. There may also be potential for indoor leisure space within the Park area which would help to increase visitor numbers in the winter months or during poor weather. The proposals for the park include a number of different zones, catering for different age groups and interests. A Family Zone, Adventure

Zone, and an Eco Zone are possible ideas. An Adventure Play Dome could act as the centre piece of the new park situated in the heart of the town centre. A redeveloped Castle/Islands Park, coupled with the redevelopment of the Annesley building, would transform this area of Newcastle attracting large numbers into the centre of the town.

The Proposed Scheme would have limited potential for adversely affecting this tourism development proposal, as all of the land earmarked for development is located on the town side of the flood defences. However, post scheme implementation, this area would remain within the functional floodplain of the Shimna catchment, thus the likelihood that this area could be developed for these purposes is unlikely.

11.5.2.5 Health, Safety & Well-being

The reduction in flood risk associated with the Proposed Scheme would have a beneficial impact upon the health, safety and well-being of the community, not only for those directly affected by flooding without the scheme, but also those that would indirectly affected.

In terms of tangible health issues (physical health), the magnitude of the positive impact gained from reducing flood risk is anticipated to be of a small scale (given the current low level of physical health risk), but of a large scale in relation to intangible health issues, i.e. reduced stress associated with flood risk, dealing with insurers, finding alternative accommodation etc. As such, the impact of the Proposed Scheme on those with reduced flood risk (approximately 312 homes and businesses) will be of minor (physical health) to moderate (stress) positive significance.

In terms of the magnitude of safety impacts, while the frequency of exposure to safety issues related to flood events is low, the severity of risk is high to anyone within the vicinity of the flood zone, and it is assumed that the level of flood protection to a 1-in-100 year, event provided by the Proposed Scheme represent a large reduction in risk exposure. The impact of the Proposed Scheme on affected (vulnerable) people would be of major-moderate positive significance.

Conversely, exposure to increased risk of injury associated with people climbing the flood wall to access the river, or getting trapped by the wall on the riverside during flood events, may be considered an adverse risk of moderate importance and of small scale, resulting in an impact of Minor Adverse significance. Similarly, potential public complacency to a more major flood event risk (i.e. over 1-in-100 year flood events) and reduced preparedness (i.e. lack of practice of emergency evacuation procedures) meet the same criteria and also result in an impact of Minor Adverse significance. As a consequence, NMDDC have requested that the flood walls within an Council grounds include anti-climb copping to reduce this risk.

The Proposed Scheme shall be designed to reduce the H&S risks of workers completing inspections and maintenance works during the operation phase, but the positive impact is not significant given the temporary nature and scale of risk.

11.5.3 Construction

11.5.3.1 Socio-economics

It is envisaged that the construction programme would last 12 months, with the contractor beginning on-site works in early 2019. Construction of the Proposed Scheme would not require demolition (other than some property boundaries), nor would it require anyone to move out of the area on a temporary basis, thus there would be no perceptible effects upon demographics.

Construction of the Proposed Scheme is likely to provide an economic boost through possible employment opportunities and spending (i.e. fuel, food, materials, etc.) within the local area. Whilst this would be a beneficial impact, the number of local people who would gain employment would be low. The impact of the Proposed Scheme in income and employment terms is therefore considered to only affect a “very small change to the economic opportunities of the group as a whole.

11.5.3.2 Land Use

As shown on **Figure 11.3**, construction of the Proposed Scheme would have a much larger footprint than the operational scheme, and as such there is greater potential for disruption to existing land uses over the 12 month construction programme. However the disruption would be temporary.

The greatest potential for impact during construction exists within Islands Park of which may be subject to reduced parking provision in order to accommodate a possible contractor compound. Whilst approximately half the existing parking provision shall be temporarily lost, the compound would be appropriately fenced to segregate the contractor from the public. This is particularly important in this area as the park accommodates a multitude of vulnerable users daily, though most notably the play park that is expected to remain functional during the works would be located between the compound and the construction site. This would require careful planning and liaison with the Council and users of Islands Park to ensure effective communication and continued safe operation (if possible) during the works. As a worst case scenario, the park could be temporarily closed during works in this area, which would have a major (albeit temporary) adverse impact.

As shown on **Figure 11.3**, the works area may also result in the temporary acquiring of land within Islands Park, between the Shimna River and Tullybranigan River to accommodate a possible contractor's compound. Whilst this area of land was formerly a pitch & putt course, then more recently a foot golf course, it is no longer is use for these practices. Whilst this area still serves as an area of amenity and open space, the impact upon this land from a land use perspective would be Minor Adverse.

A number of haul routes may also temporarily take out of commission a number of internal footways within Islands Park, which would have to be accommodated in some capacity.

11.5.3.3 Recreation and Amenity

Whilst there would be a significant reduction in amenity on the multitude of walking/rambling routes (Ulster Way, Mourne Way, Newcastle Way, Newcastle Challenge Trail, etc.) that pass along the river corridor and through the works area. It is envisaged that all would remain as through routes. Construction of the flood defences may also serve as an interesting feature to passing NMU's during the works. It is also envisaged that river bank of the Shimna River shall remain accessible during the works for any angling activity. It must be noted that recreation and amenity would be affected by construction noise, dust or visual impacts, as assessed and considered in the respective technical sections throughout this ES. On this basis, without mitigation the impact would be Minor to Moderate Adverse

11.5.3.4 Tourism

Construction of the Proposed Scheme would have limited impact upon the promotion of Newcastle as a gateway to the Mournes and Ring of Gullion destination experience. Again, it is vital to ensuring Newcastle's status is maintained from this perspective, is that walking and cycling opportunities are maintained or enhanced. This remains very much critical to the construct ion stage also and shall be accommodated.

11.5.3.5 Health, Safety & Well-being

The greatest risk to Health, Safety & Well-being during the works would be to the general public that utilise this area from an amenity and recreational passing through basis. There is a broad range of users within and through this area that require safe accommodation and passage during construction as detailed above.

11.6 Mitigation & Enhancement Measures

11.6.1 Operation

11.6.1.1 Amenities and Services

The scheme would include installation of picnic tables at Islands Park Carpark. The scheme would also include two new re-graded paths over the grass mound at Islands Park Carpark. These new paths have been incorporated into the Park to maintain public access similar to the current situation. All pathways have been designed taking into account the Disability Discrimination Act and guidance from the Sensory Trust. Similarly, the pathway incorporated to maintain pedestrian access into Tipperary Wood, would meet the same requirements. No permanent lighting would be installed as part of the works. The setting back of the flood defences from the river's edge also facilitates continued access to this important riparian corridor.

11.6.1.2 Vegetation & Tree Removal

The locations of the walls along the length of the Proposed Scheme have been located to try and retain as many trees as possible. From an amenity perspective, tree removal and vegetation clearance has been taken into account during the design. The flood walls have been pulled back from the Shimna River banks so as to maintain existing floodplain (where possible) and also to protect the riparian vegetation. All trees with a Tree Preservation Order have been identified and no such trees are planned to be removed as part of the works. The contractor would be given a specific working corridor in which he would have to remove trees to complete the construction of the flood defence; this has been constrained where possible. The majority of the tree removal would take place within the Tipperary Wood section of the works, and would be agreed with the Department of Agriculture, Environment and Rural Affairs (DAERA) - Forest Service. The removal of these trees may be as part of planned harvesting, subject to timing of the works.

11.6.1.3 Landscape Planting

Any trees removed as part of the works shall be replaced with native species, as selected by the landowner. The sheet pile wall facing the park areas would be clad and have some low-level planting to prevent antisocial behaviour. The selection of the species would be in agreement with the Council's Parks Department.

11.6.1.4 Land Use - Private Assets

All residential landowners directly affected by the works (the Flood Defence Wall runs along the landowner's property boundary) have been consulted. Private land agreements with the landowners currently exist and allow for the disturbance caused due to the installation of the new wall along their property curtilage

11.6.2 Construction

11.6.2.1 Phasing of Works

The phasing of the works is subject to permissions from a number of public bodies, including Forest Service, Council Parks and DfI-Roads. However, it is envisaged that works within the Park/Public areas would be restricted to the winter months.

The works would largely involve the site in question being, secured, vegetation removed and the protection of any structures, services or trees. The Contractor would then set out the line of the sheet pile flood wall using a GPS system. A piling rig would be used to drive the sheet pile to the required depth. The piles would then be cut to the required height above ground. The sheet piles would be covered in earth to form an embankment or clad with stone to form a flood protection wall. Both these operations would involve small dumpers moving materials. Where cladding is selected to cover the pile, this is built in front of the sheet pile (much the same as a blockwork wall) and infilled to the rear

with concrete. This operation would therefore require concrete lorries transporting and delivering concrete to site.

In general, it is envisaged that construction work would take place during normal working hours (7.00am to 7.00pm Monday to Friday, 7.00am to 2.00pm on Saturdays). However, the Contractor may need to work outside these hours, particularly for setting-up traffic management arrangements.

11.6.2.2 Community Consultation and Liaison

The Contractor would be required to establish and maintain effective liaison with the local community throughout the construction phase. This would include information about ongoing activities and provision of contact details to report incidents or for further information.

11.6.2.3 Land requirements

There will be land take from public areas (i.e. parkland, forestry, public amenity space) and private gardens of residences which back onto the river corridor to accommodate the flood walls and embankments.

Careful planning when considering suitable locations for site offices, stores, workshops, stockpiles of materials and plant yards would help minimise adverse effects of construction activities. Factors affecting the decision would include the noise, traffic and visual intrusion impacts on adjacent properties and they would not be located in areas of ecological value, within 50m of a surface watercourse, or where a loss of amenity is perceived. Whilst the location of site compounds is normally a matter for the Contractor to consider, two indicative locations have been shown on **Figure 11.3.** The contract would include a prescriptive requirement that these aspects are fully considered when compound locations are selected, including obtaining all necessary approvals.

The land required for the Proposed Scheme, including the works area, shall be acquired by private land agreements. If the Contractor chooses to use additional areas of land outwith the land made available, he would need to make all necessary arrangements, including obtaining permissions and licences as appropriate, including consultation and agreement with the relevant authorities. Accordingly, the location and operation of site compounds would be subject to consultation with and the approval of various statutory bodies.

In general, the following requirements would apply. Compounds would not be located in the vicinity of any sensitive receptors, such as schools or residential homes. Where possible, they should be located in areas that would minimise the visual impact of the compounds (i.e. they shall not be located on ridges or on hills, so that they would be widely visible). The compounds would be located in close proximity to the construction area to minimise construction traffic on public roads. The compounds would not be located in areas of unresolved archaeological potential and / or any site of ecological importance. Any storage of hydrocarbons or any liquid chemicals within the compounds would not be within 50m of a watercourse. All fuel storage areas shall be bunded to 110% of capacity to contain the effects of any spills. The compounds would also have an appropriate level of security to minimise the risk of damage, such as chemical spills caused by vandalism. Following construction, these areas shall be cleared and re-instated.

The appointed contractor shall ensure that all areas of land which have been occupied to provide the site or carry out accommodation works are reinstated to the satisfaction of the affected landowner, occupier and the Employer.

Working areas would need to be clearly defined to prevent access to the river channel and riverbank vegetation. The site should be fenced and access for plant, vehicles and workers to banks outside the site should be prohibited. Following construction, any disturbed bankside vegetation outside the crossing footprint should be restored. A “no access” buffer shall be implemented along the Shimna River, to prevent damage to banks and to prevent disturbance of riparian habitats.

11.6.3 Fencing

Temporary site boundary fencing (typically timber post & wire) or permanent fencing would be installed on the boundary of the works area to contain the site and restrict access (i.e. animals, general public). As deemed appropriate by the contractor, other forms of fencing (i.e. palisade) would be installed where necessary to provide increased levels of security (i.e. at site compounds).

The erection of fencing for the protection of any retained tree shall be undertaken in accordance with the approved plans and particulars before any equipment machinery or materials are brought on to the site for the purposes of the scheme and shall be maintained until all equipment machinery and surplus materials have been removed from the site. Nothing shall be stored or placed in any area fenced in accordance with this condition and the ground levels within those areas shall not be altered, nor shall any excavation be made or any other works carried out or fires lit without the written consent of the Department.

11.7 Residual Effects

11.7.1 Operation

Socio-economic: long-term positive impact of improved flood protection (the primary aim of the Proposed Scheme) with major-moderate positive significance effects are anticipated from damage avoidance and minor positive significance effects from expense avoidance, and regeneration potential improvement from increased investor confidence.

Health, safety and wellbeing: long-term positive impacts from improved flood protection of the residents and visitors to Newcastle, with minor positive effects anticipated on physical health, and major-moderate positive effects anticipated on psychological health, and moderate or moderate-minor positive significance effects from reduced disruption to utilities and facilities during flood events up to the 1 in 100 year level.

Recreation and amenity: no long-term adverse impacts associated with reduced access to greenspace and angling opportunities and enjoyment due to the introduction of flood walls and severance impacts, with mitigation such as careful selection of wall cladding materials, restoration of footways and sensitive re-design of public spaces, result in an anticipated residual impact of minor adverse significance.

11.7.2 Construction

Socio-economic: the short-term economic benefit of increased jobs is assumed to be of minor positive significance overall, but could be enhanced where measures are put in place to require that the Contractor’s procurement of services deliver community benefits.

Health, safety and well-being: the short-term adverse impacts associated with traffic, noise, dust, mud, health and safety, disruption during the construction period would require close monitoring of compliance with contractual obligations imposed upon contractors to minimise potential impacts and ensure sensitive working and compound area phasing. With effective mitigation in place, the nuisance impact is anticipated to be reduced in magnitude to small, resulting in an impact of minor adverse significance, which is again consistent with the effectiveness of impact mitigation described in the relevant technical sections (i.e. Air, Landscape & Visual and Noise). With mitigation, the temporary residual effect is assessed as minor adverse significance.

Recreation & amenity: short-term adverse impacts associated disrupted/ reduced access to community services, angling opportunities, greenspace & pathway provision, noise, dust, visual impact during the construction period would have the same mitigation as for safety and well-being above, also resulting in a temporary residual effect of minor adverse significance.

12. Noise & Vibration

12.1 Introduction

This section of the ES addresses the impact of the Proposed Scheme on the local environment in terms of Noise & Vibration. The focus of the assessment is on the construction phase as operational impacts are not considered significant since the flood defence walls or embankments would not present a source of long-term or permanent noise or vibration. Furthermore, there has been no assessment of traffic-induced noise effects, as the scheme would have no impact upon long-term traffic movements through the study area. The assessment therefore focuses on construction phase noise and vibration impacts at nearby sensitive receptors.

Noise annoyance is described by the World Health Organisation (WHO) as "*a feeling of displeasure associated with any agent or condition, known or believed by an individual or group to adversely affect them"*. It can affect people in houses, the street, or even during recreational activities. A change of 1dB(A) is the smallest that is considered perceptible.

Vibration can also occasionally be caused by construction. Vibration is a low frequency disturbance producing physical movement in buildings and their occupants. Vibration is usually measured in terms of Peak Particle Velocities (PPVs) and is the maximum speed of movement (measured in mm/s) of a point in the ground during passage of vibration. Vibration can be problematic because of its ability to affect precision tasks (for example in hospitals); and possible building damage, which affects the building and the occupants.

12.2 Methodology

The scope of this assessment is to identify the potential for significant effects to occur due to changes in noise and vibration levels at identified sensitive receptors as a result of construction activities associated with the Proposed Scheme.

Operation of the Proposed Scheme would not generate significant noise or vibration levels at receptors. It is understood that during an extreme flood event, floodplain connectivity would be maintained and thus all water movement in the storage areas would recede by gravity (i.e. no pumps) and there are no plans for surface water pumping stations to deal with secondary flooding. The only activities associated with operation of the Proposed Scheme which may generate noise and vibration is repair / maintenance, which is likely to be very infrequent. This would generate substantially lower levels of noise and vibration than construction, and therefore operational noise and vibration impacts have been scoped-out of the assessment.

12.2.1 Construction

12.2.1.1 Construction Noise

Noise predictions have been carried out for the identified closest receptors to the works area using the calculation procedures and plant data within BS 5228: 2009+A1:2014. The calculations represent the typical worst-case façade noise level at each selected receptor.

The noise levels generated by construction activities and experienced by nearby sensitive receptors, such as occupants of residential properties, depends upon a number of variables, the most significant of which are:

- noise generated by plant or equipment used on site, generally expressed as a sound power level;
- periods of operation of plant on the site, known as its 'on-time';
- distance between noise source and receptor; and
- attenuation due to ground absorption and barrier effects.

BS 5228: 2009+A1:2014 '*Code of practice for noise and vibration control on construction and open sites – Noise'*, provides a methodology for the estimation of likely construction noise levels as an equivalent continuous noise level averaged over a suitable assessment period, for example a one-hour period ($L_{Aeq,1h}$).

BS 5228 contains a database of the noise emission from individual items of equipment and routines which can be used to predict noise from construction activities at identified receptors. The prediction method gives guidance on the effects of different types of ground, barrier attenuation, and how to assess the impact of fixed and mobile plant.

In order to quantify the likely noise from construction works in accordance with the methods and guidance in BS 5228, it is necessary to define the various activities to be undertaken and the equipment to be used, based upon the anticipated programme of work.

Specific details of construction works are not currently available and therefore representative construction activities have been assumed using experience of similar projects. If the activities and plant used in these noise predictions differ significantly to those actually used, it is recommended that construction noise levels be reviewed. Section 4 (Scheme Description) of this ES provides details of the proposed construction works. According to the likely work schedule and envisaged plant list, the proposed works would be undertaken only during weekdays from 07:00 to 19:00 and include:

- demolition of a number of property boundary walls and fences;
- felling of a number of mature trees;
- relocation of one drainage ditch;
- 1430m of brick/concrete clad sheet piles or sheet pile core embankments;
- construction of a new pathway;
- realignment of an existing pathway; and
- erection of one floodgate.

As no coffer dams are proposed to facilitate construction of the scheme, there would be no requirement for 24-hour pumping and thus no potential for a 24-hour construction-related noise source.

Construction noise predictions were undertaken using a spreadsheet implementation of the methodology outlined in BS 5228, which predicts noise as an equivalent continuous noise level averaged over working hours, from 07:00 to 19:00.

With regard to acceptable noise levels, BS 5228 provides further guidance within Annex E, including the "ABC Method" which enables the identification of potentially significant effects at dwellings. This proposes threshold values of LAeq,T as a function of baseline sound levels at the receptors, as shown in Table 12.1 below.

Table 12.1: Example threshold of potential significant effect at dwellings

Assessment Category and Threshold Value Period	Threshold Value LAeq,T dB(A) façade		
	Category A (a)	Category B (b)	Category C (c)
Night-time (23:00 – 07:00)	45	50	55
Evenings and Weekends (d)	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75

NOTE 1: A potential significant effect is indicated if the LAeq,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 LAeq,T noise level for the period increases by more than 3 dB due to site noise.

NOTE 3: Applies to residential receptors only.

(a) Category A: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.

(b) Category B: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as Category A values.

(c) Category C: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than Category A values.

(d) 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays, 07:00 – 23:00 Sundays

Source: BS 5228

The magnitude of the impact of construction noise is based on the difference between the likely construction noise level and the Threshold Value, at the façade of a sensitive receptor, using the criteria shown in Table 12.2.

Table 12.2: Construction Noise Magnitude of Impact

Construction and Demolition Sound Level LAeq,T dB (façade)	Magnitude of Impact
Less than Threshold Value	Negligible
Exceedance of Threshold Value by >1 to <3 dB	Minor Negative
Exceedance of Threshold Value by 3 to <5 dB	Moderate Negative
Exceedance of Threshold Value by 5 to <10 dB	Major Negative
Exceedance of Threshold Value by >10 dB	Substantial Negative

12.2.1.2 Construction Vibration

There are no universally applicable formulae for prediction of the passage of vibration through the ground due to the non-uniform effects of different ground conditions. However, BS 5228 provides a range of measured historical data for a variety of different piling methods.

With reference to Belfast City Council's (BCC) Advice Note on construction noise and vibration (of which a range of local councils throughout Northern Ireland adopt), it states that:

> *"Limits on vibration are generally applicable to piling operations only. Human beings are very sensitive to vibration and piling operations are a common source of complaint. Residents are likely to complain when vibration levels are only slightly in excess of perception levels. Sensitivity to vibration varies and peak particle velocities in the range 0.1 - 0.3mm/s equate*

to the human threshold of vibration perception at frequencies of 1-80Hz. Vibrations above these values can startle, cause annoyance or interfere with work activities as well as give rise to concerns over structural damage."

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.

BCC's Advice Note also states:

"The following limits may be applicable in certain circumstances.

Vibration from construction activities shall-

- *not exceed 2.5mm/s peak particle velocity, between 08.00 hours and 19.00 hours on Mondays to Saturdays, when measured on any ground floor structural surface of any noise sensitive premises; and*
- *not be perceptible between 19.00 hours and 08.00 hours on Mondays to Saturdays or at any time on Sundays, within any residential accommodation.*

Note: imperceptibility generally equates to a peak particle velocity of less than 0.15mm/s ppv."

BS 5228 Part 2 provides a simple method of determining annoyance alongside evaluation of the potential for cosmetic damage resulting from vibration.

Table 12.3 (adapted from Table B.1, BS 5228 Part 2) details PPV levels and their potential effect on humans, and provides a semantic scale for description of vibration impacts on human receptors.

Table 12.3: Guidance on Human Effects of Vibration Levels (PPV)

Vibration Level (mm/s)	Effect	Magnitude of Impact
0.14	Vibration might be just perceptible in the most sensitive situations 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

Source: Table B.1, BS 5228 Part 2 (adapted)

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. The recommended PPV vibration limits in BS 7385 (referenced in BS 5228) for transient excitation for different types of buildings are presented in Table 12.4.

Table 12.4: Transient Vibration Guide Values for Cosmetic Damage

Type of Structure	Peak Component Particle Velocity in Frequency Range of Predominant Pulse[1]	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
Un-reinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4 Hz, increasing to 20 mm/s at 15 Hz[2]	Minor

1 - Values referred to are at the base of the building.

2 - At frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) should not be exceeded.

Source: BS 7385 Part 2

The levels quoted in Table 12.4 refer to transient sources of vibration. BS 7385 states that "*Where the dynamic loading caused by continuous vibration is such as to give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values may need to be reduced by up to 50%.*"

BS 7385-2:1993 indicates that minor damage occurs at a vibration level twice that of cosmetic damage and major damage occurs at a vibration level twice that of minor damage. This guidance can be used to define the magnitude of impact, as shown in Table 12.5.

Table 12.5: Magnitude of Impact for Vibration Damage

Magnitude of Impact	Damage Risk	Continuous Vibration Level ppv (mm/s)
Major	Major	30
Moderate	Minor	15
Minor	Cosmetic	7.5
Negligible	Negligible	6

Source: BS 7385-2: 1993

As a worst-case, it has been assumed that the piles would be driven. Construction vibration predictions were undertaken using a spreadsheet implementation of the "percussive piling" empirical prediction method outlined in Table E.1 of BS 5228-2:2009+A1:2014. Resulting PPV values due to sheet piling works on-site have been compared to the limits specified above to determine the vibration effects at residential receptors.

12.2.1.3 Sensitivity of Receptors

In accordance with the principles of environmental impact assessment, the sensitivity of receptors to noise or vibration impacts has been defined in Table 12.6.

Table 12.6: Receptor Sensitivity

Sensitivity of Receptor	Description
Very High	Concert halls/theatres, specialist vibration-sensitive equipment
High	Residential properties, educational buildings, medical facilities, care homes
Medium	Places of worship, community facilities, offices
Low	Other commercial/retail premises

12.2.1.4 Significance Criteria

The methodology for determination of the significance of an effect is described in Sub-section 1.3.5.1.3 of this ES. This has been adapted for use in this assessment, as shown in Table 12.7.

Table 12.7: Significance of Effect

Sensitivity of receptor	Magnitude of Impact			
	Major	Moderate	Minor	Negligible
Very High	Major	Major	Moderate	Minor
High	Major	Moderate	Minor	Negligible
Medium	Moderate	Minor	Negligible	Negligible
Low	Minor	Negligible	Negligible	Negligible

Descriptions are provided below for the effects likely to occur depending on their significance. These are based on the IEMA Guidelines for Environmental Noise Impact Assessment.

- Major: Disruptive, causes a material change in behaviour and/or attitude. Potential for sleep disturbance. Quality of life diminished due to change in character of the area.
- Moderate: Intrusive, noise can be heard and causes small changes in behaviour and/or attitude. Potential for non-awakening sleep disturbance. Affects the character of an area such that there is a perceived change in the quality of life.
- Minor: Non-intrusive, can be heard but does not cause any change in behaviour or attitude. Can slightly affect the character of an area but not such that there is a perceived change in the quality of life.
- Negligible: No discernible effect on the receptor.

Based on the above descriptions, it is considered that effects of negligible or minor significance are not significant, and those effects of moderate or major significance are considered significant.

12.2.2 Limitations & Assumptions

As this is not an Early Contractor Involvement (ECI) scheme, information on construction-related activities is inherently limited; no details of plant are available and only a notional construction sequence has been developed. It must be borne in mind that the actual construction sequence for the scheme would ultimately be determined by the appointed Contractor, informed by contractual requirements.

12.3 Regulatory & Policy Framework

12.3.1 The Land Acquisition and Compensation (Northern Ireland) Order 1973

Part II of the Order (Compensation for Depreciation Caused by Use of Public Works) provides a means by which compensation can be paid to owners of land and property which has experienced a loss of value caused by the use of public works, such as the Proposed Scheme. Noise and vibration are two of the issues that would be considered under any such claim for compensation. Under the Order, Notice should be published one year after the date of first use of the public works and claim period is for 2 years after the date of publication of the Notice, although there is a facility for allowing consideration of likely extent of claims during detailed design, following the completion of statutory processes. As the scheme would not present a source of noise, this legislation is unlikely to be enacted as a consequence of this scheme.

12.3.2 The Regional Development Strategy 2035 'Building a Better Future'

In terms of policy framework, there is a hierarchy of policy and plans in Northern Ireland, pertinent to development of the Proposed Scheme. The Regional Development Strategy (RDS) 2035 provides an overarching strategic planning framework to facilitate and guide the public and private sectors. It does not redefine other government departments' strategies, but complements them with a spatial perspective. It is a framework which provides the strategic context for where development should happen, however it does not contain operational planning policy which is issued through Planning Policy Statements (PPS). Although many objectives of the previous strategy (the RDS 2025) are still valid, this document now replaces it.

Under strategic guidance RG7: *Support Urban and Rural Renaissance*, it is noted that noise levels which are above comfort levels can be caused by traffic, construction, industrial, and some recreational activities. It can aggravate serious direct, as well as indirect, health effects. 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.

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.

12.3.3 Noise Policy Statement for Northern Ireland

The Noise Policy Statement for Northern Ireland was published in September 2014 for the purposes of defining the Department of Agriculture, Environment and Rural Affairs (DAERA) policy responsibility to manage environmental noise.

Through the effective management and control of environmental, neighbour and neighbourhood noise, the Noise Policy aims 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.

The guidance highlights the role of the planning system in preventing and minimising the impact of noise through its influence on the location, layout and design of new development and consideration of amenity impacts. The guidance document makes reference to the applicability of established concepts from toxicology which have more recently been applied to noise impacts, namely:

- No Observed Effect Level;
- Lowest Observed Adverse Effect Level (LOAEL); and
- Significant Observed Adverse Effect Level (SOAEL).

The document acknowledges that it is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations and hence all situations must be judged on their own merits. This guidance document defines the general noise context that has been applied in this assessment, but does not replace or diminish the applicability of the other technical noise guidance documents listed in this section.

12.3.4 British Standards and Guidance

12.3.4.1 BS 5228:2009+A1:2014 '*Noise and Vibration Control on Construction and Open Sites*'

BS 5228 includes the following:

- Guidance on the potential impacts of construction and demolition noise and vibration;
- Discussion of the legislative framework;
- Prediction assessment methodology;
- General best practice control measures; and
- Example criteria that may be used to assess the resulting impact significance of construction and demolition noise and vibration.

12.3.4.2 BS 7385: 1993 '*Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from ground borne vibration*'

BS 7385 (as referenced in BS 5228) establishes the basic principles for carrying out vibration measurements and processing the data, with regard to evaluating vibration effects on buildings. In addition, it includes recommended peak particle velocity (ppv) vibration limits for transient excitation for different types of buildings to give a minimal risk of vibration-induced cosmetic damage.

12.4 Baseline Conditions

12.4.1 Existing Conditions

With reference to the Ards Down Area Plan 2015, Newcastle is a service centre for the surrounding rural hinterland, a commuter settlement and a holiday and retirement resort. It remains one of the main centres for tourism in Northern Ireland due primarily to the beauty of its natural setting and provides a range of tourist accommodation, in particular caravan parks. Local service and recreation facilities include churches, schools, a library, golf courses, Gaelic football and soccer pitches, outdoor swimming pools and playing fields. The service sector is the main source of employment, much of which is associated with the tourist industry and general professional services; consequently, the demand for industrial land within the town has been very low. On this basis, there are very few notable sources of noise and vibration which could give rise to adverse conditions that could affect health and quality of life. The dominant sources of noise within the study area include those emanating from domestic uses and vehicular activity.

Figure 12.1 shows potentially sensitive receptors identified within the study area. All of these are residential properties and classified as being of high sensitivity to noise. A total of 1593 residential properties have been identified within the wider 400m study area, based on latest LPS building polygon mapping layers and address point data. The closest residential receptors to the scheme are in the vicinity of Shimna Mile, Bryansford Road, Bryansford Avenue, and Riverside Park.

There are 15 non-residential sensitive properties within the study area, consisting of:

- two places of worship;
- one educational facility;
- nine community & sporting facilities; and
- three health & care facilities.

Educational facilities and health facilities are classified as being of high sensitivity to noise, and places of worship / community facilities classified as being of medium sensitivity.

No baseline noise monitoring surveys have been undertaken, due to the agreement of the use of fixed noise limits during construction. As noted previously, existing noise levels within the study area are likely to be dominated by domestic uses and vehicular activity only.

12.5 Predicted Impacts

12.5.1 Do-Nothing Scenario

Under the Do-Nothing scenario, it is envisaged that there would not be any perceptible change in noise and vibration conditions, particularly as the risk of flooding and inundation in the area surrounding the Shimna River would remain, thus restrictions on future development (i.e. housing) on land potentially affected by flooding would negate the potential to introduce new sources of noise and vibration not directly associated with the Proposed Scheme.

12.5.2 Operation

Due to the nature of the Proposed Scheme, there are no predicted significant impacts as a result of noise or vibration during operation. Impacts are not considered significant as the flood defence walls or embankments would not present a source of long-term/permanent noise or vibration. Furthermore, there has been no assessment of traffic-induced noise effects, as the scheme would have no impact upon long-term traffic movements through the study area. Overall, the impact of the Proposed Scheme in terms of noise and vibration is assessed as being negligible.

12.5.3 Construction

During the construction phase, the majority of works would comprise site preparation, involving use of earth moving and excavation equipment. 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.

Although the construction phase of the Proposed Scheme has the greatest potential for impact, it should be noted that these works would be temporary in duration as it is anticipated that construction works would be sequential; the daily HGV trips would be travelling to different sites in the catchment area as the work progress from embankment to embankment. It is anticipated that the scheme would require approximately 12 months to complete.

For the purposes of the noise assessment, identified residential receptors in close proximity to the works area are deemed to be located away from a main road, based on the classification of Bryansford Road and Bryansford Avenue on the 1:50k OSNI Raster Mapping. As such, the noise Threshold Value limit of 70dB LAeq (07:00 to 19:00 Monday to Friday) from Table 12.1 is considered applicable for this scheme.

Whilst a total of 1593 residential properties have been identified within 400m of the works area, based on latest OSNI building polygon mapping layers and address point data, only those which are located closest to the scheme have been subject to assessment (as shown on **Figure 12.1**). Adherence to the Threshold Value limits adopted at the closest receptors should ensure that construction noise impacts are kept to a minimum. The estimated distance of each of these receptors from the works area is provided in Table 12.8.

Table 12.8: Estimated distance of Receptors from the Works Area

Receptor No.	Distance from Works (m)	Receptor No.	Distance from Works (m)
R1	19.5	**R26**	11.3
R2	19.8	**R27**	9.9
R3	19.4	**R28**	13.2
R4	19.7	**R29**	14.8
R5	50.6	**R30**	16.4
R6	34.2	**R31**	15.9
R7	17.7	**R32**	17.5
R8	17.1	**R33**	20.4
R9	31.6	**R34**	22.8
R10	36.0	**R35**	25.3
R11	50.6	**R36**	24.7
R12	7.0	**R37**	23.4
R13	38.3	**R38**	50.2
R14	38.0	**R39**	51.2
R15	23.4	**R40**	45.0
R16	22.5	**R41**	40.0
R17	17.1	**R42**	31.9
R18	29.0	**R43**	24.1
R19	14.2	**R44**	19.0
R20	14.2	**R45**	26.9
R21	14.3	**R46**	4.3
R22	14.3	**R47**	8.1
R23	14.7	**R48**	9.4
R24	12.1	**R49**	5.1
R25	11.6		

For each sensitive receptor identified on **Figure 12.1**, only the operation which generates the worst-case construction noise level has been reported, which in the case of the Proposed Scheme would be as a result of piling, the type of which has not yet been determined, so again a worst-case scenario assessment has been undertaken in this regard, as previously detailed.

12.5.3.1 Predicted Impact of Construction Noise – Piling

As noted previously, the Proposed Scheme would include 1430m of brick/concrete clad sheet piles or sheet pile core embankments, as indicated by the red lines shown on **Figure 12.1**. The road bridge on the Bryansford Road (New Bridge) is the hub point of the scheme. The scheme proposes construction

of four separate flood defences with a sheet pile core, each starting at the bridge. On the north bank of the Shimna River, there would be construction of a flood defence from Bryansford Road Bridge (New Bridge), running parallel to the Bryansford Road for approximately 115m, then turning and running perpendicular to the road, for approximately 70m. Also on the north bank of the Shimna River, there would be construction of a flood defence from New Bridge, running downstream and parallel to the Shimna River within Islands Park over approximately 250m. On the south bank of the Shimna River, there would be construction of a flood defence from New Bridge, running downstream and parallel to Shimna River over approximately 645m across to Beers Bridge. Also, on the south bank of the Shimna River, there would be construction of a flood defence from New Bridge, running upstream, parallel, then perpendicular to the Shimna River for approximately 290m.

As detailed within BS 5228, on typical piling sites, the major sources of noise are mobile. Therefore, the noise received at any control points will vary from day-to-day as work proceeds. The type of noise associated with piling works depends on the method of piling employed. For example, pile driving using a drop hammer results in a well-defined, impulsive noise. Air and diesel hammers also produce impulsive noise although their striking rates can be much higher than with drop hammers. With bored or pressed-in piling methods, the resultant noise is continuous rather than impulsive.

Highly impulsive noise is generally less acceptable than steady noise. However, other characteristics of the noise source play an important part in determining the acceptability of piling noise, e.g. cable slap, screeching of pulleys and guides, clanking of locking kelly bars, and ringing of piles.

The duration of piling work is usually short in relation to the duration of construction work as a whole, and the amount of time spent working near noise-sensitive areas might represent only part of the piling period. Furthermore, the noisiest part of the pile construction process might occur at each individual pile location only for a short period of time.

The acceptable hours for the residents and occupiers of a particular area should also be considered in terms of restriction; this is particularly pertinent for works adjacent to R46 – R49 which represent residential units within the Autism Initiatives Centre on Bryansford Road. The Contractor shall have regard to likely restrictions to be placed on them when considering piling techniques, and should liaise with the Council and any relevant stakeholders at an early stage to appropriately manage the works.

As a worst-case scenario, a noise level of 88dB(A) at 10m (BS 5228:2009+A1:2014, C3, ref 8) has been used to determine predicted noise levels as a result of piling at the nearest noise sensitive properties, with attenuation as a result of distance from the works factored in. This is summarised in Table 12.9 below.

Table 12.9: Daytime Predicted Construction Noise Levels at nearby Receptors

Receptor	Worst-Case LAeq @ 10m (dBA)	Distance from Construction activity (m)	Distance Attenuation (dBA)	Predicted Worst-Case Construction Noise (dBA)	Level above 70dB Daytime Limit	Magnitude of Impact
R1	88	19.5	6	82	12	Substantial Negative
R2	88	19.8	6	82	12	Substantial Negative
R3	88	19.4	6	82	12	Substantial Negative
R4	88	19.7	6	82	12	Substantial Negative
R5	88	50.6	14	74	4	Moderate Negative
R6	88	34.1	11	77	7	Major Negative
R7	88	17.7	5	83	13	Substantial Negative
R8	88	17.1	5	83	13	Substantial Negative
R9	88	31.6	10	78	8	Major Negative
R10	88	36.0	11	77	7	Major Negative

Receptor	Worst-Case LAeq @ 10m (dBA)	Distance from Construction activity (m)	Distance Attenuation (dBA)	Predicted Worst-Case Construction Noise (dBA)	Level above 70dB Daytime Limit	Magnitude of Impact
R11	88	50.6	14	74	4	Moderate Negative
R12	88	19.4	6	82	12	Substantial Negative
R13	88	38.3	12	76	6	Major Negative
R14	88	38.0	12	76	6	Major Negative
R15	88	23.4	7	81	11	Substantial Negative
R16	88	22.5	7	81	11	Substantial Negative
R17	88	17.1	5	83	13	Substantial Negative
R18	88	29.0	9	79	9	Major Negative
R19	88	14.2	3	85	15	Substantial Negative
R20	88	14.2	3	85	15	Substantial Negative
R21	88	14.3	3	85	15	Substantial Negative
R22	88	14.3	3	85	15	Substantial Negative
R23	88	14.7	3	85	15	Substantial Negative
R24	88	12.1	2	86	16	Substantial Negative
R25	88	11.6	1	87	17	Substantial Negative
R26	88	11.3	1	87	17	Substantial Negative
R27	88	10.0	0	88	18	Substantial Negative
R28	88	13.2	2	86	16	Substantial Negative
R29	88	14.8	4	84	14	Substantial Negative
R30	88	16.4	4	84	14	Substantial Negative
R31	88	15.9	4	84	14	Substantial Negative
R32	88	17.5	5	83	13	Substantial Negative
R33	88	20.4	6	82	12	Substantial Negative
R34	88	22.8	7	81	11	Substantial Negative
R35	88	25.3	8	80	10	Substantial Negative
R36	88	24.7	8	80	10	Substantial Negative
R37	88	23.4	7	81	11	Substantial Negative
R38	88	50.2	14	74	4	Moderate Negative
R39	88	51.2	14	74	4	Moderate Negative
R40	88	45.0	13	75	5	Major Negative
R41	88	40.0	12	76	6	Major Negative
R42	88	31.9	10	78	8	Major Negative
R43	88	24.1	8	80	10	Substantial Negative
R44	88	19.0	6	82	12	Substantial Negative
R45	88	26.9	9	79	9	Major Negative
R46	88	4.3	-7	95	25	Substantial Negative

Receptor	Worst-Case LAeq @ 10m (dBA)	Distance from Construction activity (m)	Distance Attenuation (dBA)	Predicted Worst-Case Construction Noise (dBA)	Level above 70dB Daytime Limit	Magnitude of Impact
R47	88	8.1	-2	90	20	Substantial Negative
R48	88	9.4	-1	89	19	Substantial Negative
R49	88	5.1	-6	94	24	Substantial Negative

With reference to Table 12.9, without mitigation, the worst-case magnitude of daytime construction noise impacts has been identified as follows:

- 4 Receptors subject to a Moderate Negative daytime construction noise impact;
- 10 Receptors subject to a Major Negative daytime construction noise impact;
- 35 Receptors subject to a Substantial Negative daytime construction noise impact.

Within the study area, the Shimna River corridor and its environs has many existing land uses, and is very much representative of the convergence and tension between the natural and human environment with the meeting of the riparian corridors of the converging Shimna, Tullybrannigan and Burren rivers (and associated wetlands) with the residential and amenity areas of Newcastle Town. As a consequence of setting the flood defences back from the river's edge and maximising the protection of the riparian corridor, it sets the working area in very close proximity to the highly sensitive residential properties that back onto this corridor. As such, the majority of receptors are at risk of significant adverse transient noise impacts due to the worst-case scenario piling operation. As would naturally be anticipated, those receptors located closest to the works are those likely to be exposed to the worst-case magnitude of daytime construction noise impacts. This predominantly includes those receptors located on Bryansford Road, and in particular Shimnamile and the Autism Initiatives facility adjacent to the Tullybrannigan River.

It should be emphasised that these worst-case transient construction noise predictions are an overestimation of the likely construction noise levels for the closest façade of each receptor to the works area, and there are a range of variables (as discussed earlier) that would affect the levels of transient exposure.

12.5.3.2 Predicted Impact of Construction Vibration – Piling

As noted previously, vibration can also occasionally be caused by construction. Vibration is a low frequency disturbance producing physical movement in buildings and their occupants. Vibration is usually measured in terms of Peak Particle Velocities (PPVs) and is the maximum speed of movement (measured in mm/s) of a point in the ground during passage of vibration. Vibration can be problematic because of its ability to affect precision tasks (for example in hospitals); and possible building damage, which affects the building and the occupants. The estimated worst-case scenario vibration levels, again associated with driven piling, are given in Table 12.10.

Table 12.10: Predicted construction vibration levels at nearby receptors

Receptor No.	Distance from Works (m)	Predicted construction vibration levels (ppv mms^{-1})	Receptor No.	Distance from Works (m)	Predicted construction vibration levels (ppv mms^{-1})
R1	19.5	0.94	**R26**	11.3	2.02
R2	19.8	0.92	**R27**	9.9	2.39
R3	19.4	0.94	**R28**	13.2	1.62
R4	19.7	0.92	**R29**	14.8	1.38

Receptor No.	Distance from Works (m)	Predicted construction vibration levels (ppv mms^{-1})	Receptor No.	Distance from Works (m)	Predicted construction vibration levels (ppv mms^{-1})
R5	50.6	0.25	**R30**	16.4	1.20
R6	34.2	0.43	**R31**	15.9	1.25
R7	17.7	1.08	**R32**	17.5	1.09
R8	17.1	1.12	**R33**	20.4	0.88
R9	31.6	0.48	**R34**	22.8	0.75
R10	36.0	0.40	**R35**	25.3	0.65
R11	50.6	0.25	**R36**	24.7	0.67
R12	7.0	0.94	**R37**	23.4	0.73
R13	38.3	0.36	**R38**	50.2	0.25
R14	38.0	0.37	**R39**	51.2	0.24
R15	23.4	0.73	**R40**	45.0	0.29
R16	22.5	0.77	**R41**	40.0	0.34
R17	17.1	1.13	**R42**	31.9	0.47
R18	29.0	0.54	**R43**	24.1	0.70
R19	14.2	1.46	**R44**	19.0	0.98
R20	14.2	1.46	**R45**	26.9	0.60
R21	14.3	1.45	**R46**	4.3	7.69
R22	14.3	1.45	**R47**	8.1	3.24
R23	14.7	1.40	**R48**	9.4	2.62
R24	12.1	1.82	**R49**	5.1	6.15
R25	11.6	1.94			

With reference to Table 12.10, without mitigation, the worst-case magnitude of daytime construction vibration impacts in terms of annoyance has been identified as follows:

- 4 Receptors subject to a Minor Negative daytime construction vibration impact; and
- 40 Receptors subject to a Moderate Negative daytime construction vibration impact.

As detailed within Table 12.3, for those receptors that would be subject to minor impacts, vibration might just be perceptible. For those that would be subject to moderate impacts, it is likely that vibration of this level in residential environments would cause complaint, but can be tolerated if prior warning and explanation has been given to residents.

With regards to BCC's Advice Note on construction noise and vibration, Receptors R46 – R49, which represent residential units within the Autism Initiatives Centre on Bryansford Road are predicted to exceed 2.5mm/s PPV, between 08.00 hours and 19.00 hours on Mondays to Saturdays, when measured on any ground floor structural surface of any noise sensitive premises. This is as a consequence of their very close proximity to the works area (the closest of any receptors).

In terms of potential for building damage, Receptors R46 & R49 are at risk of experiencing cosmetic damage as a result of the piling works (without mitigation).

Since the vibration levels have been predicted at the closest receptors to the proposed piling operation, it follows that the level of vibration would be lower at other sensitive receptors, owing to their greater distance.

12.6 Mitigation & Enhancement Measures

12.6.1 Operation

Once the Proposed Scheme is constructed and in operation, there would be no anticipated noise or vibration impacts; therefore, no mitigation or enhancement measures are required to maintain the existing ambient levels.

12.6.2 Construction

As detailed within Sub-section 12.5.2, it is evident that all receptors would be above the Threshold Value limit of 70dB LAeq (07:00 to 19:00 Monday to Friday) which is considered applicable for this scheme.

It should be noted that the levels have been assessed on a typical worst-case day at the closest façade to the receptor. Identified potential noise impacts are expected to be temporary and localised due to the linear nature of the Scheme. Noise levels would be lower as the construction works move further from receptors. Irrespective of this, to mitigate the construction noise levels during daytime, it would be necessary for the contractor to adopt piling and ancillary operations that would have less of a significant impact upon the transient noise environment, such as sheet steel piling by hydraulic jacking.

A noise level of 88dB(A) at 10m (BS 5228:2009+A1:2014, C3, ref 8) has been used to determine predicted noise levels as a result of piling at the nearest noise sensitive properties, with attenuation as a result of distance from the works factored in. This is summarised in Table 12.11 below.

Table 12.11: Daytime Predicted Construction Noise Levels at nearby Receptors

Receptor	Worst-Case LAeq @ 10m (dBA)	Distance from Construction activity (m)	Distance Attenuation (dBA)	Predicted Worst-Case Construction Noise (dBA)	Level above 70dB Daytime Limit	Magnitude of Impact
R1	68	19.5	6	62	-8	Negligible
R2	68	19.8	6	62	-8	Negligible
R3	68	19.4	6	62	-8	Negligible
R4	68	19.7	6	62	-8	Negligible
R5	68	50.6	14	54	-16	Negligible
R6	68	34.2	11	57	-13	Negligible
R7	68	17.7	5	63	-7	Negligible
R8	68	17.1	5	63	-7	Negligible
R9	68	31.6	10	58	-12	Negligible
R10	68	36.0	11	57	-13	Negligible
R11	68	50.6	14	54	-16	Negligible
R12	68	19.4	16	52	-18	Negligible
R13	68	38.3	12	56	-14	Negligible
R14	68	38.0	12	56	-14	Negligible
R15	68	23.4	7	61	-9	Negligible

Receptor	Worst-Case LAeq @ 10m (dBA)	Distance from Construction activity (m)	Distance Attenuation (dBA)	Predicted Worst-Case Construction Noise (dBA)	Level above 70dB Daytime Limit	Magnitude of Impact
R16	68	22.5	7	61	-9	Negligible
R17	68	17.1	5	63	-7	Negligible
R18	68	29.0	9	59	-11	Negligible
R19	68	14.2	3	65	-5	Negligible
R20	68	14.2	3	65	-5	Negligible
R21	68	14.3	3	65	-5	Negligible
R22	68	14.3	3	65	-5	Negligible
R23	68	14.7	3	65	-5	Negligible
R24	68	12.1	2	66	-4	Negligible
R25	68	11.6	1	67	-3	Negligible
R26	68	11.3	1	67	-3	Negligible
R27	68	10.0	0	68	-2	Negligible
R28	68	13.2	2	66	-4	Negligible
R29	68	14.8	4	64	-6	Negligible
R30	68	16.4	4	64	-6	Negligible
R31	68	15.9	4	64	-6	Negligible
R32	68	17.5	5	63	-7	Negligible
R33	68	20.4	6	62	-8	Negligible
R34	68	22.8	7	61	-9	Negligible
R35	68	25.3	8	60	-10	Negligible
R36	68	24.7	8	60	-10	Negligible
R37	68	23.4	7	61	-9	Negligible
R38	68	50.2	14	54	-16	Negligible
R39	68	51.2	14	54	-16	Negligible
R40	68	45.0	13	55	-15	Negligible
R41	68	40.0	12	56	-14	Negligible
R42	68	31.9	10	58	-12	Negligible
R43	68	24.1	8	60	-10	Negligible
R44	68	19.0	6	62	-8	Negligible
R45	68	26.9	9	59	-11	Negligible
R46	68	4.3	-7	75	5	Moderate Negative
R47	68	8.1	-2	70	0	Negligible
R48	68	9.4	-1	69	-1	Negligible
R49	68	5.1	-6	74	4	Moderate Negative

**a negative value indicates level below threshold value*

With reference to Table 12.11, by applying engineering controls at source and utilising a more noise sensitive method of piling, the magnitude of daytime construction noise impacts has been identified as follows:

- 47 Receptors subject to a Negligible construction noise impact; and
- 2 Receptors subject to a Moderate Negative daytime construction noise impact.

Also evident from Table 12.11, there still remains a potential construction noise issue at Receptors R46 & R49 as a consequence of their very close proximity to the works. As noted previously, these are associated with the Autism Initiatives facility on Bryansford Road.

In addition to the application of more noise sensitive piling techniques, consideration shall be given to the use of site or activity boundary acoustic barriers to screen neighbouring receptors, particularly at the Autism Initiatives facility on Bryansford Road and possibly those properties located within Shimnamile. The appointed contractor shall be required to undertake liaison with NMDDC and the local community to ensure that noise and vibration during construction is effectively and sensitively managed. This is particularly important for works in the vicinity of the Autism Initiatives facility on Bryansford Road.

It should be noted that the above impacts still consider an absolute worst-case scenario in terms of location of the works. The works have been assumed to be undertaken at the closest façade to the receptor. In some instances, the time when the works would be undertaken at the closest façade to the receptor may not last an entire day and thus it could be that the magnitude of impact and significance of effect is over-predicted. However, there is currently not enough detail available on the proposed works and construction schedule for this to be determined.

Due to the nature of works and the constrained timescales that are inherent to working on and adjacent to residential properties, the options for further mitigation are limited. However, the contractor shall employ best practice to reduce and minimise construction noise levels as much as reasonably practicable. Identified impacts can also be tolerated employing a good site practice to keep local residents informed about the potential impacts of the construction works and about the working schedules. If feasible, an alternative method of piling such as hydraulic jacking should be adopted, which would minimise vibration emissions.

A range of good site practices shall be adopted in order to mitigate construction phase noise and vibration; these would be defined within a Construction Environmental Management Plan (CEMP). The Contractor shall ensure the works are undertaken in such a manner that emissions of dust and other pollutants are limited and that “Best Practicable Means (BPM)”, as defined in the Pollution Control and Local Government (NI) Order 1978, are employed to avoid statutory nuisance. Recommendations for implementation of BPM are given in (but not limited to):

- BS 5228 – Noise and Vibration Control on Construction and Open Sites;
- HSE Dust and Noise in the Construction Process CRR 73 HSE Books 1995;
- HSE Noise at Work – Guidance for Employers on the Control of Noise at Work Regulations 2005; and
- BRE Control of Dust from Construction and Activities 2003.

It is assumed that the contractor would follow BPM to reduce the noise impact on the local community, including but not limited to, the points outlined below:

- All plant used on site would comply with the EC Directive on Noise Emissions for Outdoor Equipment where applicable and shall be inherently quiet where appropriate.
- Fixed and semi-fixed ancillary plant such as generators, compressors, wood chippers etc. which can be located away from receptors to be positioned so as to cause minimum noise disturbance. Where appropriate, screenings would be utilised to reduce noise levels between the source and receiver.

- All compressors shall be sound-reduced models fitted with properly lined and sealed acoustic covers which shall be kept closed whenever the machines are in use, and all ancillary pneumatic percussive tools shall be fitted with mufflers or silencers of the type recommended by the manufacturers. Pumps and mechanical static plant shall be enclosed by acoustic sheds or similar.
- All items of equipment are properly maintained, provided with effective silencers and operated in such a manner as to avoid causing any excessive noise or exhaust emission. All items of equipment operating on the site in intermittent use are shut down or throttled down to a minimum in the intervening periods between use, unless agreed otherwise with the Project Manager.
- Pumps and mechanical static plant shall be enclosed by acoustic sheds or screens where directed by the Department and to the approval of the head of Environmental Health Service within NMDDC.
- Any plant such as generators and pumps that are required to work outside the hours of 07:00-19:00 shall be surrounded by an acoustic enclosure to the approval of the Head of Environmental Health Service within NMDDC.
- The Works are carried out in accordance with the requirements of The Pollution Control and Local Government (NI) Order 1978 Part III. Noise Control procedures are at least equal to the recommendations laid down in BS 5228 Code of Practice for Noise Control on Buildings and Demolition Sites. Adherence to the codes of practice for construction working and piling, given in British Standard BS 5228 and the guidance given therein for minimising noise and vibration emissions from the site.
- Sound levels shall be monitored by methods set out in BS5228: '*Noise and Vibration Control on Construction and Open Sites, Part 1 Code of Practice for basic information and procedures for noise and vibration contro*l'.
- The Contractor shall provide and maintain noise meters and shall undertake noise monitoring during the execution of the Works. The Contractor shall propose monitoring locations and durations for the written acceptance of the Department. All monitoring results shall be made available to the Department on a weekly basis and to NMDDC upon request.

12.6.2.1 Control of Noise

The ambient noise level, Leq (see Note (ii) below) from all sources when measured 2.0m above the ground at identified noise controls stations shall either not exceed the appropriate level given in the Schedule or not exceed by more than 3dB (A) the existing ambient noise level, Leq (see Note (iii) below), at the control station measured over the same period, whichever level is the greater. The maximum sound level at any noise control station shall not exceed the level given in the Schedule. Exceptionally, the Contractor may be given permission to carry out works which exceed the noise levels in the Schedule, provided that 7 days' notice of the date and timing of these works is given to the Department and the Contractor demonstrates that he intends to take all reasonable measures to mitigate the noise nuisance. After consultations with the NMMDC and any other interested bodies, a decision would be given within 7 days of receipt of the notice.

Table 12.12: Control of Noise and Vibration Schedule

Period			Total Noise Levels at Control Stations		
			Facade Noise Level LAeq (T hrs) (note i)	Period, T, over which LAeq is measured	Maximum Noise Level LpA,max (note iv)
Mondays to Fridays	07.00 to 19.00 hrs	Normal Working Hours	70	1 hr	80
Saturdays and Bank Holidays	07.00 to 13.00 hrs		70	1 hr	80
Saturdays and Bank Holidays	13.00 to 19.00 hrs		60	1 hr	70
Sundays	07.00 to 22.00 hrs		60	1 hr	65
Evening Hours	19.00 to 22.00 hrs		Evening Ambient + 10	15 min	65
Every Night	22.00 to 07.00 hrs		Night Ambient + 5	15 min	50

Notes

(i) Noise levels relate to 1m from the most exposed facade of an occupied building. Where noise levels relate to free field conditions, the permitted noise levels shall be reduced by 3 dB(A).

(ii) The noise level, LA eq (T hrs), at a noise control station is the total LAeq from all noise sources in the vicinity, including Site noise, over the specified period, T hrs.

(iii) The existing ambient noise level, LAeq (T hrs), at a noise control station is the total LAeq from all the noise sources in the vicinity over the specified period, T hrs, prior to the commencement of the Works.

(iv) LpA,max is the highest value indicated on a sound level metre, which meets the requirements of BS 5969 Type 1 or 2 set to SLOW response and frequency weighting A.

The Contractor shall furnish such information as may be required by NMDDC in relation to noise levels emitted by plant or equipment used or installed on the site, or which the Contractor intends to use or install on the site.

The Contractor shall afford all reasonable facilities to enable the authorised officers of the local authority to carry out such site noise monitoring as may be necessary.

12.6.2.2 Control of Vibration

- Vibratory rollers in vibratory mode will not be permitted within 50 metres of any properties.
- Vibration generated by the Contractor's activities shall not adversely affect the structural and serviceability performance of any building and structure outside the boundaries of the Site. Structural vibration emanating from any part of the Works when measured at, or adjacent to, the foundation of any building and expressed as the peak particle velocity shall not exceed 2mm/sec or, in the case of unoccupied buildings, a value of 4mm/sec.
- The Contractor shall employ the best practical means to minimise vibration produced by his operations, including Contractor's Equipment maintenance, and shall comply with the recommendations in BS5228 (Noise and Vibration Controls on Construction and Open Sites; Part 1: Code of Practice for basic information and procedures for noise and vibration control).

- To ensure compliance with the specified vibration limit, monitoring shall be undertaken by the Contractor using a digital seismograph. Such monitoring shall include locations outside the limits of the Site, for which the Contractor shall obtain all necessary permissions. The Contractor shall provide for a minimum of 4 separate vibration monitoring locations to be in operation at any one time.
- The Contractor shall monitor ground vibrations at selected locations to the approval of the Department during the progress of the Works.
- Each vibrograph shall be certified as being in proper working order and shall, unless otherwise approved in writing by the Department, record vibrations in three directions simultaneously with a print-out showing the amplitude and frequency of the vibrations.
- Vibration monitoring will be carried as a minimum at a range of sensitive receptors during the works. It may be possible to provide one monitoring point for multiple locations provided the contractor can demonstrate that the proposed monitoring point is capable of monitoring vibration at the required locations.

12.7 Residual Effects

The Proposed Scheme would result in both temporary noise and vibration impacts during the construction works, and with no permanent noise impacts due to the operation of the Proposed Scheme.

12.7.1 Operational Noise and Vibration

Once the scheme is constructed and in operation, there would be no anticipated noise or vibration impacts; therefore, the overall significance of the operational noise and vibration effects of the Proposed Scheme is assessed as Negligible.

12.7.2 Construction Noise and Vibration

Based on the likely magnitude of the construction noise impacts and the sensitivity of the identified receptors, the overall significance of construction noise effects is assessed at worst as Minor Negative, assuming the developed mitigation strategy is in place.

Based on the likely magnitude of the construction vibration impacts and the sensitivity of the closest identified receptors, the overall significance of construction vibration effects is assessed as Negligible.

The piling and site clearance works have been identified as the construction activities with the greatest potential to generate noise. A range of good practice mitigation measures have been identified. Adherence to the limits outlined within this section, should ensure that construction noise impacts are kept to a minimum.

13. Drainage & the Water Environment

13.1 Introduction

This section considers the impact of the Proposed Scheme upon the water environment within the Shimna Catchment and includes water quality, hydrology, groundwater vulnerability, hydrogeology and hydromorphology. It considers the potential for adverse impacts (i.e. suspended sediments contributing to highly turbid conditions) during construction and operation, and considers the potential for non-conformance with Water Framework Directive (WFD) 2000/60/EC objectives as transposed into national legislation via The Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2017.

The aim of this section is to make an informed assessment of the impacts of the Proposed Scheme on the water environment and to identify mitigation measures that would reduce and where possible avoid impacts. The assessment also makes consideration of the changes in the baseline water environment that are likely to result in the absence of the Proposed Scheme, and recognising the influence of future climate change.

Some of the watercourses in the study area are subject to nature conservation designations, and an impact assessment of the potential impacts on the watercourses from an terrestrial ecology perspective is provided in Section 9: Biodiversity – Terrestrial Ecology of this ES, and from an fisheries and aquatic ecology perspective is provided in Section 15: Biodiversity – Fisheries & Aquatic Ecology of this ES.

13.2 Methodology

This assessment has been carried out in accordance with NIEA – Water Management Unit (WMU) Guidance Note '*Carrying out a Water Framework Directive (WFD) Assessment on EIA Developments*'. As detailed within this guidance note, the potential for impact upon the water environment associated with each specific component of the Proposed Scheme is assessed. The cumulative nature of a number of such impacts is also taken into consideration. A description of the specific restoration component or activity being assessed is provided where necessary. The impact of the specific restoration component or activity is assessed against the relevant WFD classification elements and the following WFD Objectives:

- **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 water body;
- **Objective 3:** To ensure that attainment of the WFD objectives for the water body are not compromised; and
- **Objective 4:** To ensure achievement of the WFD objectives in other water bodies within the same catchment are not permanently excluded or compromised.

Where the assessment identifies a component or activity which is not compliant with WFD Objectives but which may become compliant with appropriate mitigation, these mitigation measures are identified.

If the assessment predicts that the Proposed Scheme will cause deterioration in water body status, or prevent a water body from meeting its WFD objectives, the scheme should be reviewed, otherwise an assessment is required under Article 4.7 of the WFD.

13.2.1 Assessing the significance of effects

Firstly, an assessment is made of the importance of the water environment by considering the features within the study area. The environmental importance of a feature is characterised by identifying and analysing its attributes, such as its use or its value to the economy. Guidance on estimating the importance of water environment attributes within the study area are contained within

Table 13.1 below (adapted from the Design Manual for Roads and Bridges (DMRB) 11.3.10 Annex IV; Reporting of Significance of Potential Effects).

Table 13.1: Estimating the Importance of the Water Environment

Importance	Criteria	Typical Examples
Very High	Attribute has a high quality and rarity on regional or national scale	WFD Class 'High'. Site protected/designated under EC or UK habitat legislation (SAC, SPA, ASSI, Ramsar site, Salmonid water) / Species protected by EC legislation.
High	Attribute has a high quality and rarity on local scale	WFD Class 'Good'. Major Shellfishery. Species protected under EC or UK habitat legislation.
Medium	Attribute has a medium quality and rarity on local scale	WFD Class 'Moderate'.
Low	Attribute has a low quality and rarity on local scale	WFD Class 'Poor'.

Source: adapted from DMRB 11.3.10, Annex IV, Table A4.5

Potential impacts should then be assessed in two steps: (i) estimation of the magnitude of impact, and then (ii) significance of any potential environmental effects identified as part of the assessment process. Tables 13.2 and 13.3 (adapted from DMRB 11.3.10 Annex IV) contain guidance for estimating these.

Table 13.2: Estimating the magnitude of an impact on an attribute

Magnitude	Criteria	Typical Examples
Major Adverse	Results in loss of attribute and/or quality and integrity of the attribute	Loss or extensive change to a fishery. Major alteration to fish population levels in catchment as a whole, through fish mortality, habitat destruction or barrier to migration. Impacts long-term (>5 years) and/or irreversible. Loss or extensive change to a designated Nature Conservation site.
Moderate Adverse	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. Impacts medium-term (1-5 years) and/or irreversible.
Minor Adverse	Results in some measurable change in attribute's quality or vulnerability	Minor alteration to fish population levels in specific sub-catchment or zone. Impacts short-term (up to 1 year) and/or reversible through impact reduction or mitigation measures.
Negligible	Results in effect on attribute, but of insufficient magnitude to affect the use or integrity	No measurable alteration to fish population levels. Impacts short-term and/or reversible.

Source: adapted from DMRB 11.3.10, Annex IV, Table A4.4

Table 13.3: Estimating the significance of potential effects

Importance of Attribute					
	Very High	Minor/Moderate	Moderate/Major	Major	Major
	High	Minor	Minor /Moderate	Moderate/Major	Major
	Medium	Negligible	Minor	Moderate	Moderate/Major
	Low	Negligible	Negligible	Minor	Minor/Moderate
		Negligible	**Minor**	**Moderate**	**Major**
		Magnitude of Impact			

Source: adapted from DMRB 11.3.10, Annex IV, Table A4.5

The meaning of the significance ratings is as follows:

- **Major significance**: Effects of the development of greater than local scale.
- **Moderate significance**: Effects of the development that may be judged to be important at a local scale (i.e. in the planning context).
- **Minor significance**: Effects of low importance in the decision-making process.
- **Negligible**: Effects that are of such low importance that they are not material to the decision-making process.

13.3 Regulatory & Policy Framework

As noted in Sub-Section 1.2, the Department is duty bound to carry out the works in an environmentally sensitive manner in conjunction with the Department's Conservation Officer, and in accordance with relevant European Directives (EIA Directive, Floods Directive, Water Framework Directive, Habitats Directive etc.) and associated transposing national legislation.

13.3.1 The Floods Directive

The Flood Risk Management Plans (FRMP) have been produced as a key requirement of Directive 2007/60/EC on the assessment and management of flood risks which was brought into force on 23 October 2007. This Directive, known as the Floods Directive, was introduced in response to recent catastrophic floods that occurred across Europe. It is estimated that over 213 major floods occurred in the European Union between 1998 and 2009 and that these have caused some 2016 deaths, displaced about half a million people and cost at least £52 billion in insured losses. The Floods Directive is designed to help Member States establish a framework for managing flood risk and aims to reduce the adverse consequences of flooding on human health, the environment, cultural heritage and economic activity.

In August 2009, the Department consulted with the public on its proposed legislation for implementing the Floods Directive in Northern Ireland and in November 2009, the legislation was introduced and is known as the Water Environment (Floods Directive) Regulations (Northern Ireland) 2009.

The main requirements of the legislation and the dates for their completion are as follows:

- Carry out a Preliminary Flood Risk Assessment (PFRA) for each River Basin District and on the basis of this assessment, identify areas for which potential significant flood risks exist or might be considered likely to occur (December 2011);
- Prepare flood hazard maps and flood risk maps for each Significant Flood Risk Area (SFRA) identified (December 2013);
- Consult the public on draft FRMPs that contain objectives and measures to reduce the flood risk within the SFRA and focus on prevention, protection and preparedness (December 2014);

- Produce final FRMPs that take account of the views and representations received through the publication (December 2015);

The Directive requires these deliverables to be reviewed, and if necessary updated, on a six-yearly cycle.

13.3.2 The Water Framework Directive

The Water Framework Directive 2000/60/EC, which was introduced in 2000 has a number of links with the EU Floods Directive. Its purpose is to establish a framework for the community action in the field of water policy, implemented in Northern Ireland by The Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2003. Its primary focus, however, is improvement in water quality, rather than flooding. Its approach is based around the same River Basin Districts as the Floods Directive and this provides a number of opportunities for Government to dovetail the activities of both Directives.

It provides the framework to plan and deliver a better water environment across Europe, by setting ecological and water quality objectives to be met through activities contributed to by a number of actions. The WFD is fully effective and its key objectives provided for in RBMPs are to:

- prevent deterioration, enhance and restore bodies of surface water, achieve 'Good' chemical and ecological status of such water, and reduce pollution from discharges and emissions of hazardous substances;
- protect, enhance and restore all bodies of groundwater, achieve 'Good' chemical and quantitative status of groundwater, prevent the pollution and deterioration of groundwater, and ensure a balance between groundwater abstraction and replenishment; and
- preserve protected areas.

13.3.2.1 Synergies between Flood Risk Management Plans and River Basin Management Plans

In December 2009, the then Department of Environment (now Department of Agriculture, Environment and Rural Affairs (DAERA)), as Competent Authority for the EU Water Framework Directive (WFD), published the first River Basin Management Plans (RBMPs) for Northern Ireland under the WFD. Northern Ireland Environment Agency (NIEA) was responsible for delivery of these first RBMPs in conjunction with a number of Northern Ireland Executive Departments, including the then Department of Agriculture and Rural Development (DARD). This recognised the important roles DARD and the Department had in managing aspects of the water environment and in implementing WFD requirements.

The RBMPs identified the condition of the water environment and set out objectives for the improvement, or the prevention of deterioration, of individual water bodies for the next three river basin planning cycles ending in 2015, 2021 and 2027. A Programme of Measures was published in the RBMPs setting out actions required to meet the objectives of improving the status of all water bodies. An interim update on the measures was published in 2012. The WFD requires that RBMPs are reviewed and updated every 6 years.

Consequently, the Department of Environment published its 2nd cycle draft Plans for public consultation between December 2014 and June 2015, publishing the new Plans in December 2015. In parallel with this timescale, the Department published its first draft FRMPs for public consultation, publishing the final FRMPs in December 2015.

The importance of coordination of FRMPs with the RBMPs is recognised by, and is a requirement of, the EU Floods Directive. To this end, the geographical coverage of the FRMPs in Northern Ireland is directly aligned with WFD's River Basin Districts of Neagh Bann, North Western and North Eastern, two of which (North Western and Neagh Bann) are International River Basins shared with the Republic of Ireland.

There is continued engagement between the Department (the Competent Authority for the Floods Directive) and NIEA (the Competent Authority for the WFD) through the interdepartmental Floods

Directive Steering Group and the local Flood Forums. The Department is reciprocally engaged on the corresponding groups for WFD at interdepartmental, interagency and catchment stakeholder group level; this engagement has been on-going for many years and pre-dates the preparatory phase of the first cycle of RBMPs. In particular, the work of the Inter-agency group on River Restoration and Continuity (now the Catchment Oversight Group) provides a sound basis for developing catchment-based projects in future. This group aims to develop projects at the catchment and local level, through partnership working. In this way, both funding and benefits can be shared, providing better value for money, and developing the idea of adapting and delivering measures that have a number of drivers. Membership of the Catchment Oversight Group includes statutory fisheries groups, and DARD (now DAERA) Countryside Management Division, thus providing excellent opportunities to develop partnership working and synergies in the long-term.

The FRMPs focus primarily on areas which have been identified as being at potential significant flood risk. As these are predominantly urban areas, any reduction in flooding as a result of implementing measures, may also reduce the risk of pollution incidents given the fact that flooding often results in pollution problems from oil tanks, sewerage overflows, etc. The development and implementation of measures proposed under the FRMPs also provides potential opportunities for more natural flood risk management (e.g. improving floodplain storage, re-establishing connectivity, fish passage, sediment continuity, morphological and other enhancement of watercourses etc. during capital works). Collaborative working by personnel and stakeholders implementing the FRMPs could potentially both reduce flood risk and help to manage the adverse consequences that flooding has on the environment, human health, cultural heritage and economic activity, thus satisfying the requirements of both Directives. Where the sites of such measures overlap with 'Natura 2000' sites (under the Habitats and Birds Directives), or are hydrologically connected, there are opportunities to seek benefits through liaison and information sharing.

Measures within the RBMPs highlight the need for multi-agency working at a catchment level to deliver benefits for water status, morphology, flooding and fisheries through a coordinated, joined-up approach.

Similarly, the FRMPs identify the need to achieve the objectives of the WFD in terms of 'Good' status through the Environmental Objectives set out in Section 3.1 of the FRMPs. The coordination of river basin planning and flood risk management planning is therefore important in delivering the objectives and measures of both Directives.

13.4 Baseline Conditions

13.4.1 Surface Waters

Under the WFD, River Basin Management Plans have been developed for all river, estuarine and coastal waters in the UK. In December 2009, NIEA published the first North Eastern RBMP. In line with the WFD, the RBMPs should be reviewed and updated every six years. On this basis, an update to the North Eastern RBMP was published in December 2015. The Plan identifies where our water environment is in a 'Good' or 'Excellent' condition, and sets out objectives for the improvement or the prevention of deterioration of individual river, lake, marine and groundwater bodies for the subsequent river basin planning cycles. A Programme of Measures was published as part of the Plan, setting out actions required to meet the objectives to improve the status of all water bodies.

With reference to the '*North Eastern RBMP*' (NIEA 2015), the general study area is located within the *North Eastern* River Basin District (NE RBD) which covers an area of approximately 3000km^2, with a further 1000km^2 of marine waters. It takes in large parts of Counties Antrim and Down and a small portion of County Londonderry. The district is flanked by the Antrim Plateau and Glens of Antrim to the north and the Mourne Mountains, which include Slieve Donard, the highest peak in Northern Ireland, to the south.

With reference to the '*South Down Local Management Area (LMA) Action Plan and Update*' (2013), the study area is located within the South Down LMA which includes the eastern part of the Mourne Mountains, as well as the land area draining to Dundrum Bay and Killough Harbour. The main rivers that drain from the mountains are the Shimna and Burren rivers at Newcastle, with the Kilkeel and

Annalong rivers to the south. The Carrigs, Moneycarragh and Blackstaff rivers all drain into Dundrum Bay Inner which is important as a shellfish water and lies within the Murlough Special Area of Conservation. There are also a number of smaller coastal rivers that flow directly to the sea and a number of tributaries to the main rivers already named, including the Tullybrannigan River.

As shown on **Figure 13.1**, the Shimna River rises in the Mourne Mountains and flows to Newcastle through Tollymore Forest Park. Within the town of Newcastle, the Shimna River meets the Burren River in Islands Park. Further downstream of the confluence with the Burren River, the Shimna River is joined by the Tullybrannigan River in the vicinity of the boating lake in Castle Park, before discharging into the Irish Sea (as shown on **Plate 13.1**).

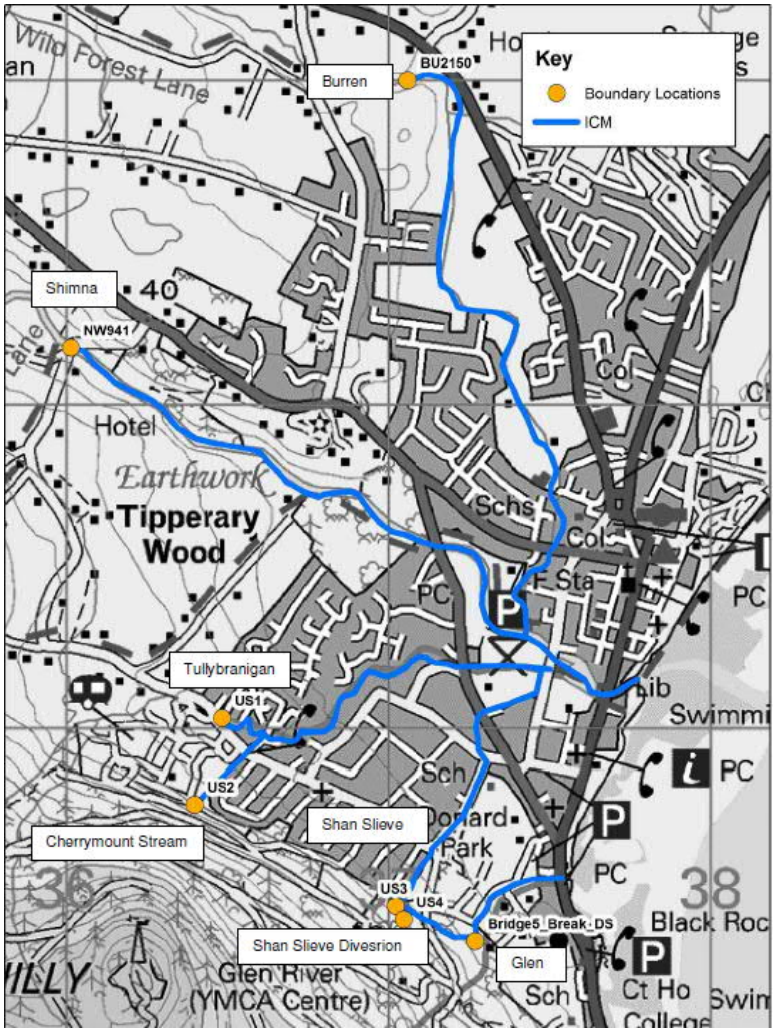


Plate 13.1: Newcastle Urban River Boundary Locations

Source: 'Shimna River, Newcastle Feasibility Study for Flood Risk Investigation' (RPS 2015).

The source of the Shimna River is in the Mourne Mountains, rising on the slopes of Ott Mountain. The river then flows in a northerly direction into Fofanny Dam, before flowing in a north-easterly direction through Tollymore Forest Park where it has its confluence with the Spinkwee River and Trassey River.

From Tollymore, the Shimna River flows in a south-easterly direction towards Newcastle, flowing through Tipperary Wood before entering the settlement limit of the town. As noted above, the final tributaries to join the river prior to it reaching the sea are the Burren River and the Tullybrannigan River, at Islands Park/Castle Park. Near the mouth, as it flows through Castle Park, it widens quite considerably to create a shallow boating pond.

The river's diverse geology, flora and fauna have made the river corridor an Area of Special Scientific Interest (ASSI). As detailed on the DAERA webpage [www.daera-ni.gov.uk/protected-areas/shimna-river-assi], the Shimna River (and Trassey River) is one of the best examples in Northern Ireland of an

upland, oligotrophic (base-poor) river. Apart from the presence of Fofanny Dam, the river is in a highly natural state due to limited human impact. It is of particular note for the naturalness of the river channel, which exhibits all the physical attributes of in-channel features, flow and riverbed types typical of unaltered upland rivers. A short, fast-flowing spate river, the Shimna River is characterised by sequences of riffles, runs and pools where its gradient is shallow and the river beds are composed of cobbles, with scattered boulders and sandy margins but where the gradient is steep and the bed composed of bedrock and boulder the flow is more dramatic with rapids, cascades and water falls.

The aquatic plants reflect the nutrient-poor and highly acidic character of the water and are dominated by mosses and liverworts. In the upper reaches of the Shimna River and its tributary, the Trassey River, compressed flapwort and filamentous green algae dominate the channel, with water earwort, flagellate feather-moss and bulbous rush appearing in the channel further downstream. As the Trassey meets the Shimna, there is a marked increase in diversity but again mosses and liverworts predominate. Here, and as far down river as the outskirts of Newcastle, long-beaked water feather-moss, Alpine water-moss, greater water-moss and claw brook-moss dominate the channel, and rusty feather-moss, fox-tail feather-moss, yellow fringe-moss and the liverwort overleaf pellia dominate the boulder tops and wet margins.

The Shimna River provides excellent habitat for spawning salmonids, with populations of Atlantic salmon, brown trout and sea trout present. Other species inhabiting the system include minnow, stone loach, 3-spined stickleback and eel. On this basis, it is also a very popular river for angling under the control and operation of the Shimna Angling Club.

Marginal semi-natural vegetation along the Shimna River is limited, except at its headwater, and is generally confined to a narrow belt of woodland. This woodland is mainly confined to the riverbank and adjacent slopes. The woodland is generally acidic (calcifugous) in type with a variable structure and composition. Some of the commoner trees and shrubs include downy birch, hazel, goat willow and hawthorn. However, in a few locations, impressive mature sessile oak line the river. The field layer is a mixture of bramble and ferns while the ground cover supports carpets of bluebell, wood anemone and greater wood-rush.

13.4.1.1 Surface Water, Heavily Modified and Artificial Water Body Classification

With reference to the '*Recommendations on Surface Water Classification Schemes for the purposes of the Water Framework Directive Report*' (UKTAG, 2007), Member States are required to classify the 'status' of surface water bodies. This is determined by whichever is the lower of a water body's 'ecological' or 'chemical' status. To achieve the overall aim of 'Good' surface water status, the Directive requires that surface waters be of at least 'Good' ecological and 'Good' chemical status. 'Good' surface water status is one of the principal objectives for surface water bodies not designated as heavily modified or artificial. The other principal objective is to prevent deterioration of surface water status.

The ecological quality of surface waters is an expression of the quality of the structure and functioning of surface water ecosystems, as indicated by the condition of a number of 'quality elements'. The Directive uses the term 'quality elements' to refer to the different indicators of ecological quality comprising its ecological status classification schemes. The quality elements used to assess ecological status are:

- Biological quality elements (invertebrates, plants, fish, phytobenthos and phytoplankton);
- General chemical and physiochemical quality elements (phosphorous in rivers and lakes, nitrogen in transitional and coastal waters, dissolved oxygen and pH); and
- Hydromorphological quality elements (water flow and physical modifications).

For each water body, the ecological quality elements are classified individually, and chemical quality is determined by the levels of certain hazardous and dangerous substances. The ecological and chemical results are then combined to give an overall status in one of five classes:

- High Ecological Status (HES);
- Good Ecological Status (GES);

- Moderate Ecological Status (MES);
- Poor Ecological Status (PES); and
- Bad Ecological Status (BES).

As noted above, the Directive requires that the overall ecological status of a water body be determined by the results for the biological or physiochemical quality element with the worst class (i.e. the quality element worst affected by human activity).

This is called the 'one out - all out' principle. If a water body is classified as 'High' or 'Good' status, then it has a healthy ecology, which deviates only slightly from natural conditions, is an important natural asset, and can support a wide range of uses such as recreation, fishing and drinking supply. If a water body is classified as 'Moderate', 'Poor' or 'Bad', then the ecology is adversely affected and the range of uses that can be supported is reduced.

Some water bodies have been modified to such an extent that they can no longer be restored to their original condition without compromising their current use (heavily modified water bodies). Other water bodies have been created where no water body previously existed (artificial water bodies). There are four classes for the status of heavily modified and artificial water bodies:

- Good Ecological Potential or better (GEP);
- Moderate Ecological Potential (MEP);
- Poor Ecological Potential (PEP); and
- Bad Ecological Potential (BEP).

The classification system for heavily modified and artificial water bodies takes into account the modified nature of these water bodies; thus instead of the aim of achieving 'GES', these surface waters must aim to meet 'GEP'. Their ecological potential is assessed for water quantity, water flow and physical habitat, depending on whether reasonable effort has been made to maximise the quality of the ecology and habitats. The ecological potential classification also reflects the chemical quality of the water.

13.4.1.2 Water Quality

With reference to **Figure 13.1** and the '*South Down Local Management Area (LMA) Action Plan and Update*' (2013), the study area is located within the Shimna River waterbody (UKGBNI1NE050505110) catchment area. This is a heavily modified waterbody where the water quality status is currently MEP. The 2021 and 2027 water quality objectives for this waterbody are MEP and GEP respectively. The overall status of this waterbody, along with its biological elements, physiochemical elements, specific pollutants, hydromorphological elements and Priority elements, is provided in **Plate 13.2** below.

Under the previous RBMP, the Tullybrannigan was considered to be a separate waterbody (UKGBNI1NE050505035) of GES. However, under the latest 2015 RBMP, it was be subsumed within the Shimna River waterbody.

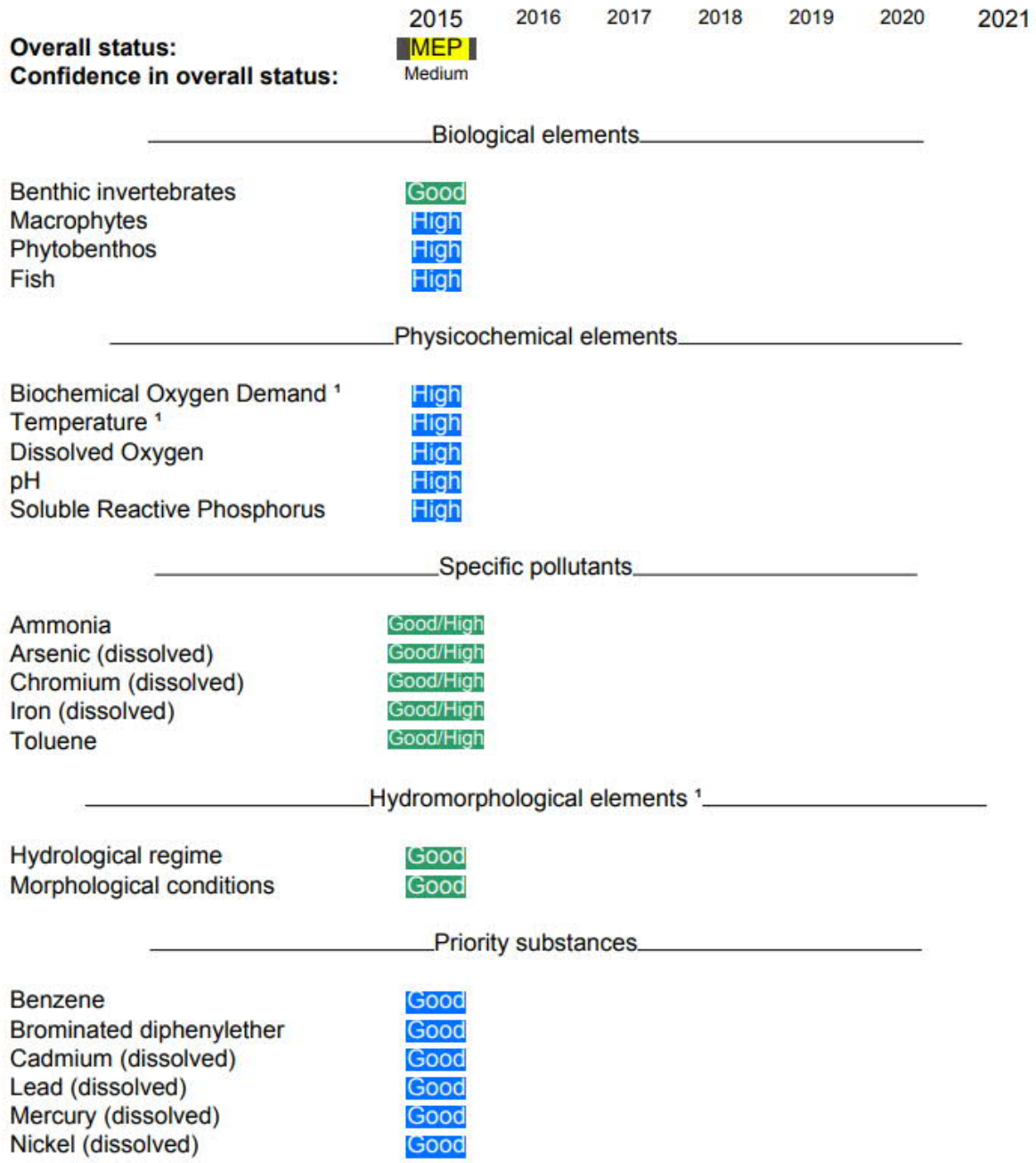


Plate 13.2: Water Quality Status of the Shimna River

Source: 'South Down Local Management Area (LMA) Action Plan and Update' (2013)

In the most recent monitoring period, the Shimna River waterbody has been identified as being of MEP as shown on **Plate 13.2**, even though all assessed elements, pollutants and substances would suggest otherwise. Where all applicable mitigation measures have already been taken or screened out, the water body can be classified as GEP or better. Where one or more applicable mitigation measure(s) remains to be taken, the water body will be classified as MEP or worse, as is the case with the Shimna. This will then be combined with the outcomes from other assessments to give an overall classification. In light of this, this waterbody is therefore considered to be of **high** importance from a water quality perspective.

13.4.1.3 Protected Areas

The WFD requires that a register of protected areas be identified to help ensure that the management of relevant water bodies is geared towards achieving protected area objectives. Protected areas are

identified as those requiring special protection under existing National or European legislation, either to protect their surface water or groundwater, or to conserve habitats or species that directly depend on those waters. The purpose of the protected area register is to bring all EC water-related legislation under one umbrella. With reference to the '*North Eastern RBMP*' (NIEA 2015), the RBD has important habitats and wildlife living in areas identified as needing special protection under existing laws. These protected areas include:

- areas designated for the abstraction of water intended for human consumption under the WFD;
- areas designated for the protection of economically-significant aquatic species. For example, this may include waters designated under the Shellfish Directive (codified version) 2006/113/EC, or the Fish Directive (consolidated) 2006/44/EC. Both of these directives have now been revoked by the WFD;
- bodies of water designated as bathing waters under the Bathing Waters Directive 2006/7/EC;
- nutrient-sensitive areas, including areas designated as Vulnerable Zones under the Nitrates Directive (consolidated) 91/676/EEC, and areas designated as Sensitive Areas under the Urban Waste Water Treatment (UWWT) Directive (consolidated) 91/271/EEC; and
- areas designated for the protection of habitats or species under the Habitats Directive 92/43/EEC or the Birds Directive 2009/147/EC, where the maintenance or improvement of the status of water is an important factor in their protection.

These protected areas are shown on **Plate 13.3** below.

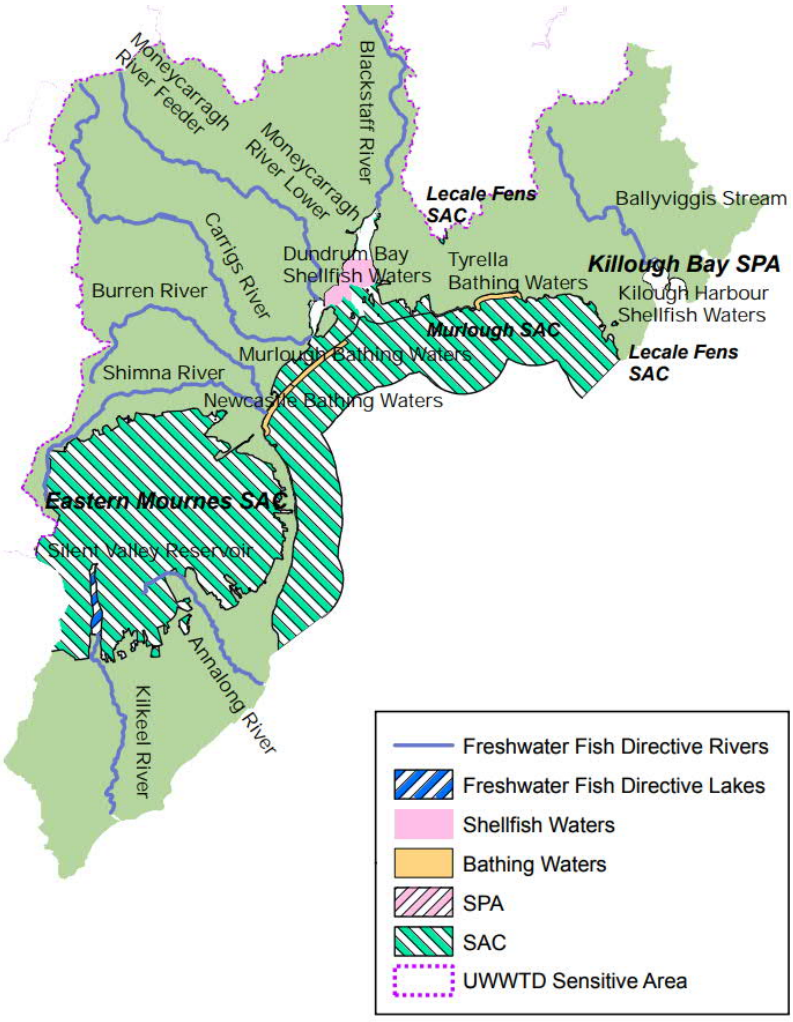


Plate 13.3: Protected areas in South Down LMA
Source: 'South Down Local Management Area (LMA) Action Plan and Update' (2013)

13.4.1.3.1 Areas designated for the abstraction of water intended for human consumption

This is a new category of protected area which replaces the system of drinking water protection previously provided by the Drinking Water Abstraction Directive 75/440/EEC and also incorporates groundwaters. With reference to the '*South Down Local Management Area (LMA) Action Plan and Update*' (2013), there are six surface drinking water protected areas within the LMA, though none are known to be present within the study area. The upstream part of the catchment is however utilised for public supply.

13.4.1.3.2 Areas designated to protect economically significant aquatic species

All waters designated under the Fish Directive (consolidated) 2006/44/EC (now revoked) are included as or within water bodies under the WFD, and placed on the Protected Areas register. Water quality standards and monitoring requirements to ensure the protection of coarse and game fisheries are covered by the standards and procedures of the WFD.

Rivers and lakes are still designated into two categories of water: those suitable for Salmonids (mainly salmon and trout), and those suitable for Cyprinids (coarse fish including carp, tench, bream, roach, chub and minnows). With reference to the '*South Down Local Management Area (LMA) Action Plan and Update*' (2013), there are 106km of rivers and 0.8km^2 of lake identified under the Freshwater Fish Directive, all designated as salmonid. With reference to **Plate 13.2**, this includes the Shimna River and the Burren River.

Existing designations under the Shellfish Waters Directive 2006/113/EC (now revoked) have also become 'areas designated to protect economically significant aquatic species' under the WFD and placed on the Protected Areas register. With reference to the '*South Down Local Management Area (LMA) Action Plan and Update*' (2013), there are 2 designated shellfish waters; Dundrum Bay and Killough Harbour.

13.4.1.3.3 Bathing Waters

Bathing Waters are areas protected for recreational and bathing use and must meet mandatory and guideline standards for microbiological quality in order to protect human health. With reference to the '*South Down Local Management Area (LMA) Action Plan and Update*' (2013), there are three identified bathing waters; Murlough, Tyrella and Newcastle, as shown on **Plate 13.2**.

13.4.1.3.4 Nutrient Sensitive Areas

Nutrient Sensitive Areas comprise nitrate vulnerable zones, polluted waters designated under the Nitrates Directive, and areas designated as sensitive areas under the Urban Waste Water Treatment Directive in relation to nutrient enrichment. With reference to the '*South Down Local Management Area (LMA) Action Plan and Update*' (2013), a total territory approach has been adopted in Northern Ireland under the Nitrates Directive. The Newcastle bathing water is designated under Annex IIA (c) of the Urban Wastewater Treatment Directive as it fails to meet the standards of the Bathing Waters Directive.

13.4.1.3.5 Areas designated for the protection of habitats or species

The objective for Natura 2000 Protected Areas identified in relation to relevant areas designated under the Habitats Directive 92/43/EEC is to:

> *"Protect and, where necessary, improve the status of the water environment to the extent necessary to achieve the conservation objectives that have been established for the protection or improvement of the site's natural habitat types and species of Community Importance in order to ensure the site contributes to the maintenance of, or restoration to, favourable conservation status (i.e. to protect and, where necessary, improve the water or water-dependent environment to the extent necessary to maintain at or restore to favourable conservation status, the water-dependent habitats and species for which the Protected Area is designated)".*

The objective for Natura 2000 Protected Areas identified in relation to relevant areas designated under the Birds Directive 2009/147/EC is to:

> *"Protect and where necessary improve the water environment to the extent necessary to achieve the conservation objectives that have been established for the protection or improvement of the site in order to ensure that the site contributes to the conservation (survival and reproduction in their area of distribution) of bird species listed in Annex I of the Birds Directive".*

Where a Natura 2000 Protected Area forms part of a water body, or where a water body lies within such an area, the WFD status objectives apply in addition to the requirement to maintain at favourable conservation status or restore it to that status.

With reference to the '*South Down Local Management Area (LMA) Action Plan and Update*' (2013), there are three water-dependent Special Areas of Conservation (SAC); Murlough, Eastern Mournes and Lecale Fens, and there is one water-dependent Special Protection Area (SPA); Killough Bay in the LMA.

Within the immediate study area, there are no European designated sites. It is however hydrologically connected to National and European designated sites:

- Murlough ASSI declared under the Environment Order (Northern Ireland) 2002; and
- Murlough SAC designated under the EC Habitats Directive (92/43/EEC) on the conservation of natural habitats and of wild flora and fauna.

The study area is also close to a proposed European designated site:

- East Coast Marine proposed Special Protection Area (pSPA) designated under the EC Birds Directive (2009/147/EC on the conservation of wild birds).

Furthermore, as detailed previously, the Shimna River ASSI is also located within the study area.

13.4.1.4 Groundwater

Groundwater occurs everywhere beneath the ground across Northern Ireland. It plays a significant role in supporting surface water flows and levels through natural discharge from the ground to rivers, lakes, streams and wetlands. This contribution to surface waters can also act to dilute pollutant concentrations in the surface water; therefore, helping support the overall ecological and amenity value of these systems.

With reference to the '*Characterisation of groundwater bodies within Northern Ireland*' (June 2012), there is one groundwater body within the study area. The Downpatrick Groundwater Body covers the entire study area and is currently classified as 'Poor'. The main pressure in the Downpatrick Groundwater Body is diffuse phosphorus, which in turn contributes to phosphorus loading in surface water because of groundwater baseflow contributions. Possible sources include agricultural or septic tanks.

13.4.1.4.1 Groundwater Vulnerability

A new methodology for groundwater vulnerability assessment has also been developed by the GSNI and BGS, in accordance with WFD guidance to help characterise and assess risk to groundwater bodies. In order to carry out risk assessments, knowledge of the vulnerability of groundwater is necessary. Typically, groundwater is of High quality and often requires little treatment prior to use. However, it may be vulnerable to contamination from both diffuse and point source pollutants, from direct discharges into groundwater, and indirect discharges into or onto land. Groundwater decontamination is difficult, prolonged, and expensive, and therefore the prevention of pollution is important.

With reference to '*A groundwater vulnerability screening methodology for Northern Ireland Report*' BGS (2005), groundwater vulnerability is defined as the tendency and likelihood for general contaminants to reach the water table after introduction at the ground surface. All groundwater is to

some degree vulnerable, and the groundwater vulnerability screening methodology is designed to reflect the ability of contaminants to reach the water table surface.

The screening methodology applies to the situation where contamination from the land surface leaches vertically downwards to the water table within the uppermost aquifer at a particular locality. The groundwater vulnerability assessment is, therefore, influenced by several factors that relate to the pathway element of a typical Source – Pathway – Receptor risk assessment. In this case, the pathway is characterised by the hydrogeological and geological characteristics of the top soil layer, the underlying superficial deposits and bedrock.

The pathway between the ground surface and the water table can affect the degree of attenuation of contaminants. It can be influenced by the:

- permeability and clay content of the superficial deposits;
- thickness of the superficial deposits;
- mode of groundwater flow in bedrock aquifers (fracture or inter-granular flow);
- permeability and clay content of inter-granular bedrock aquifers; and
- depth to the water table in both superficial and inter-granular bedrock aquifers.

It is the above factors that determine the vulnerability classification. Vulnerability has been divided into five categories, with Class 1 areas having the lowest risk of groundwater pollution, and Class 5 the highest. Class 4 is further subdivided according to the nature of the pathway:

- 4a – sand and gravel cover;
- 4b – moderate permeability cover;
- 4c – low permeability cover;
- 4d – thin soil over bedrock; and
- 4e – where superficial aquifers are present.

With reference to the GSNI GeoIndex, the study area is classified as being of 4e groundwater vulnerability. Due to the scale (1:250,000) of the digital geological mapping available, the classification of the study area is generalised and whilst this information provides an overall understanding as to how vulnerable the groundwater is to contamination, detailed geological information garnered from the Geotechnical Investigation is utilised to establish the actual site-specific risk to groundwater with scheme implementation.

13.4.1.4.2 Hydrogeology

A new aquifer classification system has been developed by the Geological Survey of Northern Ireland (GSNI) and British Geological Survey (BGS) in accordance with WFD guidance to assess and manage all waters within Member State boundaries in a unified manner. With reference to the '*Water Framework Directive – Aquifer Classification Scheme for Northern Ireland*' GSNI (2005), the WFD describes a groundwater body as a "*distinct volume of water within an aquifer or aquifers*". For the purposes of WFD analysis, the aquifer classification scheme considers the following elements in defining aquifer type/category:

- Strata type (Bedrock or Superficial);
- Relative 'productivity' with respect to exploitation history/well yields (where data is available); and
- Flow Type (intergranular, fractured, karstic or combination).

Raised Beach Deposits of the south-eastern end of the study area (surrounding Newcastle) and small isolated alluvial deposits associated with watercourses throughout the study area, are identified as 'potential superficial aquifers'. It follows that the vast majority of the superficial deposits in the study area are not considered as having potential to store or transmit significant amounts of groundwater.

Bedrock underlying the study area comprising Silurian and Ordovician lithologies, and igneous intrusions, is classified as Bl(f), possessing limited potential productivity fracture flow. The Silurian and

Ordovician lithologies include greywackes, siltstone, mudstones and sandstones. Some groundwater may occur in shallow cracks and joints in the near-surface zone. Rare springs and shallow boreholes provide small quantities of weakly mineralised water.

The intrusive igneous rocks (granites/granodiorites) may have ground water associated with shallow cracks and joints opened-up by weathering. Due to the scale (1:250,000) of the digital geological mapping available, the classification of these areas is generalised, however it provides an overall understanding as to the bedrock aquifer type/category throughout the study area.

13.5 Predicted Impacts

13.5.1 Do-Nothing Scenario

Under the Do-Nothing scenario, it is not envisaged that there would be any perceptible change in the water environment in terms of water quality, hydrology, groundwater vulnerability, hydrogeology and hydromorphology. The measures currently implemented or proposed as part of the '*South Down Local Management Area (LMA) Action Plan and Update*' (2013) would continue with the objective of eventually achieving GEP within the Shimna River waterbody (UKGBNI1NE050505110) catchment area.

In terms of climate change, recent scientific evidence would suggest that intense bouts of flooding are set to become more frequent. Met Office records show that since 1910, there have been 17 record-breaking rainfall months or seasons – with 9 of them since 2000. As intense storms are becoming more frequent, sea levels are also rising because of climate change. On this basis, it is envisaged that the study area would become more prone to flooding over time.

As noted above, the hydrology of the catchment would remain unaffected, particularly as there is unlikely to be any notable land use changes within the study area as a result of the development limitations associated with flood risk in the Q_{100} floodplain area. As noted in Sub-Section 1.1, flood maps were created for:

- Q_{10} (10% Annual Exceedance Probability (AEP);
- Q_{100} (1% AEP);
- Q_{1000} (0.1% AEP); and
- Q_{100} with climate change (2030 scenario).

These flood maps depict the 'Do-Nothing' or 'Do-Minimum' scenario, where it is assumed that regular routine maintenance is carried out on watercourses only. They also formed the basis for the outline design of a flood protection scheme and the economic assessment of flood risk and the benefits of such a scheme. Copies of these maps are included within the '*Shimna River, Newcastle Feasibility Study for Flood Risk Investigation*' (2015), which is included within Appendix 1 – Annex B of this ES.

13.5.2 Operation

Operational impacts are those associated with the long-term usage of the Proposed Scheme and typically include emissions (i.e. sediment release, discharge of pollutants) from the scheme which may result in ongoing water quality issues, changes in hydromorphology or catchment conditions which may affect flows or groundwater levels, and changes which may affect drainage.

13.5.2.1 Drainage – Water Flows and Levels

The Proposed Scheme would only require the realignment of one drainage ditch. Any local drainage discharging to the Shimna River would be fitted with a flap vale to prevent back water flooding. The discharge points or locations would not be altered as part of the scheme, avoiding any hydromorphological impacts associated with modifying or changing outfall locations; therefore, the impact would be largely negligible.

The Proposed Scheme would have the potential to impact upon groundwater by altering flow paths. Sheet pile walls would be used as a structural component of the flood defences, and would also act as a seepage cut-off, blocking the natural seepage during a flood event from the river and up through the ground. It is considered that the effect is likely to be very localised compared to the length of the river and extent of the associated aquifer(s). The movement of groundwater toward the river may be prevented by seepage cut off; if the amount of groundwater is significant, then cutting it off has the potential to cause flooding behind the flood defence. To avoid this, to the rear of the sheet pile wall, a small (150mm) perforated pipe would be installed for groundwater drainage, thus minimising the potential for impact upon groundwater levels. This would then be taken to a single location and discharge to the Shimna River via a flapped outfall pipe. Considering the overall scale of the works, these impacts would be negligible.

13.5.2.2 Water Quality

The Proposed Scheme would facilitate the through flow of water within the Shimna Catchment. However, in itself, this shall not be a source of emissions that would constitute any perceptible change in terms of biological elements, physiochemical elements, specific pollutants or priority elements.

In terms of scheme operation, during extreme flood events, water quality impacts can be related to the changes in hydrology. The containment of flows within the river channel and its functional floodplain would benefit water quality, as polluting substances that may be present in the undefended floodplain would be less likely to be able to enter the watercourse. As the Proposed Scheme would limit the encroachment of flood waters into the urban area, any reduction in flooding as a result of implementing measures, would reduce the risk of pollution incidents given the fact that flooding often results in pollution problems from oil tanks, sewerage overflows, etc.

13.5.2.3 Hydromorphology

The Proposed Scheme would have a perceptible impact in terms of hydromorphological elements on the Tullybrannigan River, though not on the Shimna River, where no instream works are proposed.

The Proposed Scheme would require modification to the north bank of the Tullybrannigan River between Beers Bridge and Islands Park. From a long-term perspective, the change to the bankside is considered negligible, if not minor beneficial, as it is currently formed by way of two-tier stone-filled gabion baskets which have limited benefit in terms of the naturalisation of this watercourse and provide little cover from a fisheries point of view. On this basis, the affected section of the Tullybrannigan River is already heavily modified and thus the modifications associated with the scheme would not constitute a deterioration or derogation from this perspective. As detailed within the Sub-section 15.6.2.1 (Biodiversity – Fisheries and Aquatic Ecology), the Proposed Scheme presents an opportunity to improve the hydromorphology within this stretch of the river and may include riprap to form the bankside to improve cover and a possible two-stage channel in its upper reach to improve bed conditions, even though the effects of the downstream impoundment would limit the benefits of this.

13.5.2.4 Hydrology

By providing flood defences, the Proposed Scheme would alter the hydrology of the Shimna River during an extreme flood event by narrowing of the floodplain for relatively short sections upstream and downstream of New Bridge on the Bryansford Road. The natural floodplain within Islands Park and Castle Park would still remain functional for the conveyance of flood waters, and has been modelled to provide effective storage of flood waters, whilst limiting the risk to people and property.

13.5.2.5 Climate Change

The purpose of the Proposed Scheme is to enable the community to adapt to climate change. The models used for the design of the scheme accounts for climate change predictions. Additionally, the scheme does not negate or prevent any future increase to levels of protection, improved resilience or upgrades to the defences as the foundations are designed to support defences capable of containing a 1-in-100 year flood, should such an upgrade in the future be desired.

13.5.3 Construction

First and foremost, any works in, near or liable to impact a waterway '<u>must</u>' gain the consent of NIEA – Water Management Unit and DAERA – Inland Fisheries prior to commencement of such works. The range of operational phase assessments undertaken in Sub-Section 13.5.2 do not take cognisance of potential for pollution incidents during the construction phase, which could arise from several activities, as described below.

Plate 13.4: Construction of the Burren River Flood Alleviation Scheme

Source: https://dawsonwam.co.uk/projects/burren-river-flood-alleviation-scheme

As indicated on Plate 13.4, by their very nature, the works (i.e. earthworks, construction and trackout) have the potential to pose significant risk to the water environment. The main construction works (i.e. working areas on the river bank and within the channel) would have impacts in terms of generation and mobilisation of sediment and potential release of pollutants to the adjacent watercourses (i.e. Shimna River, Tullybrannigan River), and alterations to the hydrological conditions of these (in particular Tullybrannigan River), and to a much smaller extent, possibly also the enabling works (involving utilities diversions, vegetation clearance and tree felling as necessary). In essence, at every stage in the construction process, there is potential for water pollution issues to arise.

The range of construction activities that may cause adverse water-related impacts are extensive and are documented comprehensively within:

- C648 '*Control of Water Pollution from Linear Construction Projects*' (CIRIA, 2006);
- C532 '*Control of water pollution from construction sites: guidance for consultants and contractors*' (Masters-Williams *et al*., 2001);
- SP156 '*Control of water pollution from construction sites – guide to good practice*' (Murnane *et al*., 2002); and
- '*Engineering in the Water Environment Good Practice Guide – Temporary Construction Methods*' (Scottish Environment Protection Agency (SEPA), 2009).

These documents provide key guidance on the likely impacts from water pollution as a result of construction, and the methods for controlling such impacts. As comprehensively detailed within these documents, the range of construction activities that may cause adverse water-related impacts are extensive and too numerous to discuss in detail within this ES. Nevertheless, the construction activities that pose the highest risk of surface water impacts are listed in Table 13.4.

Table 13.4: Construction activities posing a high risk of surface water impact

Pollution Risk	Hazards
Activities that provide a pollution source.	Uncontrolled sediment erosion and contaminated silty runoff; Refuelling facilities, chemical and waste storage or handling areas; Polluted drainage and discharges from site; Contaminated groundwater from dewatering of contaminated sites.
Activities that cause significant variations in natural flow.	Unregulated and poorly considered abstractions and discharges e.g. dewatering; Changes to the existing drainage network, including interception and redirection of natural and artificial watercourses (e.g. field drains); Discharge of groundwater to surface water; Increased runoff from cleared and capped areas (relative to Greenfield values).
Activities that significantly modify or destroy physical habitats.	Watercourse crossings; Works within water; Outfall points.

Source: CIRIA 648 'Control of Water Pollution from Linear Construction Projects' (2006).

During construction, pollution from mobilised Suspended Solids (SS) would generally be the prime concern, but spillage of fuels, lubricants, hydraulic fluids and cement from construction plant may lead to incidents, especially where there are inadequate pollution mitigation measures. Other risks include:

- water abstraction;
- pollution due to vandalism of stores or plant;
- pollution due to waste materials, dust or residues from handling contaminated land; and
- pollution from pumped discharges, for example, dewatering. These can also cause erosion.

13.5.3.1 Water Quality

13.5.3.1.1 Sedimentation (Suspended Solids)

Pollution of surface waters by mobilised SS can have significant adverse ecological (flora & fauna) impacts. Salmonids are particularly sensitive to reductions in water quality, and habitats can be damaged by siltation from settlement of SS. This is recognised within the '*UK Environmental Standards and Conditions (Phase 2)*' (UKTAG 2008) which specifies a normal maximum SS concentration of 25mg/l for Salmonids; although a precautionary annual mean target of less than 10mg/l is recommended by the Joint Nature Conservation Committee (JNCC) for most river reaches.

Given the juxtaposition of the works to the channels of the Shimna and Tullybrannigan rivers, there are limited buffer zones available to protect these watercourses and direct preferential pathways would exist to these watercourses for delivery of mobilised SS from the works. There are a range of potential impacts associated with mobilised SS, though most notably on fisheries (i.e. deposition of sediments in salmonid spawning areas of rivers and its impact on development of eggs and fry). There can also be a direct effect on fish gills, either through physical damage to the gill tissue or through clogging of the gills with waterborne particulate matter. The settlement of sediments on the substrate can smother invertebrates and fish eggs, while the infiltration of coarse sediments (gravel and cobble) with fines can have longer term implications for the productivity of both groups. The characteristics of the riverbed are critical for fish spawning, and alevin survival is closely related to the level of fines with impacts detectable at a level of 10% fines.

Various construction activities have the potential to release sediment and cause unacceptable SS levels in the catchment area, though none more significant than instream works on the Tullybrannigan River, which due to a sensitive adjacent land use, the flood defence must be constructed from the river side of this watercourse. As shown on **Figure 13.2**, the channel of the Tullybrannigan River would be partially infilled with a temporary earth bund in order to facilitate a piling platform. This would be done by depositing well compacted and stabilised clean granular material into the channel. To

maintain appropriate conveyance of flows, it would also require construction of a temporary channel on the south bank, which would constitute localised widening of the river at this location and a temporary crossing point (there is no intention at this stage to track through the watercourse to access the platform). The temporary earth bund has been considered in terms of reduction in channel capacity (i.e. for flood risk), the potential for increase in flow velocity (for adjacent bed and bank erosion and toe scour), for changes in flow patterns (for adjacent bed and bank erosion and toe scour), fluctuations in water level (for adequate freeboard) and channel substrate (to avoid installation problems).

For the instream works, it is anticipated that imported material would be placed temporarily on top of geotextile/silt curtain in the channel to create a 'working platform' across part of the width of the watercourse for constructing the scheme and for transporting materials/plant. The material used is anticipated to be no less than 150mm diameter with the platform being around 6m wide. The waterside face of the bund shall also be lined with geotextile to prevent washout. The temporary crossing shall be achieved by way of a closed culvert arrangement, likely two pipes placed side-by-side and embedded to a sufficient depth to ensure continued fish passage.

Run-off from site compounds or the general working area may also transport additional SS into the Shimna and Tullybrannigan rivers which would not otherwise find their way there. Such inputs may impact on the water quality of adjacent surface waters or upon any groundwater sources if pathways exist.

Any areas of exposed ground and stockpiles of construction materials could result in the introduction of SS (and associated chemical pollutants, if present) to the watercourse during periods of heavy rain if they are not properly maintained and contained. During flood conditions, working areas may be flooded with river water which can mobilise silt and other materials. Should uncontrolled SS release occur at low flows, then this may result in 'blinding' of the river bed with fine sediment where low flow speeds allow it to settle.

Prescriptive mitigation measures (as discussed in Sub-Section 13.6) must be stringently applied on-site, however any breach or failure in the measures designed to restrict mobilised sediments from reaching any of the surface waters within the study area has the potential for Moderate/Major Adverse transient impacts, particularly considering the value and sensitivity of the downstream receiving water environment.

13.5.3.2 Accidental Spillage of Oil

Any construction activities carried out close to watercourses involve a risk of pollution due to accidental spillage. While liquids such as oils, lubricants, paints, bituminous coatings, preservatives and weed killers present the greatest risk, other materials such as cement can also have serious environmental effects.

The use of potentially polluting substances (through vehicle movements, material storage and movements and concrete pouring) is considered to have the potential to lead to pollution within the Shimna and Tullybrannigan rivers. The 'dry side' working and the driving of sheet pile walls are anticipated less likely to cause pollution events but are nonetheless conservatively considered here to have a similar impact on water quality status should they occur. In all instances, it is assumed that uncontrolled pollution events are likely to change the Water Quality status of receptor water bodies from 'High' or 'Good' to below 'Poor' (or 'Bad'). It is also anticipated that uncontrolled pollution has the potential to travel long distances through the impacted water bodies. (This is precautionary as water bodies are likely to recover from pollution incidents in the short-medium term, whereas water body status is determined based on medium-long term water quality.)

The refuelling of general construction plant also poses a significant risk of pollution, depending on how and where it is carried out. Pollution as a result of accidental spillage could potentially affect fish, aquatic flora and could also have a dramatic effect on invertebrate communities. Any significant pollution in waters used for spawning or as nursery areas within the Shimna River or Tullybrannigan River, may have long-term consequences if an entire year class is lost. To allow such substances to enter a surface water, would be in breach of The Water (Northern Ireland) Order 1999. Therefore

measures to control the storage, handling and disposal of such substances would need to be put in place prior to and during construction (as discussed in Sub-Section 13.6).

Although prescriptive mitigation measures must be stringently applied on-site, any breach or failure in the measures designed to contain/restrict contaminants from reaching any of the surface waters within the study area has the potential for Moderate/Major Adverse transient impacts, particularly considering the value and sensitivity of the downstream water environment.

13.5.3.3 Fish Passage

Poorly managed in-stream or bank works within the Tullybrannigan or Shimna rivers could result in obstruction of the stream channel during periods of upstream fish migration prior to spawning. Obstructions to fish passage can be due to physical or hydraulic causes, while artificial light during hours of darkness may also inhibit movement. The works associated with the placement of the temporary crossing culverts in the Tullybrannigan River would unlikely cause any disruption of fish movements, as fisheries significance within this section of the watercourse was assessed as Negligible and largely devoid of fish in the area of the proposed works. This aspect is addressed in more detail within Sub-section 15.6.1.2 (Biodiversity – Fisheries and Aquatic Ecology)

In general terms, the impacts on fish passage are assessed to be of negligible magnitude, during the construction phase.

13.5.3.4 Litter and Debris

Litter and debris pollution can have a varying effect on watercourses, depending on the type of debris involved. Litter and debris will, at best, affect only the appearance of the watercourse but more serious cases of pollution can arise if the litter or debris contains contaminants such as open oil containers.

Although prescriptive mitigation measures would be stringently applied on-site, any breach or failure in the measures designed to control litter and debris from reaching any of the surface waters within the study area has the potential for Minor/Moderate Adverse transient impacts.

13.5.3.5 Groundwater Impacts

Topsoil stripping and site clearance could also result in minor groundwater impacts, as the removal of the vegetative layer would increase recharge; however, impacts would be limited to the immediate construction site. Groundwater levels can be affected by de-watering due to the creation of excavations and pumping operations to keep such excavations (and wet side working areas) sufficiently dry to allow construction to proceed. However, the nature of the likely required excavations, i.e. that they are mostly ≤1m deep and of limited width, means that de-watering operations are not anticipated. Where excavations are deeper (1m-3m deep), these are in areas elevated well above the river level and unlikely to encounter groundwater. Effects, if any, are anticipated to be localised in the vicinity of the works and to only last for the duration of the works.

There would be a risk of groundwater contamination due to accidental spillage, at any location throughout the construction site. Again, while liquids such as oils, lubricants, paints, bituminous coatings, preservatives and weed killers present the greatest risk, other materials such as cement can also have serious environmental effects. Use of mechanised plant also involves potential for spillage or leakage of contaminants such as diesel fuel, oils or hydraulic fluids. Unmitigated, such spillages could seep through the unsaturated zone and contaminate the groundwater. Refuelling of plant on-site would also present a risk to groundwater.

Although prescriptive mitigation measures would be stringently applied on-site, any breach or failure in the measures designed to limit contamination of groundwater within the study area has the potential for Negligible/Minor Adverse transient impacts.

13.6 Mitigation & Enhancement Measures

13.6.1 Operation

There is no mitigation measures proposed to reduce the significance of water quality impacts in terms of ongoing water quality issues or catchment conditions which may affect flows or groundwater levels. This is because the assessment has indicated that the significance of the impacts before mitigation is deemed to be negligible.

Any local drainage discharging to the Shimna River would be fitted with a flap vale to prevent back water flooding. The discharge points or locations would not be altered as part of the scheme. Furthermore, to the rear of the sheet pile wall, a small (150mm) perforated pipe would be installed for groundwater drainage, thus minimising the potential for impact upon groundwater levels.

Hydromorphological changes to Tullybrannigan River from a fisheries perspective is addressed within Sub-section 15.6 (Biodiversity – Fisheries and Aquatic Ecology).

13.6.2 Construction

The contract documents for construction would include prescriptive clauses to ensure that the obligation is placed upon the appointed Contractor to meet the environmental commitments and as a minimum, the proposed mitigation measures set out below. As noted earlier, any works in, near or liable to impact a waterway (including measures to mitigate adverse impacts) **'must'** gain the consent of NIEA – WMU and DEARA – Inland Fisheries.

Measures to protect the water environment would be formulated in accordance with best practice guidance, such as Pollution Prevention Guidelines (PPGs) and their replacement series (Guidance for Pollution Prevention (GPPs)) and CIRIA guidance documentation C648 '*Control of Water Pollution from Linear Construction Projects*' (2006), C532 '*Control of water pollution from construction sites: guidance for consultants and contractors*' (Masters-Williams *et al.,* 2001), SP156 '*Control of water pollution from construction sites – guide to good practice*' (Murnane *et al.,* 2002) and SEPA's '*Engineering in the Water Environment Good Practice Guide – Temporary Construction Methods*' (2009). This documentation comprehensively details issues that present the risk of adverse impacts occurring within the water environment and how to mitigate such impacts. These are too numerous to discuss in detail within this ES, however in general, the following mitigation proposals are considered standard measures that should be applied during construction of such a project.

Consideration should also be given to the Ulster Angling Federation's '*Construction Works - Actions to Prevent Pollution*' guidelines, which requires that an additional clear and demonstrable effort is needed by the Contractor to prevent pollution and as a minimum identifies a range of procedures which should be followed.

As discussed in Sub-Section 13.5.3, construction activities that pose a high risk of surface water impact were identified, and stringent mitigation measures must be applied to ensure adverse impacts upon the water environment are minimised.

13.6.2.1 Sedimentation (Suspended Solids)

In terms of specific mitigation measures, the Construction Environmental Management Plan (CEMP) must include an Erosion Prevention and Sediment Control Plan and this must be submitted to NIEA - WMU prior to commencement of any works. The first aim of this plan should be to minimise erosion by reducing disturbance and stabilising exposed materials. The plan should then consider control measures to minimise the release of mobilised sediment which results, despite the erosion control measures. Measures to prevent erosion are more effective than controlling sediment once mobilised. Further advice on preparing an Erosion and Sediment Control Plan is provided in CIRIA 648 (Ref 36) '*Control of Water Pollution from Linear Construction Projects*' (2006), including information detailing appropriate mitigation measures.

13.6.2.2 Managing Runoff and Silty Water

The first step towards preventing silt pollution from construction works is to minimise the generation of silt-laden runoff. This can be achieved by carefully planning the site works so that activities likely to generate silt-laden runoff are carried out during drier months (if possible), and erosion of surface soils is controlled. Seasonal weather patterns should be taken into consideration when programming and planning construction activities.

However, as local weather is inherently unpredictable, the control of erosion from surface soils would be paramount to the protection of the water environment. This should encompass the requirement that any attenuation measures are designed to cope with one-off adverse precipitation events and cannot be overwhelmed resulting in polluted runoff reaching the main watercourse to the detriment of the aquatic environment.

Stockpiles should be kept to a minimum, however to control erosion, areas of exposed ground and stockpiles should be minimised to reduce silty runoff and located well away from drains and watercourses (by a minimum distance of 10m where the land is flat, and further if there is a slope to a watercourse), stabilised as soon as possible (e.g. seeded or geotextile mats), and bunded by earth or silt fences (if required) at the toe of the stockpile to intercept silt-laden runoff during rainfall events. Stockpiles shall not be located where there is a steep slope towards a watercourse.

Existing vegetation should be retained where possible, as mature vegetation stabilises the soil and prevents erosion. Areas where vegetation clearance is required should be kept to a minimum, and the works divided into phases, with seeding and planting of the phases that are complete. This will minimise the areas of exposed soil and thus the risk of erosion. A minimum of a 10m vegetative buffer shall be maintained adjacent to watercourses (e.g. rivers, ponds) except where works are specifically required to the watercourse.

Vehicle crossings of watercourses shall be minimised and shall use designated crossing points and existing road infrastructure only. Mud shall be controlled at entry and exits to the site using wheel washes and/or road sweepers, and tools and plant must be washed out and cleaned in designated areas.

13.6.2.3 Accidental Spillage

Measures would be taken and procedures put in place to minimise the risk and potential effects of spillage incidents, such as the following:

- Storage of oils and diesel, along with the general maintenance and refuelling of plant, would be restricted to impermeable bunded areas with a minimum 110% storage capacity and away from surface waters or areas where any spillages could easily reach a surface water. All fuel, chemicals and oils would be stored within bunded areas in accordance with GPP 2: Above ground oil storage tanks, and PPG26 – Storage and handling of drums and intermediate bulk containers, and be compliant with The Control of Pollution (Oil Storage) Regulations (Northern Ireland) 2010;
- Leaking or empty oil drums shall be removed from site immediately and disposed of via an appropriately licensed waste disposal contractor;
- All hazardous substances on-site shall be controlled in accordance with The Control of Substances Hazardous to Health Regulations (Northern Ireland) 2003 (as amended) (COSHH Regulations). The storage compound shall be fenced-off and locked when not in use to prevent theft and vandalism;
- Refuelling of plant and machinery shall take place at least 10m away from watercourses using a mobile fuel bowser and restricted to designated areas on hard standing. Only double-bunded fuel bowsers shall be used. Vehicles must not be left unattended during refuelling operations. Fixed plant shall be self-bunded. Mobile plant must be in good working order, kept clean and fitted with drip trays where appropriate. All water runoff from designated refuelling areas shall be channelled to an oil separator or an alternative treatment system prior to discharge;

- Spill kits and oil absorbent material must be carried by mobile plant and located at vulnerable locations (e.g. crossings of land drains and ditches) to reduce risk of spillages entering the sub-surface or groundwater environment. Booms shall be held on-site for works near watercourses;
- Care must be taken whilst using shuttering oils when preparing formwork. This requires operatives to be trained in the proper handling of materials, the sensitive nature of the wider drainage system, and the consequences of accidental spillage;
- An Emergency Response Plan shall be prepared by the appointed Contractor and included as part of the CEMP, and construction workers trained to respond to spillages as well as being made aware of the NIEA Water Pollution Hotline to report pollution incidents;
- Concrete mixing must be undertaken in designated impermeable areas, at least 10m away from a watercourse or surface water drain to reduce the risk of runoff entering a watercourse, or the sub-surface, or groundwater environment; and
- Equipment, batching and ready mix lorry washing and cleaning should be washed-out on site into a designated area that has been designed to contain wet concrete / wash waters (see PPG6 – Working at construction and demolition sites).

Prescriptive requirements in the contract documentation would require the contractor to properly assess risk and devise mitigation measures for those activities not already covered by statutory requirements. Where possible, risks would be designed-out. Throughout the construction period however, the Contractor would be required to comply with PPG/GPP requirements and refer to CIRIA 648 '*Control of Water Pollution from Linear Construction Projects*' (2016), which provides advice on potential impacts arising during the construction phase and the assessment and mitigation of these risks.

13.6.2.4 Fish Passage

As noted earlier, works likely to generate silt-laden runoff (e.g. earthworks and excavations) shall be undertaken preferably during the drier months of the year. However, with the exception of winter migration and spawning of Salmonids, watercourses are more vulnerable to the effects of elevated suspended sediment levels during the summer when the potential for dilution is reduced. Avoiding works during the Salmonid spawning season and egg incubation phases (1 October – 30 April) at waters of fisheries significance would avoid the risk of damage to spawning areas and losses of fish eggs or newly hatched fry. It would also reduce the potential for ingress of silt to these channels during the wettest period of the year.

In consultation with DAERA – Inland Fisheries, appropriate site management during in-stream and bank works outside of this period would ensure that the channel remains passable for migratory Salmonids at all times. Night-time working involving direct illumination of the Tullybrannigan River or Shimna River would be prohibited. This would be included as a condition in the Construction Method Statement (which would be subject to approval by DEARA).

13.6.2.5 Litter & Debris

The Contractor shall be required to maintain a tidy site as far as practicable and would be required to dispose of materials in a controlled and responsible manner. These measures should assist in reducing the potential for adverse impacts on surface waters arising from construction activities.

Areas of hard standing and surface roads shall be swept regularly to prevent the build-up of material which could be washed into watercourses.

13.6.2.6 Consents

Works in, over or under a watercourse or works altering or repairing any structure in, over or under a watercourse, and works within the drainage margin of the watercourse would require consent / approval from NIEA - WMU, and if salmon and inland fisheries would be affected, consent/approval from DAERA - Inland Fisheries.

13.7 Residual Effects

As noted earlier, it is not sufficient to assess the size and probability of potential impacts; their significance should also be assessed. The level of significance is to be assigned after consideration of any proposed mitigation (i.e. significance is assigned with mitigation in place allowing for the positive contribution of all mitigation that is proposed). It is therefore the residual effects associated with the Proposed Scheme that are most reflective of what the overall predicted impact would be upon the water environment during the operational and construction phases.

13.7.1 Operation

As noted previously, the water environment associated with the Shimna catchment can be considered of very high importance, particularly as it is designated both as a salmonid waterbody and an ASSI, and thus would be acutely sensitive to change. With mitigation measures described above, the residual effect of the Proposed Scheme would be Minor Adverse, as the changes to the drainage regime in the long-term would be minimal.

Whilst the Proposed Scheme would have the potential to impact upon groundwater by altering flow paths, with mitigation measures described above, the effect of changes to groundwater flow movements would be very localised and negligible.

The Proposed Scheme shall facilitate the through flow of water within the Shimna catchment, however in itself, shall not be a source of emissions that would constitute any perceptible change in terms of biological elements, physiochemical elements, specific pollutants or priority elements associated with WFD objectives. On this basis, the significance of effect would be Negligible.

From a hydrological perspective, the significance of effect is likely to be Minor Beneficial, as whilst there would be a localised narrowing of the floodplain, the Proposed Scheme would limit the encroachment of flood waters into the urban area. The reduction in flooding as a result of implementing measures would reduce the risk of pollution incidents given the fact that flooding often results in pollution problems from oil tanks, sewerage overflows, etc.

From a hydromorphology perspective, whilst the scheme would result in the modification of the Tullybrannigan River, it is on a stretch that has already been modified. With mitigation measures described above, the change to the bankside is considered Negligible, if not Minor Beneficial as it is currently formed by way of two-tier stone-filled gabion baskets which have limited benefit in terms of the naturalisation of this watercourse and provide little cover from a fisheries point of view. On this basis, the affected section of the Tullybrannigan River is already heavily modified and thus the modifications associated with the scheme would not constitute a deterioration or derogation from this perspective. As detailed within Sub-section 15.6. (Biodiversity – Fisheries and Aquatic Ecology), the Proposed Scheme presents an opportunity to improve the hydromorphology within this stretch of the river and may include riprap to form the bankside to improve cover and a possible two-stage channel in its upper reach to improve bed conditions, even though the effects of the downstream impoundment would limit the benefits of this.

13.7.2 Construction

Without prescriptive and stringent mitigation measures being effectively implemented on-site, the adverse risk to the Shimna River and Tullybrannigan River during the construction phase could potentially be Very Large Adverse. Even with minor impacts, the significance of effect that the associated works would have on the water environment could potentially be ‘Moderate Adverse’ considering the high value and sensitivity of the environment that would be affected.

With effective mitigation, the majority of potential effects are assessed as being Minor/Negligible, however as noted previously, measures would be prescriptive and stringent, and clearly written into the construction contract Specifications and Employer’s Requirements. Nevertheless, the significance of effect would entirely depend upon committed applications on-site through continuous monitoring, reporting and communication before, during and after the construction phase.

13.8 Summary & Conclusions

As the impacts of a specific component or activities associated with the Proposed Scheme would have minimal impact upon the water environment (i.e. from a water quality, hydromorphology, fisheries and spillage risk perspective), it is unlikely that the Proposed Scheme would cause deterioration in the Shimna water body, or prevent it from meeting its WFD objectives.

14. Geology & Soils

14.1 Introduction

Geology and soils play an important part in determining the environmental character of an area in terms of its effects on landform, land use and vegetation. Northern Ireland has approximately 97 soil parent materials, making it the most geologically diverse area of its size in the British Isles. The nature of geology as a parent material influences the character of the soil of a region. Soil chemistry and physical structure influences the type of vegetation native to that area. Soil type is a major determining influence on the agricultural worth of an area of land. Any construction can have an impact on both the geology and soils of an area, and it is therefore important that the potential impacts of development on these environmental factors are considered fully.

Geological or geomorphological features, which are considered to be of significant national importance, are designated as Areas of Special Scientific Interest (ASSIs), meaning that they have a certain degree of statutory protection against operations which might cause damage or loss of that important feature, and consideration should be given to the impact of the proposals on these. In Northern Ireland, other sites of geological importance are classified by the Northern Ireland Environment Agency (NIEA) - Natural Heritage as Earth Science Conservation Review (ESCR) sites.

The objective at this stage is to undertake sufficient assessment to identify possible geological/soil constraints associated with the Proposed Scheme, and the significance of effects upon it. The assessment considers the impact of the Proposed Scheme on the existing ground, which includes an assessment of the impact on soils and any contaminated land, and also the impact on any sites of geological importance.

14.2 Methodology

14.2.1 Ground Investigation

The study area was subject to a ground investigation undertaken in March 2018, to provide geotechnical and environmental information for the Proposed Scheme. The scope of the investigation included boreholes, trial pits, slit trenches, soil sampling, in-situ and laboratory testing and the preparation of a factual report, contained within Appendix 14 of this Environmental Statement.

Site operations, which were conducted between 6th and 30th March 2018, comprised:

- seven cable percussion boreholes;
- seven cable percussion boreholes with rotary follow-on drilling;
- three boreholes by dynamic (windowless) sampling methods with rotary drilling at one location and dynamic probe follow-on at two locations;
- a standpipe installation in five boreholes; and
- eight machine-dug slit trenches.

The exploratory holes and in-situ tests were located as shown on the exploratory hole location plan within the factual GI Report as included in Appendix 14.

A previous GI investigation has been carried out in 2014 by Geotechnical and Environmental Services (GES) on behalf of DfI Rivers. Information from this report is also included in this section where appropriate.

14.2.2 Assessing the Significance of Effects

It is not only sufficient to assess the size and probability of possible impacts; their significance should also be assessed. The significance of the effect is formulated as a function of the receptor or

resource's environmental value (or sensitivity) and the magnitude of project impact (change). In other words, significance criteria are used to report the effect of the impact.

Firstly, to assess the overall significance of potential effects of the Proposed Scheme on geology and soils, an assessment has been made of the sensitivity of the resource, using the general criteria contained in Table 10.1.

Table 10.1: Estimating the importance of geology and soils

Importance	Criteria	Example
High	High Attribute with high quality and rarity, national scale	Area of educational or scientific geological interest (i.e. ASSI); Earth Science Conservation Review (ESCR) site; Free-draining agricultural soils (i.e. Rankers, Brown Earths).
Medium	Attribute with medium quality and rarity, regional scale	Non-designated areas of educational or scientific geological interest (i.e. outcrop exposure); Areas licensed for mineral extraction; Free-draining agricultural soils (i.e. Shallow Brown Earths, Podzols).
Low	Attribute with low quality and rarity, local scale	Sites not in the above categories but with some geological interest; Impeded/Poor-draining agricultural soils – Surface Water Gleys, Alluvium.
Negligible	Areas of little or no interest	Other areas of superficial geology or geomorphological feature; No soil profile - Peat, Urban, Disturbed.

The presence and sensitivity of receptors at risk from potential land contamination can be assessed by consideration of the following:

- surrounding land uses, based on mapping, site visits and the occupants of adjacent sites;
- proposed end-use, based on the nature of the Proposed Scheme;
- type of construction operations that would be necessary as part of the Proposed Scheme;
- surrounding sites of nature conservation importance; and
- geology, hydrogeology and hydrology of the site and its surrounding area.

The sensitivity of potential receptors can be described qualitatively, according to the categories shown in Table 10.2.

Table 10.2: Descriptive scale for sensitivity of receptors to potentially contaminated land uses

Qualitative description (Receptor sensitivity)	End Users (operational workers / visitors)	Surrounding Land Uses	Construction Workers	Ecological Sites	Built Environment
High	Residential, allotments, play areas	Residential area	Extensive earthworks, and demolition of buildings	Nationally or internationally designated ecological sites	Buildings, including services and foundations of high historic value or other sensitivity
Medium	Landscaping or open space	Open space or commercial area	Limited earthworks	Locally designated ecological sites	Buildings, including services and foundations

Low	“Hard” end use (e.g. roads, industrial, car parking)	Industrial area	Minimal disturbance	No sites of significant ecological value close by	Not applicable

The magnitude of impact is defined wherever possible using the terms defined in Table 10.3.

Table 10.3: Estimating the magnitude of impact on an attribute

Magnitude	Criteria
Major	Direct loss of a feature of interest; High risk of exposure of a sensitive receptor to potentially harmful levels of contamination via a confirmed pathway.
Moderate	Partial loss of a feature of interest; Proven Source – Pathway – Receptor pollutant linkage identified with elevated level of contamination recorded.
Minor	Minor effect on a feature of interest; Superficial disturbance to geology, changes in geomorphology; Identified Source – Pathway – Receptor pollutant linkage but contamination likely to be low risk.
Negligible	Insufficient impact to affect feature of interest; Changes to made ground deposits; No Source – Pathway – Receptor pollutant linkage identified.

Table 10.4 outlines a suggested means of estimating the significance of potential effects, based upon the magnitude of impact and sensitivity of the receptor. Professional judgement and awareness of the relative balance of importance between sensitivity and magnitude allows the overall significance of impact to be assessed. The significance of effect is assessed with mitigation to define residual effects.

Table 10.4: Estimating the Significance of Potential Effects

Importance of Attribute					
	High	Neutral	Moderate/Large	Large/Very Large	Very Large
	Medium	Neutral	Slight/Moderate	Moderate/Large	Large/Very Large
	Low	Neutral	Slight	Moderate	Large
		Negligible	**Minor**	**Moderate**	**Major**
			Magnitude of Impact		

14.2.3 Limitations and Assumptions

All information reported is based upon the ground conditions encountered during the site investigation works, and on the results of the laboratory and field tests performed. However, there may be conditions at the site that have not been taken into account, such as unpredictable soil strata, contaminant concentrations, and water conditions between or below exploratory holes. It should be noted that groundwater levels usually vary due to seasonal and/or other effects and may at times differ to those recorded during the investigation. No responsibility can be taken for conditions not encountered through the scope of work commissioned, for example between exploratory hole points, or beneath the termination depths achieved.

It is assumed that effective measures would be put in place prior to construction to control/mitigate potential pollution incidents, from sources such as accidental leaks or fuel spills from construction plant and machinery. It is also necessary to ensure that any materials being imported onto the site do not contain contaminated materials.

14.3 Regulatory & Policy Framework

The following key planning policy and legislation is pertinent to the assessment of the Proposed Scheme in relation to impacts upon geology and soils.

14.3.1 The Environment (Northern Ireland) Order 2002

This legislation requires NIEA to identify and designate ASSIs, which are nationally important sites designated for their important flora, fauna and/or geological features. The Order replaces the original ASSI provisions contained in the Nature Conservation and Amenity Lands (Northern Ireland) Order 1985 (as amended).

14.3.2 The Waste and Contaminated Land (Northern Ireland) Order 1997 (Part III)

The Waste and Contaminated Land Order was made in November 1997, came into force in March 1998 and implements the EC Framework on Waste in Northern Ireland. The Order makes a number of provisions, such as:

- transfer of responsibility for waste regulation from the district councils to the DOE, focused within the NIEA;
- introduction of measures designed to increase control over the processing and handling of waste including Waste Management Licensing, Duty of Care, Registration of Carriers, Special Waste and Producer Responsibility; and
- introduction of measures relating to the identification of contaminated land, designation of special sites, duties of enforcing authorities to require remediation, determination of appropriate persons to bear responsibility for remediation, liability of contaminating substances which escape to other land, and contaminated land registers.

Some parts of the Order with respect to waste management have yet to be implemented; for example, waste licensing is operating under the provisions of the Pollution Control and Local Government (Northern Ireland) Order 1978 until regulations for the transfer of responsibility to DAERA can be introduced.

14.3.3 The Waste Management Regulations (Northern Ireland) 2006 and The Water Order (Northern Ireland) 1999

The management of all materials onto and off the scheme construction site should be suitably authorised through the Waste Management Regulations (Northern Ireland) 2006 and/or the Water Order (Northern Ireland) 1999. This should be demonstrated through a Site Waste Management Plan (SWMP) (see http://www.netregs.gov.uk).

14.3.4 The Plant Health Order (Northern Ireland) 2006 (as amended)

Under Articles 10 to 12 of this Order, certain relevant material shall not be removed from an area of plant health control (defined in Article 10(2)) until the Department is satisfied as to the matters specified in Article 12, unless an inspector has discharged that relevant material, or the removal of that relevant material is permitted under Part 6 (measures to control the landing of relevant material and prevent the spread of plant pests).

14.3.5 Planning Policy Statement 2 (PPS 2) Natural Heritage

This Planning Policy Statement, PPS 2, sets out DAERA's planning policies for the conservation, protection and enhancement of our natural heritage. From a geology and soils perspective, key policy objectives are:

- 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 assist in meeting international (including European), national and local responsibilities and obligations in the protection and enhancement of the natural heritage; and
- to protect and enhance biodiversity, geodiversity and the environment.

In essence, any planning decision should ensure that appropriate weight is attached to designated sites of international, national and local importance; priority and protected species; and to biodiversity and geological interests within the wider environment.

14.3.6 Guidance on the Regulation of Greenfield Soil in Construction and Development 2010

This is a guidance document produced by the NIEA and the Construction Employers Federation (CEF), in order to promote the sustainable re-use of greenfield soil. The NIEA take the view that if excess uncontaminated greenfield soils are generated during development works, as long as this material is put to an agreed, suitable end use, the soil will not be subjected to waste regulatory controls (i.e. a waste management licence or a registered exemption will not be required).

Producers and users are not obliged to comply with the guidance, but if they do not, the greenfield soil would be classified as a waste and would be subject to the requirements of waste legislation. Consequently, the storage, treatment, transportation, deposit or disposal of such material without the requisite licences or permits may constitute an offence.

14.3.7 NIEA Regulatory Position Statement – Low Risk Construction Activities (May 2016)

The NIEA Regulatory Position Statement – Low Risk Construction Activities provides details of the various construction activities which will now, not be subject to formal waste management authorisation. Maximum quantities are included within the statement and involve activities such as:

- re-use of topsoil, subsoil, clay; and
- storage of excavated clean river gravel for maintenance of existing tracks and footpaths.

14.4 Baseline Conditions

14.4.1 Superficial (Drift) and Solid Geology

Information on the drift and bedrock geology of the study area was obtained through reference to the Geological Survey of Northern Ireland, 1:250,000 scale Geological Map of Northern Ireland, Quaternary Edition (1991) and Solid Edition (1997), and the GSNI GeoIndex map viewer, as is shown on **Figures 14.1 & 14.2**. The above publications indicate that the natural soil strata in the study area comprise alluvial and raised beach deposits over bedrock comprising greywacke, siltstone, mudstone and shale of the Hawick Group from the Silurian Period. To the south east of the study area is a Felsite dyke of Palaeogene Period orientated NW to SE. To the west of the study area is a similar dyke, orientated NE to SW.

With reference to the Ground Investigation Report, produced by Causeway Geotech (2018), a summary of the ground types encountered in the exploratory holes is listed below, in approximate stratigraphic order:

- Paved surface: boreholes BH114 & BH115 and ST101 to ST103 encountered macadam surfacing, in depths ranging from 0.10m to 0.20m.
- Topsoil: encountered typically in 300mm thickness across much of the site.
- Made Ground (sub-base): Aggregate fill beneath the paved surface in all area ranging in thickness from 0.30m to 1.45m.
- Made Ground (fill): encountered throughout the investigation in several areas, ranging from silty sandy gravel with fragments of pipe and glass in BH101, to a silty fine to coarse sand in ST06. A re-worked clay fill was also encountered in ST08.
- Alluvial/Beach deposits: typically medium dense to dense sands and gravels together with soft to firm silt and clay.
- Bedrock (Greywacke, Mudstone & Siltstone): Rockhead was encountered at depths ranging from 3.60m in BH108 to approximately 8.30m in borehole BH116.

14.4.2 Made Ground

Past site uses and present day activities have resulted in anthropogenic modification to land within the study area. Although not identified on published geological maps, the ground investigations undertaken in both 2014 (Geotechnical and Environmental Services), and 2018 (Causeway Geotech), identified Made Ground of variable composition in exploratory locations.

In 2018, the GI uncovered Made Ground (sub-base) consisting of an aggregate fill beneath the paved surface in all area ranging in thickness from 0.30m to 1.45m.

Topsoil was also found overlying superficial deposits, typically 300mm in thickness across most of the site.

The exploratory holes investigated in 2014, uncovered Made Ground of Soft grey brown slightly sandy slightly gravelly silt with roots and rootlets. This also contained occasional crockery and red brick remnants, grey brown silty sandy fine to coarse gravel, and gravelly fine to coarse sand.

14.4.3 Hydrogeology

Based on the GSNI Geoindex, the wider Newcastle area is underlain by a bedrock aquifer of class Bl(f), indicating an aquifer of limited potential productivity, fracture flow with moderate yields being unusual. In this type of aquifer low yields are more common, and regional flow is limited. Flows are mainly shallow and local in nature. The Geoindex identifies the Newcastle area as a 'potential superficial aquifer'.

With reference to the Causeway Geotech Report (2018), groundwater was encountered throughout their investigation during percussion boring through soil as water strikes. Water strikes were encountered at depths ranging from 2.30m to 9.80m. Several boreholes encountered multiple water strikes. Details of the individual groundwater strikes, along with any relative changes in levels as works proceeded, are presented on the exploratory hole logs for each location.

However, it should be noted that the casing used in supporting the borehole walls during drilling may have sealed out any groundwater strikes encountered and the possibility of encountering groundwater during excavation works should not be ruled out. It should also be noted that any groundwater strikes within bedrock may have been masked by the fluid used as the drilling flush medium.

14.4.4 Soils

As shown in **Figure 14.3**, based on the UKSO Soils map viewer, the study area is mainly masked by 'Urban' soils. As urban soil has been manipulated, disturbed and/or transported by anthropogenic activities, it has no soil profile, and is of low value. To the south-west, is an area of Cambisols, with podzols present in the mountain area.

14.4.4.1 Contaminated Land

With reference to **Figure 14.3**, land which may have been impacted by former or current potentially contaminative land uses are evident in the wider study area. These areas have been identified from the NIEA – Waste Management/Land & Resource Management Unit's database of sites where, based on their historic land use, there is potential for contamination to be present.

Where waste and industrial residues are present, there may also be toxic or other hazardous material. This material may pose a threat to human health or impose other constraints, should it require excavation or avoidance. The desktop study review has identified a number of potentially contaminated sites (some of which are contained within NIEA records) within the immediate study area. Further potential sources of contamination were identified during ground investigation works and ecological surveys completed within the area in May and July 2018.

14.4.4.2 Potential Sources of Contamination

The potential for contaminated land is limited in the area. The majority of issues are likely to occur at sites of Petrol Stations/Fuel Storage, as well as areas of historic Railway Land, all of which are at the outer extents of the study area. However, potential sources include:

- Contaminants, of 'Medium' potential associated with Railway Land (DO255/018) to the north east of the study area from the former Belfast and County Down Railway (BCDR) line, which passed through the area;
- Petrol filling station/Fuel storage (DO255/032) with 'High' contamination potential, located to the east of the study area, at 12 Main Street;
- Petrol filling station/Fuel storage (DO255/004) with 'High' contamination potential also located to the east of the study area, on Donard Street;

- Reclaimed Land (DO255/003) of 'Low' contamination potential at Tollymore Road/Bryansmore Park, to the north of the study area; and
- Areas containing the invasive species, Japanese knotweed were identified adjacent to the River Shimna during the ecological surveys undertaken in July 2018.

The Photo Ionization Detector (PID) tests undertaken as part of the 2018 GI, recorded some elevated levels probably due to the presence of a bitmus layer at the borehole location, and the possibility of coal tar present in former road construction. Where contaminated land is encountered, further investigation would be necessary, including a contaminated land risk assessment to assess the appropriate remediation/mitigation measures.

14.4.5 Minerals

With reference to the BGS/GSNI 1:1000,000 Minerals Resource Map of Northern Ireland (County Down and Belfast), and Ards Down Area Plan 2015, within the settlement limit of Newcastle town itself, is an Area of Constraint on Mineral Development.

The GSNI Map viewer shows occurrences of some minerals in the wider area of Newcastle, but these are outwith the study area, and are therefore not considered further in this assessment.

14.4.6 Designated and Non-Designated sites

With reference to NIEA – NED digital data sets for protected sites, and the Ards Down Area Plan (2015), it is evident that there is one geologically designated ASSI within the general study area designated for earth science interest.

The closest designated geological site is Murlough ASSI, off the coast of Newcastle. The River Shimna flows into this area, designated for earth science interest for its sea-level history and coastal processes.

Due to the nature of the study area, and its close proximity to the Mournes, there are a number of Earth Science Conservation Review (ESCR) sites within the mountain complex itself, however the Murlough Complex is the only site within the general study area.

14.5 Predicted Impacts

14.5.1 Do-Nothing

With a Do-Nothing scenario, there would be no impact on the geology and soils of the area, which would likely remain in their current state. As the area for development is a functional floodplain, land development is already restricted under planning policy and is unlikely to be subject to significant change in terms of usage.

14.5.2 Operation

14.5.2.1 Superficial (Drift) and Solid Geology

As noted in the Section 10.4.1, the natural soil strata in the vicinity of the site area comprise alluvial and raised beach deposits over bedrock comprising greywacke, siltstone, mudstone and shale of the Hawick Group from the Silurian Period. To the south-east of the study area is a Felsite dyke, of Palaeogene Period orientated NW to SE. To the west of the study area is a similar dyke, orientated NE to SW.

Based on **Figure 14.1**, the alluvium deposits encompass an area generally on the northern bank of the Shimna River, from west of the junction of Bryansford Road and Bryansford Avenue, to east of Main Street, Newcastle. All scheme elements located on the north bank would be underlain by this superficial geology.

In the vicinity of Tipperary Wood, the vegetation clearance and installation of sheet pile wall would be entirely underlain by raised beach deposits of gravel, sand and silt. Similarly, the potential contractor site compound, working area and construction area located between the Tullybrannigan River, Shimna River and Bryansford Road would also be underlain by these raised beach deposits.

In terms of the magnitude of impact, any changes to the characteristics of the underlying superficial deposits would be considered 'Minor Adverse'.

The results of the ground investigation show that sand and gravel is found in shallow strata. If a flood wall or embankment is constructed without sheet piles, there is likely to be a massive amount of piping and water flow beneath the defences which can cause flooding. The Proposed Scheme allows for 4m deep piles, and this depth of pile seems a reasonable maximum assumption from a preliminary consideration of the site investigation. Detailed design would be required to confirm the depth of piles, but it is unlikely to be deeper than 4m.

The construction required for the scheme would be entirely underlain by Hawick Group sandstone, as shown on **Figure 14.2**. In terms of magnitude of impact on the solid geology, the construction of the piling would impact only a small localised area, and therefore the impact is considered 'Negligible' to 'Minor Adverse'.

14.5.2.2 Hydrogeology

Based on the GSNI Geoindex, the wider Newcastle area is underlain by a bedrock aquifer of class Bl(f), indicating an aquifer of limited potential productivity, fracture flow with moderate yields being unusual. In this type of aquifer low yields are more common, and regional flow is limited. Flows are mainly shallow and local in nature. The Geoindex identifies the Newcastle area as 'potential superficial aquifer'.

Given the scale of the works in comparison with the area covered by the aquifer, the impact of the Proposed Scheme is unlikely to result in significant impacts, therefore a Minor impact would be expected.

14.5.2.3 Soils

The Proposed Scheme is entirely underlain by soils classified as 'Urban'.

As urban soil has been manipulated, disturbed and/or transported by anthropogenic activities, it has no soil profile. Therefore in terms of magnitude of impact, changes to the characteristics of soil profile type affected by the Proposed Scheme would be Negligible, as the existing urban soils would remain of Low/Negligible importance following construction.

14.5.2.4 Minerals

With reference to the BGS/GSNI 1:100,000 Minerals Resource Map of Northern Ireland (County Down and Belfast), a key aspect of sustainable development is the conservation and safeguarding of non-renewable resources, such as minerals. There is a need to ensure that these resources are not needlessly sterilised by developments, thus leaving insufficient supplies for future generations.

As the Proposed Scheme is contained within the Newcastle Town Settlement Limit, congruent with the Area of Constraint on Mineral Development, there would be no predicted impact expected on areas of known mineral deposits, active quarries or licensed areas of mineral development. The magnitude of impact is therefore assessed as 'Negligible'.

14.5.2.5 Designated and Non-Designated sites

With reference to NIEA – NED digital data sets for protected sites, and the Ards Down Area Plan (2015), it is evident that there is one geologically designated ASSI within the general study area designated for earth science interest.

The closest designated geological site is Murlough ASSI, and Murlough Complex ESCR off the coast of Newcastle. The Shimna River flows into this area, designated for earth science interest for its sea-

level history and coastal processes. There would be no direct impact to the Murlough Complex as a result of scheme construction; therefore the magnitude of impact is 'Negligible'.

14.5.3 Construction

There would be no short-term impacts on the solid geology of the area, however soil compaction could result from construction machinery usage which would occur in the vicinity of the works. Soil compaction results in impeded drainage and subsequent waterlogging, and could result in permanent damage to the soil characteristics and structure. However, as the predominant soil type within the area of the Proposed Scheme is 'Urban', soil structure and characteristics are already poor.

The 'ploughing' effect caused by construction machinery would inhibit vegetation growth, both during and immediately after the construction phase. After topsoils have been excavated under the footprint of the Proposed Scheme, they would be stored in managed temporary and appropriately located stockpiles and re-used for covering verges, earthwork slopes and landscaping wherever possible.

14.5.3.1 Contaminated Land

There have been no major potentially contaminated land sites identified which are likely to be directly affected by the construction works. However, during the construction phase, excavations and piling operations have the potential to disturb contaminated materials and create new pathways which may allow pollutant linkages to develop. Contaminated soils may be spread into more sensitive locations around the site, (i.e. close to surface watercourses).

Should contaminated land be encountered, further investigation would be necessary, including a contaminated land risk assessment to assess the appropriate remediation/mitigation measures.

The magnitude of impact is assessed as being 'Neutral'. However, due to the proximity of the Shimna River to the construction works, should any contamination be discovered, the impact would increase in severity accordingly.

14.5.3.2 Control of Invasive Species

The July 2018 ecology survey recorded evidence of Japanese knotweed on the site. As the site is adjacent to a watercourse, there is still the possibility of other invasive species being present. These could appear during the next growing season or further in the future.

It is against the law to spread non-native invasive species. Japanese knotweed, Himalayan balsam and Giant hogweed are listed on Schedule 9 (Part II) of the Wildlife (Northern Ireland) Order 1985 [as amended]. This identifies each species as a non-native invasive species and makes it illegal to cause the plant to grow in the wild. As new plants can generate from seeds, live tissue and root fragments, it therefore makes it an offence to move contaminated plant or soil material to new sites. Any material leaving site contaminated with Japanese knotweed should be disposed of in accordance with this Order.

This piece of legislation, places a legal duty on the Contractor to carefully manage any invasive species on its land and to prevent their spread. Failure to do so can (and has) led to prosecutions. Further guidance on the control of invasive species is outlined in Section 9.0, Biodiversity – Terrestrial Ecology. Responsibility for dealing with invasive plant species rests with the Contractor. Control efforts can help reduce the spread of invasive non-native species and are most successful if carried out as a wider co-ordinated strategy with collaboration of all relevant parties/landowners/managers. Control often needs to be repeated year-after-year.

14.6 Mitigation & Enhancement Measures

14.6.1 Operation

As there would be no significant impact on the geology and soils of the area from an operational perspective, no mitigation is proposed.

14.6.2 Construction

During construction of the Proposed Scheme, the Contractor would be required to minimise adverse effects on the geology and soils by implementing good operational practices. Effects on soil resources would be mitigated by employing high standards of soil handling and management during the construction, and by avoiding the creation of bare areas of permanently exposed soil that would be vulnerable to erosion.

A review of NIEA – Land & Resource Management Unit's database of sites where, based on their historic land use, there is potential for contamination to be present would indicate that there is minimal risk of encountering contaminated land during the works. However, should contaminated material be encountered, this would have to be fully investigated and dealt with in accordance with the advice of the relevant authorities, and if necessary, special disposal arrangements for excavated material may be required. Any contaminated materials encountered during the construction would have to be appropriately remediated on-site or disposed of at an appropriately licensed landfill site. In line with NIEA - Waste Management Unit's requirements, if a potentially contaminating source has been identified, a suitable risk assessment and remediation strategy (if required) should be submitted and agreed to mitigate all risks.

A Construction Environmental Management Plan (CEMP) containing a suite of specific Environmental Management sub plans would be developed prior to commencement of construction works and submitted to the NIEA by the Contractor. Mitigation of demolition and construction impacts would depend on development and adherence to a defined Code of Construction Practice (CoCP) that contains an effective CEMP, thus ensuring good practice and emphasising environmental protection. The CEMP would ensure that construction activities take place in accordance with all relevant legislation for the protection of surface and groundwater, codes of good practice as well as best practice guidance for works on or near water.

From this, management of potentially contaminated soil and groundwater during the construction phase would typically include:

- If ground conditions suggesting the potential presence of previously unidentified contamination are encountered during site works, a programme of soil sampling and testing would be undertaken. The data obtained should be assessed against earthworks criteria as suitable for retention on-site, or as potentially requiring off-site disposal;
- Where the potentially contaminated materials can be delineated visually or on the basis of odour and require removal to facilitate on-going works, the materials should be temporarily stockpiled on polythene sheeting elsewhere on-site pending a decision on their method of disposal; and
- If contaminated soils are encountered during works, the risks associated with leaving such material in-situ and untreated would require a site-specific assessment with consideration of the mobility of the material and the potential linkages to sensitive receptors. The most likely impact associated with a 'do-nothing' scenario is that contaminants may be mobilised by wind or surface water or by leaching into groundwater and subsequent transferral to underlying aquifers or surface waters.
- Any stockpiling should be well away from any sensitive areas of ecological or archaeological interest, or watercourses where pollution could occur.
- In line with NIEA – Waste Management Unit's requirements, the re-use of site-won materials presents a potential risk to environmental receptors. Made Ground associated with the historical activities may be encountered.

Any contaminated soils and soil type materials require their hazardous properties to be firstly classified and assessed in accordance with Joint Agency Technical Guidance WM2 '*Interpretation of the definition and classification of hazardous waste*' (3rd edition, August 2013). Classifying waste correctly is a legal requirement which helps to ensure that waste is managed appropriately. After this hazardous waste assessment is completed, the options for managing this material should be further considered taking into account the European Waste Hierarchy. In the event that contaminated materials are to be disposed to landfill, Waste Acceptance Criteria (WAC) would need to be applied

for different types of landfill. For wastes suspected or known to be contaminated, it must be demonstrated through WAC testing that they are acceptable as inert wastes.

The management of all materials onto and off the scheme construction site should be suitably authorised through the Waste Management Regulations (Northern Ireland) 2006 and/or the Water Order (Northern Ireland) 1999. This should be demonstrated through a Site Waste Management Plan (SWMP) (see http://www.netregs.gov.uk).

14.7 Residual Impacts

There are no known areas of potentially contaminated land within the immediate footprint of the works. Where contaminated land is encountered, further investigation would be necessary, including a contaminated land risk assessment to assess the appropriate remediation/mitigation measures. As such, the overall potential adverse risk to human health and the environment would be reduced by either removing or capping any contaminated ground, thus the residual impact could be deemed 'Slight/Moderate Beneficial'.

There would be no residual effects on designated or non-designated sites of geological or geomorphological interest, or areas of licensed mineral extraction, and therefore there would be no residual impact.

14.8 Summary & Conclusions

In summary, there would be no designated or non-designated sites of geological or geomorphological interest affected by the Proposed Scheme, nor would any areas licensed for mineral extraction be affected.

From a geology and soils perspective, there are relatively few key issues. There would be no significant impacts on solid or drift geology, or on soils of the region and thus the significance of effect is likely to be neutral.

Potential areas of contaminated land are unlikely to be encountered. If contaminated land is encountered, further investigation would be necessary, including a contaminated land risk assessment to assess the appropriate remediation/mitigation measures.

15. Biodiversity - Fisheries & Aquatic Ecology

15.1 Introduction

This section of the ES examines the potential impacts associated with the Proposed Scheme on fisheries and the aquatic environment, with a particular emphasis on salmon and trout stocks. Data has been compiled from fisheries and aquatic ecological surveys of the two river reaches (the Tullybrannigan and Shimna rivers) subject to the scheme combined with existing information on fisheries and aquatic biology, Water Framework Directive (WFD) ecological status, conservation designations and protected aquatic species.

15.2 Methodology

15.2.1 Desk-Based Assessment

15.2.1.1 Baseline Data Sources

The following sources were used to collate baseline environmental data for each watercourse at the works area and for the general river sub-catchment:

- Department of Agriculture, Environment & Rural Affairs (DAERA) – the Inland Fisheries Group within Marine & Fisheries Division were consulted regarding the potential sensitivity of the two rivers potentially impacted by the Proposed Scheme works;
- Northern Ireland Environment Agency - Water Management Unit (Rivers and Lakes Team). A direct information request was submitted to NIEA for all water monitoring data, including WFD status, for waterbodies within the study area, https://appsd.daera-ni.gov.uk/RiverBasinViewer/;https://www.daera-ni.gov.uk/topics/water/river-basin-management
- NIEA digital datasets:- https://www.daera-ni.gov.uk/articles/wmu-digital-dataset-downloads
- Northern Ireland Environment Agency - Protected Areas www.doeni.gov.uk/niea/protected_areas_home

15.2.1.2 Conservation Designations

The Proposed Scheme and associated works adjacent to the Shimna and Tullybrannigan rivers, was geo-referenced against the following conservation designations:

- Designated salmonid rivers - the EU Freshwater Fish Directive (FWFD) 1978 (as amended 2006).The FWFD set associated water quality objectives and standards that, for salmonids, reflect their high sensitivity to water quality impairment. Article 6 of the WFD repealed the FWFD in December 2013, 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);
- 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;
- 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 Habitats Directive:
    - Atlantic salmon (*Salmo salar*);
    - Brook lamprey (*Lampetra planeri*);
    - River lamprey (*Lampetra fluviatilis*);
    - Sea lamprey (*Petromyzon marinus*); and

- Freshwater pearl mussel (*Margaritifera margaritifera*)

- The European Eel (*Anguilla anguilla*), although not an Annex II listed species, was recently added to the IUCN Red List as Critically Endangered (Jacoby and Gollock, 2014).

15.2.1.3 Water Framework Directive Ecological Status

The Water Framework Directive (2000), implemented in Northern Ireland through the Water Environment (WFD) Regulations (NI) 2003 [as amended], requires Member States to ensure that all waterbodies attain 'Good' ecological status, or where 'Good' status is already achieved, prevent any deterioration in status.

The most recently available WFD River Waterbody (RWB) classification, published in December 2015 for the second cycle RBMPs (https://appsd.daera-ni.gov.uk/RiverBasinViewer/), was used to assess the overall ecological status/ condition of the Shimna River waterbody which includes the Tullybrannigan sub-catchment.

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 (NIEA, 2009). Therefore, additional baseline information (e.g. fish, physical habitat quality, macroinvertebrates – see below) was reviewed to more accurately assess ecological quality/sensitivity of the river reaches in the area adjacent to the works.

The baseline information allowed an expression of confidence (HIGH, MEDIUM, or LOW) in applying the published WFD ecological class to describe baseline conditions in the adjacent river reaches of the Shimna and the Tullybrannigan. Both rivers are included in a single waterbody WFD classification under the heading of "Shimna River". Clearly it would be inaccurate to apply this overall WFD classification to a survey reach, if the NIEA monitoring station on which indicator elements and classification to the localised reaches adjacent to the works, particularly if the classification is at odds with collated baseline environmental data. This approach is similar to that used by NIEA when down-weighting the effect of monitoring stations or using a risk-based assessment of pressures and impacts, but may be more accurate because it is reliant on test site-specific data and observations.

15.2.2 Field Surveys

15.2.2.1 Physical Habitat

This aspect of the study consisted of detailed baseline assessments of physical river habitat (substratum, depth, flow velocity, fine sediment) based on the fully quantitative salmonid habitat assessment method developed by DAERA Inland Fisheries and the Agri-Food and Biosciences Institute (AFBI) for assessing the impact of instream works or point pollution sources (DAERA/ AFBI, 2010 – Internal Report). "Impact" reaches and "control" reaches, located respectively downstream and upstream of the works, were surveyed in July 2018. This control and impact reach baseline is incorporated as a BACI (Before-After Control-Impact) design which enables post-construction monitoring of environmental impacts (see Matthaei *et al*. 2006).

As recommended by DAERA/AFBI, each survey reach was 40m long; 25 sampling points were surveyed across five cross-sectional transects in each reach (4 sampling points per transect), with each transect separated by approximately 8m of stream length. At each sampling point, flow velocity was recorded at 60% depth using a Geopacks flow meter, with water depth measured using the meter's impeller stick. Substrate was visually assessed at each sampling point using a bathyscope; the dominant substrate type was estimated and scored according to the modified Wentworth Scale (Table 15.1) as described by Bain *et al*. (1985).

Table 15.1: Substrate classification and scoring system, based on the Wentworth Scale (from Bain *et al*. 1985)

Substrate type	Size Class (mm)	Score
Sand/silt	<2	1

Gravel	2-16	2
Pebble	17-64	3
Cobble	65-256	4
Boulder	>256	5
Irregular Bedrock	-	6

In addition, the percentage of deposited fine sediment (<2mm grain) on the river bed was estimated at each sampling point to the nearest 5% according to Clapcott *et al*. (2011), with the dominant fine sediment type (sand, silt, clays) estimated by running the grain through the observer's fingers.

The classification system described by Bain *et al.* (1985) 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;
- Heterogeneity (SD) – calculated as the standard deviation of the mean CI.

These indices provide a measure of how coarse or smooth the substrate is in a reach and if it is composed of a mixture or is dominated by a particular class (Table 15.2).

Table 15.2: Substrate description inferred from sample data (modified from Bain *et al*. 1985)

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

Mean percent fine sediment cover was calculated for each site with the site's quality assessed against a threshold guideline of 20%, above which salmonid and benthic biodiversity may be compromised (see Clapcott *et al*. 2011). Clapcott *et al*. (2011) reviewed international studies and reported that fine sediment cover >20% was associated with marked reductions in salmonid habitat suitability and in the survival and emergence of trout embryos and alevins. In the River Bush in Northern Ireland, O'Connor & Andrew (1998) detected an impact on alevin survival at a level of 10% fines. Clearly there is some variability among studies but fines <20% by weight are linked to good quality habitat for salmonid spawning, and this is a feature in Northern Ireland salmonid rivers of national and international importance (Johnston, 2012).

15.2.2.2 WFD benthic macroinvertebrate-based biological quality

The benthic macroinvertebrate community was sampled to provide additional baseline data to inform the site sensitivity assessment. Benthic macroinvertebrates were sampled at both the control and impact reach at each location in July 2018; although seasonal samples are a pre-requisite to classification of the quality of a site based on WFD methodology (UKTAG, 2014), this was not possible for the current study due to time constraints. However, single season data are still useful in providing an indication of a site's general biological quality given the long-lived nature of benthic macroinvertebrate communities.

A standard three-minute kick sample with one-minute search and hand-held net (1mm mesh) was used to collect samples. Where possible, samples were collected from riffle/run habitats, and preserved in 70% ethanol prior to sorting and identification. Sample sorting followed the relative abundance method outlined by Murray-Bligh (2002) with baseline indices summarised as the total

number of taxa, total site Walley, Hawkes, Paisley & Trigg (WHPT) score, and average score per taxon (ASPT), using the abundance weighted sensitivity scores developed by Walley and Hawkes (1997) as recommended for the WFD (WFD-UKTAG, 2014).

The general sensitivity/ ecological quality of each site was assessed using the WFD classification approach. Environmental quality ratios (EQRs) and expected (predicted) metric values were calculated for the number of taxa and ASPT from site-specific physical and chemical data using the RIVPACS IV model incorporated in the online River Invertebrate Classification Tool (RICT, https://www.sepa.org.uk/environment/water/classification/river-invertebrates-classification-tool/).

Expected (predicted) metric values were determined from site-specific physical and chemical data using RICT. Predictions require input of the following test site data: altitude; distance from source; discharge category; percent substrate composition; alkalinity (or a surrogate such as electrical conductivity, calcium concentration or total hardness). Input data were obtained from 1:50,000 Ordnance Survey maps used in ArcGIS 10.0 and from the physical habitat surveys based on the recommended methods outlined in Murray-Bligh (2002). Discharge category was provided by the NIEA for nearby monitoring stations. Electrical conductivity was based on spot measurements taken at each site (Hanna HI86303 conductivity meter).

In RICT, the default RUN settings were selected with season set to summer, and the taxon end-group and predictive environmental variables both set for Northern Ireland. An overall site classification is produced based on a “worst of” approach (worst of NTAXA or WHPT-ASPT quality assessment) to give an overall invertebrate classification (see WFD-UKTAG, 2014; see Table 15.3).

Table 15.3: Environmental Quality Ratios used to classify test sites based on benthic invertebrates

Quality status/condition	WHPT NTAXA EQR	WHPT ASPT EQR
High/Good	0.80	0.97
Good/ Moderate	0.68	0.86
Moderate/ Poor	0.56	0.72
Poor/ Bad	0.47	0.59

15.2.2.3 Salmonid habitat assessment

Full surveys of fisheries habitat along the respective reaches of the Shimna and Tullybrannigan rivers were conducted during July 2018. These assessments were based on the Life Cycle Unit method developed by Kennedy (1984) and currently used by the DAERA Inland Fisheries; this method is outlined in detail in an advisory leaflet produced by the Department of Agriculture (NI), Fisheries Division during the 1980s (DANI, undated). The procedure involves mapping of the river or stream channel to detail spawning, nursery and holding water, with quality scores assigned to each type of habitat. Habitat type is recorded as:

- Nursery (shallow rock/cobble riffle areas for juvenile fish - fry/parr);
- Holding (deeper pools/runs for adult fish);
- Spawning (shallow gravel areas for fish spawning); and
- Unclassified (unsuitable for fish – shallow bedrock areas or heavily modified sections of channel).

Each stretch of a particular habitat type is also Graded 1 to 3, based on a series of criteria as set out in Annex 1 of the DANI advisory leaflet. In essence, this is similar to the 4-point habitat scale used by Loughs Agency; three of fisheries interest (Nursery, Holding and Spawning) and one of non-fisheries interest (unclassified) which generally describes a substrate of fine silt, or extensive bridge invert, or engineered channel with solid bed and possibly constrained banks. This approach has been used by the authors for over 20 years and has been agreed in principle with DAERA.

15.2.2.4 Juvenile fish stocks

A survey of juvenile salmonid stocks in the respective reaches of the Shimna and Tullybrannigan rivers was conducted during July 2018, according to the semi-quantitative methodology described by Crozier and Kennedy (1994), and routinely used by DAERA Inland Fisheries. The procedure involves two operators fishing continuously in an upstream direction for five minutes at each sampling location, using an E-Fish 500W single anode electrofishing backpack (EF-500B-SYS). The system operates on 24V input and delivers a pulsed DC output of 10 to 500W at a variable frequency of 10 to 100Hz. Output voltage and frequency are adjusted according to the electrical conductivity at the survey site.

All fish were caught using a dip net, retained for identification and measurement of length, and then returned to the water live. Any additional Age 0 salmonids seen but not captured were also recorded. The age structure of the trout and salmon stocks was later verified by constructing length frequency distributions for each species, thereby facilitating the determination of fish age according to body length.

This survey methodology has been calibrated for both salmon and trout so that an Abundance Index for each species can be assigned based on the relationship between the semi-quantitative sample numbers (5-minute sample size) and quantitative population estimates in reaches of known fish density. Fry abundance is classified from “Excellent” to “Absent” according to separate indices for salmon developed by Crozier and Kennedy (1994), and for trout by Kennedy (*pers comm.*; Table 15.4).

Table 15.4: Semi-quantitative abundance categories for age 0 salmon (a) and trout (b), as developed by Crozier and Kennedy (1994) Kennedy (*unpublished data*)

(a) Salmon

Fry (0+) nos.	Density (No/100m^2)	Abundance/ quality category
0	0	Absent
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

(b) Trout

Fry (0+) nos.	Density (No/100m^2)	Abundance/ quality category
0	0	Absent
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

15.2.3 Assessment of Impacts

15.2.3.1 Procedure

The significance of potential effects was assessed based on test site sensitivity and guidelines on the perceived magnitude of effect, as outlined in the Design Manual for Roads and Bridges (DMRB), specifically with regard to Road Drainage and the Water Environment, Volume 11, Section 3, Part 10 HD45/09 (DMRB, 2009).

15.2.3.2 Estimating Sensitivity

The DMRB provides the specific guidance on Estimating the Importance of Water Environment Attributes (DMRB, 2009) which includes typical examples relating to surface waters, WFD class, site designation, and fisheries interests (Table 15.5). This table provided the basis for estimating the sensitivity of receptors.

Fisheries Importance/ Ecological Sensitivity of the Shimna and Tullybrannigan reaches potentially affected by the Flood Alleviation Scheme was graded broadly in line with the DMRB criteria outlined in Table 15.5, and was based on the following collated desk and field-based information:

- Salmon and trout presence, density/quality classes;
- Salmonid habitat quality classes;
- Physical habitat survey data;
- Percent fine sediment cover;
- Additional benthic invertebrate data;
- WFD surface waterbody and test site-specific status; and
- Conservation designations.

Table 15.5: Estimating the Sensitivity of the Water Environment (DMRB, 2009)

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 'Poor'/unspecified.

15.2.3.3 Magnitude of Effect

The magnitude of effect was assessed according to criteria set out in the DMRB (Table 15.6), which includes a consideration of the timescale of the effect (short, medium or long-term).

Table 15.6: Estimating the Magnitude of Effect (DMRB, 2009)

Magnitude	Criteria	Type and Scale of Effect
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 effect the use or integrity	Unlikely to affect the integrity of the water environment. No measurable alteration to fish population levels.

15.2.3.4 Significance of Effects

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 15.7. 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 15.7: Estimating the Significance of Potential Effects (DMRB, 2009)

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

The five significance categories with typical effects are shown in Table 15.8.

Table 15.8: Significance of Effects Descriptors (DMRB, 2009)

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 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.

Where the significance of effect is considered at least Moderate, it is considered significant 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.

15.3 Regulatory & Policy Framework

15.3.1 Fisheries Administration

Under the provisions of the Fisheries Act (NI) 1966, the Department of Agriculture, Environment & Rural Affairs (DAERA) has responsibility for the conservation, protection, development and improvement of salmon and inland fisheries of Northern Ireland. Within DAERA, this remit is undertaken by Marine & Fisheries Division, and specifically by the Inland Fisheries Group.

15.3.2 EU Legislation

EU legislation relevant to fisheries and the water environment in Member States includes:

- EC Habitats Directive (92/43/EEC);
- EU Water Framework Directive (2000/60/EC) (incorporating standards from the Fish Directive (Consolidated) (2006/44/EC); repealed in 2013); and
- European Eel Regulation (EC) 1100/2007.

15.3.3 Domestic Legislation

Domestic legislation relevant to fisheries and the water environment in Northern Ireland includes:

- Fisheries (Northern Ireland) Act 1966;
- The Environment (Northern Ireland) Order 2002;
- The Water (Northern Ireland) Order 1999;
- Drainage (Northern Ireland) Order 1973 and The Drainage (Amendment) (Northern Ireland) Order 2005;
- Nature Conservation and Amenity Lands (Amendment) (Northern Ireland) Order 1989;
- Water Environment (Water Framework Directive) (Northern Ireland) Regulations 2003;
- Wildlife (Northern Ireland) Order 1985; and
- Wildlife and Natural Environment Act (Northern Ireland) 2011.

15.3.4 Policy Framework

Policy with regard to Atlantic salmon and European eel in this region is set out in the following:

- South Down Local Management Area Plan;
- 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
- North East River Basin District Eel Management Plan (DAERA).

15.3.5 Relevant Guidance

Specific guidance relevant to the Proposed Scheme includes:

- Requirements for Protection of Fisheries Habitat during Development Works at River Sites (DAERA); and
- Pollution Prevention Guidelines (PPGs) and their replacement series (Guidance for Pollution Prevention (GPPs)).

15.4 Baseline Conditions

15.4.1.1 Desk Study

15.4.1.2 Designated Sites

The study area is located within a series of designated sites/areas with regard to nature conservation and landscape importance:

15.4.1.2.1 Shimna River ASSI

The Environment (Northern Ireland) Order 2002 provides the legislative basis for the protection of important nature conservation sites in Northern Ireland, including the designation of such areas as Areas of Special Scientific Interest (ASSI). ASSIs are the major statutory mechanism for protecting nature conservation sites and generally provide the underpinning protection measure for the designation of European sites.

The Shimna River was designated as an ASSI in 2009 due to the physical features of the river and its associated riverine flora and fauna. It is considered one of the best examples in Northern Ireland of an upland, oligotrophic (base-poor) river as, apart from Fofanny Dam in the headwaters; it is in a highly natural state with few anthropogenic impacts.

The river is noted for the naturalness of the channel, having the high quality in-channel features typical of an unaltered upland system. It is a short, fast-flowing spate river, extending 11.77 km from Fofanny Reservoir to the sea at Newcastle, with excellent habitat for salmonids and populations of Atlantic salmon, Brown trout and Sea trout present. Other fish species include Minnow, Stone loach, Three-spined stickleback and Eel. The indigenous aquatic flora reflects the nutrient-poor and highly acidic character of the water and are dominated by mosses and liverworts.

15.4.1.2.2 Areas of Nature Conservation and Landscape Importance

Sites of Local Nature Conservation Importance (SLNCIs) and Local Landscape Policy Areas (LLPAs) are designated for their habitats, species, earth science and/or landscape value. They may be of local importance and may also contribute to national and European biodiversity. The following areas are designated within the Ards Down Area Plan 2015 for the features listed:

- Burren, Shimna & Trassey Rivers SLNCI
  - is designated, in part, for river and woodland habitat.
- LLPA 2 Bryansford Road – Enniskeen Hotel and large houses and Shimna River Corridor is designated for:
  - Areas of woodland and important tree groups - substantially wooded corridor of high environmental quality and visual amenity provides a good visual entrance feature into town;
  - Original character defined by low density housing and areas of fine wooded landscape;
  - River significant for salmon fishing and breeding and local nature conservation interest - river and trees support a range of habitats and species; and
  - Public access along river alongside Tipperary Wood linking to Tipperary Lane with potential for extension and linkage with Tollymore Forest Park; and Landform backdrop to river emphasises visual significance of the area.

- LLPA 4 Tullybrannigan River Corridor:
  - River valley corridor provides local wildlife habitat and nature conservation interest;
  - Mature trees and riverside vegetation are of local amenity value;
  - Water quality is important for fishing.

15.4.1.3 EU Water Framework Directive

15.4.1.3.1 River Catchments

The study area is located entirely within the catchment of the Shimna River which, along the Tullybrannigan River, is delineated as the *Shimna River* waterbody under the Water Framework Directive (WFD). The Shimna River waterbody is located within the North-Eastern River Basin District under the WFD system.

The Shimna waterbody represents a catchment area of approximately 35 km^2 and the main-stem Shimna River extends over a channel length of 11.77 km from Fofanny Dam to the sea.

15.4.1.3.2 Ecological Status

To achieve the ecological objectives of the Water Framework Directive (WFD), River Basin Management Plans (RBMPs) have been implemented through a series of Local Management Areas (LMAs) during the initial 2010 to 2015 planning cycle and now extending into the subsequent 2016-21 cycle, with provision under WFD for a third cycle from 2022 to 2027.

The most recently published WFD ecological assessments for the Shimna waterbody (2015) are summarised in Table 15.9, indicating the overall classification and status with regard to each of the principal parameters monitored.

Table 15.9: Classification of individual quality elements contributing to overall WFD status of Shimna waterbody, 2015

Parameter	Classification
Benthic Invertebrates	Good
Macrophytes	High
Phytobenthos	High
Fish	High
BOD*	High
Temperature*	High
Dissolved oxygen	High
pH	High
SRP	High
Ammonia	Good/High
Iron (dissolved)	Good/High
Hydrological regime	Good
Morphological conditions	Good
Overall status	MEP

Source: DAERA

For the current planning cycle to 2021, NIEA has developed a series of RMBPs for each River Basin District including the North-Eastern RBD. These documents set out the latest assessment of pressures and impacts on the water environment, describe the progress NIEA made towards achieving objectives for 2015, explain the significant water management issues that still need to be addressed, and outline a programme of measures with which these can be achieved.

15.4.1.3.3 EC Freshwater Fish Directive

The EC Freshwater Fish Directive (Consolidated) 2006/44/EC set specific water quality standards for Salmonid waters and Cyprinid waters, with regard to dissolved oxygen, ammonia, pH and total zinc. The main stem section of the Shimna was designated as Salmonid under the Surface Waters (Fish Life) (Classification) (Amendment) Regulations (Northern Ireland) 2007, which implement the EC Fish Directive (Consolidated) 2006/44/EC.

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.

15.4.1.3.4 Site Sensitivity

Application of the criteria and examples listed in Table 15.5 was used to determine the sensitivity of the potentially impacted sections of river as shown in Table 15.10.

Table 15.10: Sensitivity of river reaches potentially impacted by the Proposed Scheme

River	WFD class	ASSI	Key species/ indicators	Sensitivity
Shimna	Moderate Ecological Potential (MEP)	Yes	**Atlantic salmon**. Brown (and sea) trout; European eel. WFD class MEP	Very High
Tullybrannigan	Moderate Ecological Potential (MEP)	No	**Atlantic salmon**. Brown (and sea) trout; European eel. WFD class MEP	High

Under the WFD system, the two rivers are combined in a single waterbody as *Shimna River* waterbody and therefore subject to the same ecological classification of Moderate Ecological Potential (MEP). However, for the current assessment, the relevant reaches of the two channels have been assessed as being of High sensitivity (Tullybrannigan) and Very High sensitivity (Shimna). Both reaches were regarded as of High sensitivity due to the presence of Atlantic salmon which is listed under Annex II of the Habitats Directive, but the Shimna was elevated to Very High due to its ASSI designation.

15.4.2 Key Fish Species

15.4.2.1.1 Atlantic Salmon

The salmon is an anadromous species having both a freshwater stage and a marine stage to its life cycle. The species is listed under Annexe II of the Habitats Directive and was added to the UK Biodiversity Action Plan (BAP) list in 2007 as a priority species for conservation action. More recently, the salmon achieved an IUCN threat status of Vulnerable in the Irish Red List No 5 (King *et al*., 2011).

Northern Ireland's Atlantic salmon management strategy is aligned to the agreement reached by the North Atlantic Salmon Conservation Organisation (NASCO) and its Parties to adopt and apply 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 Party to NASCO.

Atlantic salmon stocks in general are in serious decline and southern stocks, including some in North America and Europe, are threatened with extinction. As a conservation measure, the former Department of Culture, Arts & Leisure (pre-DAERA) reduced the exploitation of stocks through a voluntary buy-out scheme for commercial salmon fisheries during 2001-03. This was followed by a series of regulations in March 2014, including the closure of the remaining commercial fisheries and mandatory catch and release of salmon caught by anglers within the DAERA jurisdiction.

The Shimna is one of seven Index Rivers monitored by DAERA to provide the basis for salmon management throughout Northern Ireland. Each river has been chosen to represent a different catchment type and provides key information on stock levels to inform regional policy.

15.4.2.1.2 Brown Trout

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 species is distributed throughout the Shimna catchment and is probably more abundant in the migratory form as sea trout which migrate to sea and return to freshwater to spawn. Sea trout are very popular on the Shimna as a target angling catch.

15.4.2.1.3 European Eel

The European eel stock has been in rapid decline throughout its range since around 1980. This has led to the European Commission introducing the Eel Recovery Plan (Council Regulation No 1100/2007) which aims to return the European eel stock to more sustainable levels of adult abundance and glass eel recruitment. Each Member State is required to establish national Eel Management Plans which aim to achieve a 40% escapement of silver eel to sea as potential spawning stock. Member States are also required to implement Eel Management Plans for the recovery of the stock through action by specific measures in each eel river basin, in this case the North-Eastern River Basin District.

The European eel is not listed in the EC Habitats Directive but has recently been added to the International Union for Conservation of Nature (IUCN) Red List of Threatened Species in the category of Critically Endangered.

15.4.2.2 Fish Stock Data

Seven Index Rivers, including the Shimna, are monitored by DAERA to provide the basis for salmon management throughout Northern Ireland. Monitoring of salmon (and trout) stocks is based on the annual abundance of juvenile fish and the numbers of adult salmon returning to the river.

15.4.2.2.1 Juvenile Salmon Abundance

Salmon and trout fry (Age 0) distribution and abundance are an indication of the distribution and level of spawning by adult fish in a river. Trends in abundance of juvenile salmon (and trout) are monitored by DAERA through annual semi-quantitative electrofishing surveys according to a methodology developed by Crozier & Kennedy (1994). A total of 24 sites are surveyed in the catchment each year, including 15 on the main channel Shimna.

A selection of key survey sites are utilised by DAERA to provide an Abundance Index for the river as a measure of stock status. The Abundance Index for 2013-17 is illustrated in **Plate 15.1** relative to the abundance categories *Poor* to *Excellent* as determined for salmon fry by Crozier & Kennedy (1994). Average salmon fry abundance at these reference sites has been relatively low in the *Poor* to *Fair* categories during this time period, well below the target level of *Good* abundance.

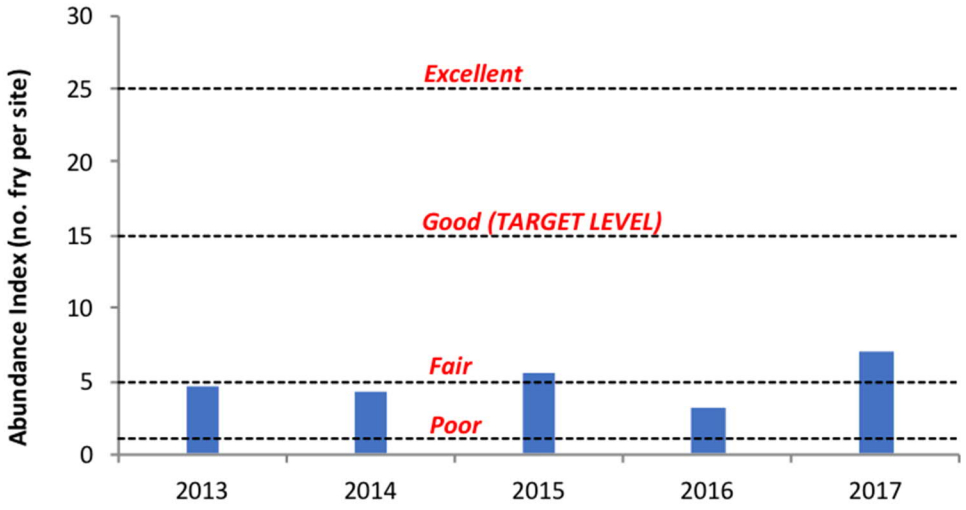


Plate 15.1: Salmon fry Abundance Index for the Shimna River, 2013-17 (Source: DCAL)

Source: AFBI

15.4.2.2.2 Adult Salmon Runs and Conservation Limits

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.

DAERA and AFBI have established the Conservation Limit (CL) for the Shimna and an electronic fish counter has been installed to assess the numbers of adult fish returning to the river each year as potential spawners. The annual percentage compliance with the CL is shown in **Plate 15.2** - a compliance level below 100% indicates that the CL was not met.

DAERA and AFBI have also established a Management Target (MT) as a precautionary abundance reference point, set at 115% of the CL to allow for losses of fish to angling, predation etc. A compliance level below 115% indicates that the Management Target was not achieved (**Plate 15.2**). Clearly neither the CL nor the MT have been achieved during this period, although it should be noted that the % compliance for 2017 is provisional (Kennedy, *pers comm*).

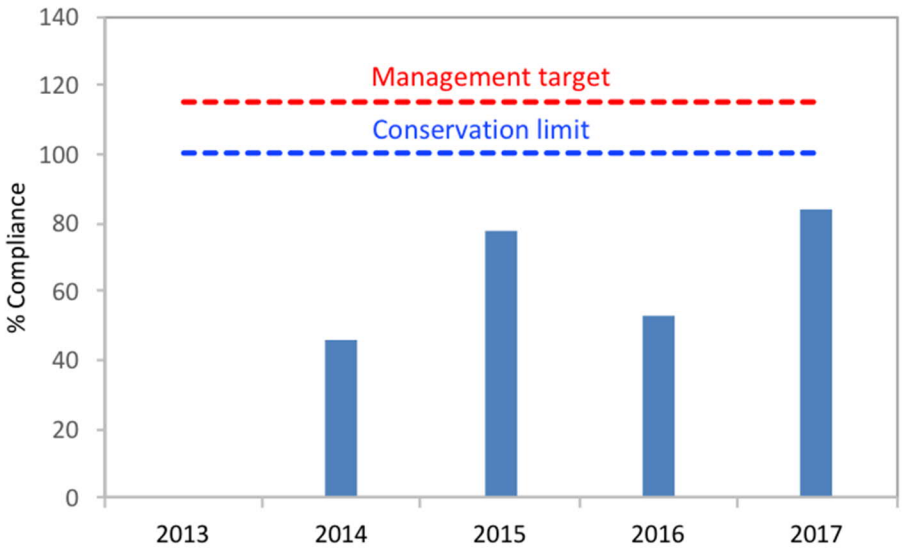


Plate 15.2: Percentage compliance with Conservation Limit and Management Target for salmon in the Shimna, 2013-17

Source: AFBI

15.4.2.2.3 Trout stocks

A Recruitment Index has been developed by DAERA/AFBI to assess the relative abundance of brown trout in their first year (0+ age class) at electric fishing sampling sites on a number of rivers in Northern Ireland including the Shimna. Juvenile trout are recorded during annual electrofishing surveys at the same locations as for salmon.

The Recruitment Index describes the relative abundance (%) of first year trout, compared to a target level of recruitment, which is based on the expected numbers of fish at monitoring sites according to the quality of habitat at those sites. Percentage compliance with the Recruitment Index for the Shimna is shown in **Plate 15.3**. Where the index is greater than 100%, recruitment of trout is higher than the average expected density. Where the index is lower than 100%, recruitment of brown trout is less than the average expected density. This data would suggest that expected juvenile trout densities for the Shimna are being achieved or exceeded during the period 2012-16 (Plate 15.3).

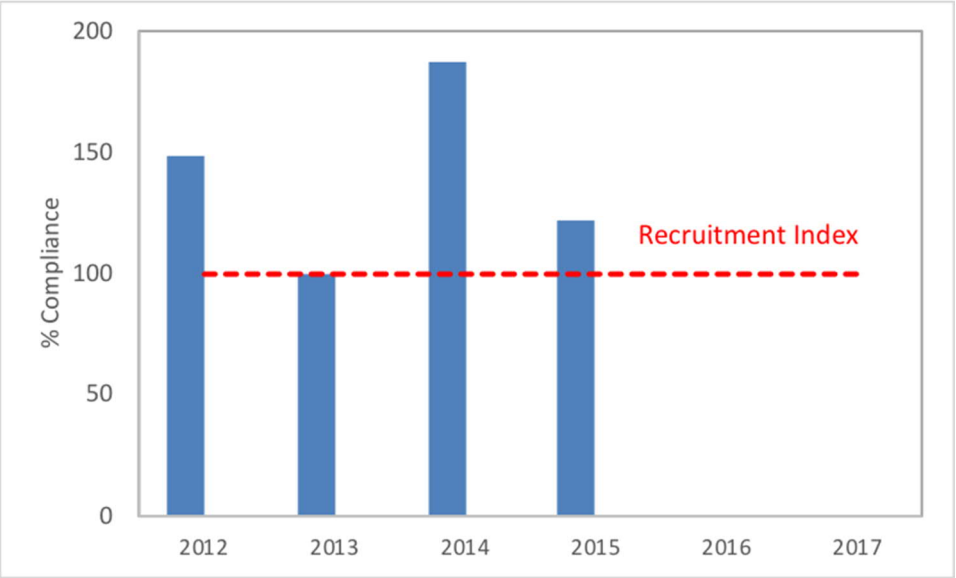


Plate 15.3: Percentage compliance with the Recruitment Index for the Shimna, 2012-15
Source: AFBI

15.4.2.3 Fishery Management

The Shimna Angling Club was founded in 1960 and leases the fishing rights to most of the river from the Annesley Estate. The section of river flowing through Tollymore Park is owned by DAERA and the fishery in general is managed by the club under a management agreement with DAERA.

The fishing season is open from 01 March to 31 October and the river is best known for its salmon and sea trout fishing. The Shimna has held the Irish record for the heaviest rod-caught sea trout since 1983 when a fish of 7.43 kg (16lbs 6oz) was taken.

15.4.3 Field Surveys

15.4.3.1 Survey sites

Four sites were surveyed, with an upstream "control" reach (above any works) and downstream "impact" reach (below works) assessed in both the Shimna and Tullybrannigan rivers (**Figure 15.1**; Table 15.11). Survey of the reach at Site 2 on the Tullybrannigan was limited to just below Beers Bridge (Bryansford Road) within the works area because of excessive water depth and riverbed sediment, which prevented safe wading.

Table 15.11: Site survey details

Site No.	Description	Grid Ref	
		Easting	Northing
1	"Control" reach - Tullybrannigan River u/s of works above Bryansford Rd Bridge	337214	331190
2	"Impact" reach - Tullybrannigan River within works area below Bryansford Rd Bridge	337256	331168
3	"Control" reach - Shimna River upstream of works area below fish counter	336959	331653
4	"Impact" reach - Shimna River downstream of works area but above Burren River confluence	337376	331294

15.4.3.2 Physical Habitat

In the Tullybrannigan River, there was a marked difference in physical habitat type and quality comparing the upstream control (Site 1) and downstream impact reaches (Site 2; Table 15.12); the control reach was narrower, shallow, with riffle/run flow habitat over clean gravel cobble substrate and negligible fine sediment cover. Initially, the top quarter of the impact survey reach was run habitat over cobble/ gravel with the marginal areas retained within gabion basket that was buried beneath the riverbed. However, the remainder of the impact reach was deep glide/ pool habitat with the substratum largely covered with a layer of deep fine silt as reflected in the substrate indices. The impact reach was also heavily influenced by the boating lake impoundment which is affecting water depth and flow rate to approximately 30m downstream of Beers Bridge at Bryansford Road.

In the Shimna River, both control and impact reaches had greater substrate complexity and lower fine sediment cover. The sharper gradient in the impact reach was associated with higher flow velocity, greater substrate complexity and zero fine sediment. Higher water depth and slower flows were associated with slightly higher levels of fine sediment cover in the impact reach, although these remained below levels that are expected to cause stepwise declines in benthic macroinvertebrate community diversity (e.g. see Clapcott *et al*. 2011).

Overall, the higher coarseness indices and low sediment levels at control sites in both rivers (Sites 1 and 3) are consistent with values associated with good salmonid habitat quality reported elsewhere in Northern Ireland (Johnston, 2012).

Table 15.12: Physical habitat quality at each site based on surveys conducted in July 2018

Site	Stream/ River	Sediment cover (%) & type	Mean width	Mean water depth (m)	Mean flow velocity (ms^{-1})	Coarseness index (CI)	Substrate heterogeneity (SD)	Inferred substrate description
1	“Control” reach Tullybrannigan River u/s of works	0.8; sand	3.75	0.1	0.18	3.3	0.84	Mixture, intermediate coarseness
2	“Impact” reach Tullybrannigan River within works	63; silt	7.5	0.48	0.026	2	1.33	Heterogeneous, fine
3	“Control” reach - Shimna River upstream of works	0	8	0.15	0.27	3.85	0.37	Nearly homogeneous, intermediate coarseness
4	“Impact” reach - Shimna River downstream of the works	9.3; sand/ silt	13.5	0.56	0.03	3.25	1.13	Mixture, intermediate coarseness

15.4.3.3 Benthic macroinvertebrate-based biological quality

As noted above, the “impact” reach sampling location on the Shimna River (Site 4) was deep and slow-flowing glide habitat; for the purposes of kick-sampling of benthic macroinvertebrates, a sampling location (Site 4a; **Figure 15.1**) was chosen approximately 200m further upstream in riffle/ run habitat to ensure standardisation of habitat type as required for WFD-based biological assessment (Murrary-Bligh, 2002).

The control site (Reach 1) on the Tullybrannigan River was assessed at HIGH ecological quality based both on the number of taxa and WHPT-ASPT score (Table 15.13). The impact reach (Site 2) was assessed at MODERATE ecological quality overall, despite a GOOD quality assessed for WHPT-

ASPT; the “worst of” approach used for WFD assessment meant that the lower quality status is used for overall assessment.

Both the control and impact reach within the Shimna River (Sites 3 and 4) were assessed as having at least GOOD ecological quality, which reflects the complex physical substrate, high flow velocity, and low sediment at these reaches.

Table 15.13: Stream ecological quality determined from benthic macroinvertebrate community samples

Site	Stream/ River	BMWP WHPT score	Number of taxa	N-TAXA WFD-based invert. class	WHPT ASPT	ASPT WFD-based invert. Class
1	“Control” reach Tullybrannigan River u/s of works	123.3	19	HIGH	6.48	HIGH
2	“Impact” reach Tullybrannigan River within works	58.3	11	MODERATE	5.3	GOOD
3	“Control” reach - Shimna River u/s of works	100.7	16	GOOD	6.3	HIGH
4a	“Impact” reach - Shimna River d/s of works	76.9	14	HIGH	5.5	GOOD

15.4.3.4 Salmonid Habitat Classification

15.4.3.4.1 Survey Reaches

Habitat surveys were carried out in the two river reaches potentially impacted by construction works associated with the Flood Alleviation Scheme. At each location, the survey was commenced 1-200m upstream of the upper limits of the planned flood walls/embankments, and conducted over a reach extending downstream beyond the lower limits of the works. This resulted in survey sections of 740m on the Shimna and 375m on the Tullybrannigan.

The habitat assessment for both reaches is summarised in **Figure 15.2** using a colour coding for each habitat type and quality rating. This data is also recorded quantitatively in terms of both channel length and area for each habitat type/quality observed in each river reach (Tables 15.9 and 15.10).

15.4.3.4.2 Shimna River

The survey commenced at the site of the DAERA/AFBI fish counting installation upstream of New Bridge on Bryansford Road (**Figure 15.2**). This section of the river contains good reaches of *Spawning* and *Nursery* habitat interspersed with some deep holding water for adult fish. Downstream of the bridge, the bed-slope (gradient) eases as the channel meanders through Islands Park towards the confluence with the Burren River - this section is largely a mixture of lower grade *Nursery* and *Holding* water, although there are two notable deeper *Holding* reaches and a major *Spawning* ford. After merging with the Burren River, the combined channel forms a large deep *Holding* pool before discharging to the sea.

The detailed analysis of habitat types shown in Table 15.14 suggests a total river survey length of 875m which is in excess of the true survey length of 740m; this is due to separation of some sections of the channel into two adjacent sections clearly separable by habitat type (**Figure 15.2**), resulting in the recording of two channel lengths over the one section.

The overall analysis indicates that the survey reach consists largely of *Holding* water of variable quality (Grade 1 to 3) at 57.1% of the total survey area. *Nursery* habitat accounts for most of the remainder (40%), but is generally of lower quality (Grade 3). There are two significant areas of *Spawning* gravel.

Table 15.14: Classification of salmonid habitat in the Shimna survey reach

Habitat type/grade	Nursery			Holding			Spawning			Unclass-ified	Total
	N1	N2	N3	P1	P2	P3	S1	S2	S3		
Length (m)	0	103	289	181	146	131	8	18	0	0	875
		391			459			25			
Area (m^2)	0	978	2,898	2,805	1,081	1,646	128	158	0	0	9,693
		3,875			5,533			285			
Area (%)	0.0%	10.1%	29.9%	28.9%	11.2%	17.0%	1.3%	1.6%	0.0%	0.0%	100%
		40.0%			57.1%			2.9%			

15.4.3.5 Tullybrannigan River

The survey commenced approximately 125m upstream of the Beers Bridge on Bryansford Road (**Figure 15.2**); this upper section of river consists of a series of riffles and glides, all characterised as *Nursery* habitat. This *Nursery* reach extends downstream of the bridge for approximately 30m but the remainder of the channel is significantly impacted by the boating lake impoundment which has resulted in a deep slow-flowing reach of *Holding* water.

The analysis of habitat types shown in Table 15.15 indicates that this reach is dominated by *Holding* water (70.7%) of low/moderate quality (Grade 2/3), with the remainder (29.3%) classified as *Nursery* habitat, also of low/moderate quality (Grade 2/3), and mostly upstream of the area of the proposed works.

Table 15.15: Classification of salmonid habitat in the Tullybrannigan survey reach

Habitat type/grade	Nursery			Holding			Spawning			Unclass-ified	Total
	N1	N2	N3	P1	P2	P3	S1	S2	S3		
Length (m)	0	50	130	0	155	41	0	0	0	0	376
		180			196			0			
Area (m^2)	0	220	980	0	2,325	578	0	0	0	0	4,103
		1,200			2,903			0			
Area (%)	0.0%	5.4%	23.9%	0.0%	56.7%	14.1%	0.0%	0.0%	0.0%	0.0%	100%
		29.3%			70.7%			0.0%			

15.4.3.6 Juvenile Fish Stocks

The fish stock survey was carried out on 31 July 2018 at five sites located on the Shimna and Tullybrannigan rivers in the area of the works. Salmon and trout were present in both rivers, with trout in the majority in the Tullybrannigan, and salmon in the majority in the Shimna. Other species detected were eels and flounder.

15.4.3.6.1 Population Age Structure

The age structure of the trout and salmon populations was verified by constructing separate length frequency distributions for each species to verify age estimation from fish size (fork length) (**Plate 15.4**). The survey catch was dominated by first year fish (Age 0) with a tight cluster around a single mode for both trout and salmon. Only a single Age 1 fish, a trout, was detected in this methodology which is aimed at Age 0 fish and focusses on shallow riffle habitats.

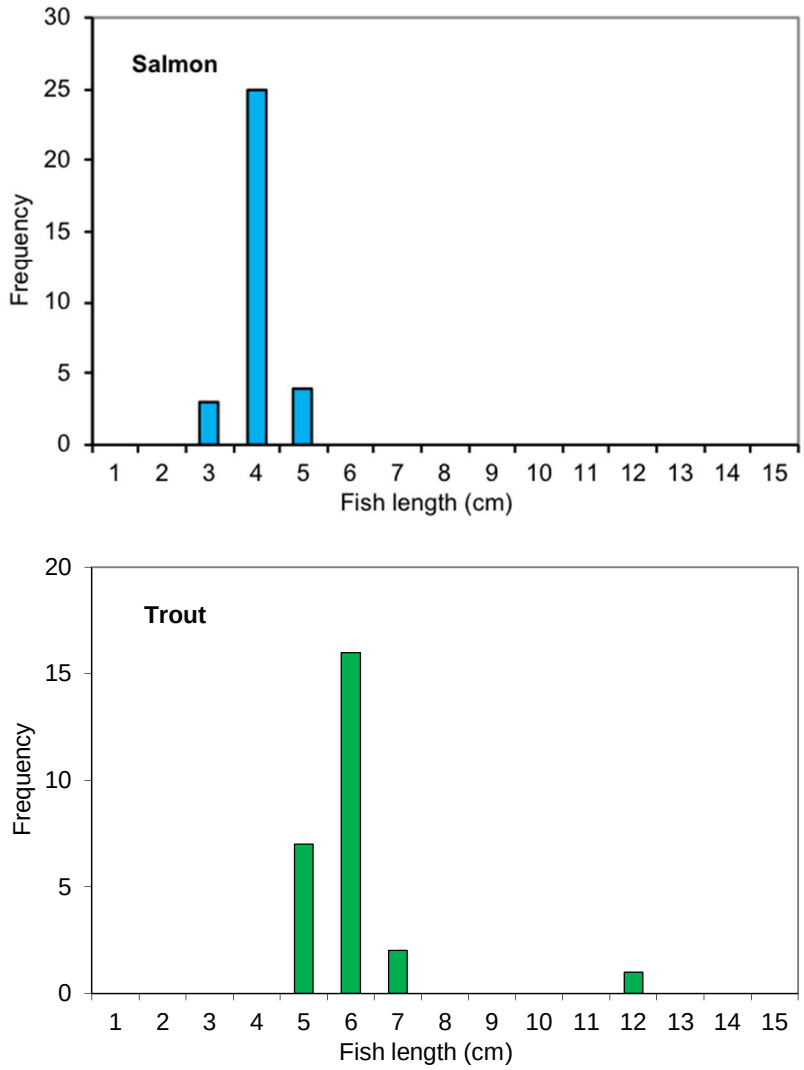


Plate 15.4: Length frequency distributions of salmon and trout caught during juvenile fish stock survey

15.4.3.6.2 Distribution & Abundance

Summary results of the semi-quantitative survey are shown in Table 15.16, the numbers having been adjusted to allow for any fish observed but not captured and identified. The Abundance Index is applied to each site based on the separate indices developed for salmon by Crozier and Kennedy (1994), and for trout by Kennedy (1984 *pers comm.*; Table 9.3).

Table 15.16: Summary results of electrofishing survey indicating adjusted numbers and age of trout and salmon caught at survey sites

Site	River	Control/ Impact	Salmon			Trout		
			Age 0	Age 1	Abundance Index	Age 0	Age 1	Abundance Index
1	Tullybrannigan	Control	4	0	Poor	9	0	Good
2	Tullybrannigan	Impact	7	0	Fair	12	1	Good
3	Shimna	Control	128	0	Excellent	0	0	Absent
4	Shimna	Impact	0	0	Absent	0	0	Absent
4a	Shimna	Impact	96	0	Excellent	28	0	Excellent

These observations demonstrate that trout and salmon spawn in the lower reaches of both rivers, although there was an absence of trout from the Shimna control site (Site 3). No salmonids were detected at Site 4 which was the impact site for the physical habitat survey; habitat at this location was generally unsuitable for salmonids and possibly intermittently subject to brackish conditions due to tidal influences. Juvenile flounder and stickleback were detected at this site. However, an additional site (Site 4a) was surveyed where habitat was more suitable approximately 200m upstream of Site 4.

These densities of juvenile salmonids are not representative of the two rivers as a whole; salmon spawning tends to be clustered at the lower end of the system, while trout spawning is more evenly distributed throughout the catchment (R Kennedy, *pers. comm.*). It has been noted that a number of large autumn salmon often spawn in the lower reaches of the main channel (R Kennedy, *pers. comm.*), and this may have given rise to the very high densities of Age 0 salmon at Sites 4 and 5, both exceeding the threshold for an Abundance Index of *Excellent*.

15.5 Predicted Impacts

15.5.1 Do-Nothing Scenario

Under the Do-Nothing scenario, it is not envisaged that there would be any perceptible change in the aquatic ecology and fisheries habitat of the water environment. The measures currently implemented or proposed as part of the '*South Down Local Management Area (LMA) Action Plan and Update*' (2013) would continue with the objective of eventually achieving GEP within the Shimna River waterbody (UKGBNI1NE050505110) catchment area. The measures to improve the status of this waterbody would naturally serve to improve its fisheries habitat quality.

15.5.2 Operation

The potential for any impacts would be significantly reduced during the operational phase with the construction process complete, flood defences in place, and a reduced requirement for any hazardous materials on-site. Potential impacts are discussed under the following headings:

15.5.2.1 Loss of habitat in the Tullybrannigan River

Construction of the piling platform in the Tullybrannigan reach would involve deposition and compaction of granular material on the riverbed; although the platform would be removed upon completion of the works, the underlying bed materials would remain compacted and therefore compromised in terms of fish production. At present, there is an area of moderate quality spawning and nursery habitat in the initial 30m stretch immediately downstream of Beers Bridge; this reach is currently inhabited by juvenile trout and salmon, and eels. Long-term loss of this area of habitat would represent an impact of ***Minor*** magnitude.

15.5.2.2 Removal of bankside tree cover

Concerns had been raised in correspondence with the Shimna Angling Club regarding removal of bankside tree cover to facilitate construction of the flood defences and it was stated that the resultant light penetration could have potential impacts on trout and salmon stocks. However, immediate bankside tree cover would be retained in the riparian zone throughout the extent of the works on the Shimna; trees would be removed from the left bank of the Tullybrannigan in the area of the works but this, for the most part, is a less sensitive reach. In addition, there is no intention to artificially illuminate the flood defences.

The vast majority of the existing riparian bankside vegetation would be retained and, as there would be no perceptible change in light or shading of the river, the impact would be ***Negligible***.

15.5.2.3 Access to river for recreational angling

Scheme operation would have no significant bearing on the usage of this stretch of the Shimna River from an angling perspective as all banks, upstream and downstream of New Bridge would remain

accessible with scheme implementation. The greatest risk of reduced access to the river would be on the south bank, upstream of New Bridge, as the flood wall would be located closest to the river's edge for 42m. In all other locations, the flood wall would be set well back from the river. A new pathway would be incorporated adjacent to New Bridge to maintain pedestrian access into Tipperary Wood, and has been designed taking into account the Disability Discrimination Act and guidance from the Sensory Trust. The scheme would also include two new re-graded paths over the grass mound at Islands Park carpark to maintain public access similar to the current situation, and would meet the same requirements.

Any impacts relating to public access would be of ***Negligible*** magnitude.

15.5.3 Construction Impacts

The potential for impacts on fisheries and aquatic habitats during the construction phase is mainly associated with ground disturbance and the entrainment of sediments in surface water run-off. Other potential impacts would be associated with construction of the piling platform and temporary crossing in the Tullybrannigan River which would include obstruction of fish passage, and compaction of the riverbed with consequent loss of fish. Noise and vibration from sheet piling procedures could have a negative effect on fish stocks, particularly during key migration periods. There are also potential impacts from the accidental spillage of hazardous substances (oil and fuel) used in the construction process.

15.5.3.1 Sediment release and entrainment

Fine sediment (grain size <2mm) is potentially a major cause of environmental impacts during river engineering schemes, and is associated with clearly defined negative impacts (Newcombe and Jensen, 1996; Turley *et al*. 2014). Sensitive fish species such as brown trout and Atlantic salmon are highly vulnerable to suspended and deposited sediment in spawning and nursery habitats (Kemp *et al.* 2011). In spawning gravels, incubating salmonid eggs require good water circulation to provide oxygen and remove waste products. As deposited fine sediment content increases, gravels become embedded, resulting in restricted water circulation and reduced egg and alevin survival (Cowx and Welcome, 1998). After emergence, juvenile salmonids (fry) disperse downstream to suitable nursery rearing habitat generally within 100m (Kennedy, 1984), often in faster flowing riffles/ runs, where they establish feeding territories and compete for food. Suspended sediment can lower water clarity leading to reduced prey capture efficiency and may affect respiration rates by clogging of gills (Kemp *et al*. 2011). Deposited sediment can reduce habitat complexity and quality by in-filling of substrate, thus reducing territory size leading to increased aggression and ultimately lower carrying capacity. Deposited fine sediment can also indirectly affect growth and survival of juvenile salmonids by reducing the quality of habitat for preferred invertebrate prey species (Suttle *et al*., 1994).

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 are also more mobile than sessile eggs or juvenile stages, and thus more capable of avoiding adverse local conditions (Kemp *et al*. 2011).

Freshwater benthic macroinvertebrates are also an important component of river ecosystems, acting both as sentinels of general water and habitat quality, and as an important food resource for higher trophic levels such as fish and birds. Pulses of fine sediment can cause behavioural drift, whereas excessive fine sediment can reduce the quality of physical habitat by smothering and blocking of interstitial spaces and water flow (Allan, 1999). 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; Matthaei *et al*. 2006; Kemp *et al.* 2011).

Sediment release and entrainment can also increase the risk of nutrient addition and alterations in channel morphology and hydrology (Levesque and Dube, 2007; Kelly, 2015). For example, excavated bank material or soils associated with the construction process could increase inputs of sediment-bound phosphorus, which could negatively affect aquatic biota by causing excessive algal and macrophyte growth, and depressed oxygen levels.

Fine sediment is partly 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 is specified for salmonid 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 (UKTAG, 2010). However, there is no national environmental standard or guideline for deposited fine sediment in the UK. Fine sediment cover above a threshold of 20% bed cover, based on recommendations in New Zealand by Clapcott *et al*. (2011), and published research (e.g. O'Connor & Andrew,1998; Kemp *et al.* 2011), provides a general indication of increasing risk for both invertebrates and salmonids.

Potential sources of fine sediment during the construction phase would include:

- construction and removal of piling platform in the Tullybrannigan River;
- construction and removal of temporary crossing in the Tullybrannigan and associated movement of plant machinery;
- soil and vegetation clearance;
- plant movement along river banks; and
- reinstatement of bank soils and vegetation.

Significant sediment run-off would have the potential to alter feeding efficiency and respiration, and cause behavioural avoidance; such impacts would be of ***Minor*** magnitude and have been attributed to fish adaptation to high natural levels of sediment (e.g. high rainfall events; Levesque and Dube, 2007). However, severe or persistent sediment run-off could lead to losses of juvenile fish and invertebrates and would result in an impact of ***Moderate*** magnitude, notably in the Shimna reach which contains significant stocks of juvenile salmon.

15.5.3.2 Loss of habitat and associated fish mortality

Construction of the piling platform in the Tullybrannigan reach would cover the existing riverbed with compacted granular material over a channel length of approximately 140m leaving an open channel of 3m to carry the river flow in normal conditions of discharge. Assuming the piling platform has an average width of 10m would result in loss of habitat over an area of 1,400m^2. In general, this reach is of low quality and value to the fishery in terms of spawning and nursery grounds, but the initial 30m stretch immediately downstream of Beers Bridge is of moderate quality and is inhabited by juvenile trout and salmon, and eels. When the construction materials are deposited, this area of habitat would be lost for the duration of the scheme in terms of available habitat for fish production. Moreover, any fish present in the reach when the platform is constructed would in all probability be crushed as the granular material is deposited and compacted on the riverbed.

Installation of the temporary crossing to facilitate access to the platform would have similar impacts in terms of habitat loss and fish mortality.

The Tullybrannigan reach was assessed as of High sensitivity due to the presence of juvenile salmon indicating a level of spawning by adult fish in the most upstream area of the reach. However, as it is a reach of moderate/ low overall quality with localised fish distribution, the impacts are assessed as being of ***Minor*** magnitude.

15.5.3.3 Obstruction of fish passage

Construction of the temporary river crossing of the Tullybrannigan reach for access to the piling platform could result in temporary blockage of the channel, or flow conditions unsuitable for fish movement; for example, if the flow is concentrated into a narrow, high velocity stream or if the temporary structure involved a sudden change in bed level requiring fish to ascend a perched pipe or sill. Either eventuality would have the potential to obstruct fish passage for resident or migratory life-stages of salmon, trout or eels. This would be of particular significance were it to occur in late summer through autumn which would coincide with the main period of upstream migration for adult salmon and sea trout.

The magnitude of impact would depend on the duration of obstruction and the time of year. Short-term obstruction of the Tullybrannigan may cause localised population effects and would have an impact of ***Minor*** magnitude. Longer duration obstruction during the spawning migration period could prevent any spawning in this tributary for the year and could therefore have an impact of ***Moderate*** magnitude.

15.5.3.4 Noise and vibration

The potential effects of noise and vibration associated with the construction works have been discussed in Section 12 where it is noted that the driving of sheet piling has the greatest potential to produce an impact, particularly where sheet piling is required in close proximity to the river. For the current project, the flood defences would require approximately 525m of sheet piling within 25m of the Shimna and 140m of sheet piling within 25m of the Tullybrannigan. The area of the Shimna potentially affected is an important migratory route for salmon, sea trout and eels; it is also a significant spawning and nursery reach for trout and salmon as demonstrated by the *Excellent* abundance of juvenile fish detected during the survey. The Tullybrannigan reach is generally of lower sensitivity but has a limited area of spawning and nursery habitat at Beers Bridge.

Effects on fish migrations and spawning activity

The effects of pile driving on fish have been reviewed by Hastings & Popper (2005) who report that there have been no definitive studies on this issue and therefore no clear guidelines on likely impacts, but a limited number of grey literature reports note that different species of fish can be killed within close range of pile driving activity (Abbott & Bing-Sawyer 2002; Caltrans 2004). On the other hand, these reports and other investigations (Nedwell *et al*. 2003; Abbott 2004), suggest that further from the source, fish mortalities are unlikely. Similarly, Parvin *et al*., (2007) state that during pile driving in a riverbed, direct physical injury to fish is only likely in the immediate locality of the activity.

Hastings & Popper (2005) report that there is no reliable information available on the potential non-lethal effects of pile driving on fish. However, another study by Marty (2004) using full histological preparation and procedures on fish held in cages 10m from pile driving activity, showed that there was no damage to tissue and internal organs.

Salmon are relatively insensitive to sound (Nedwell *et al*, 2003), responding only to low frequency sounds in the frequency range <1 - 300Hz (Hawkins & Johnstone, 1978) with best sensitivity of 100dB at 150Hz, although they do have good sound frequency and intensity discrimination, and can discriminate sounds of different frequencies and levels over ambient noise (Hawkins & Johnstone, 1978).

A study by Nedwell *et al.* (2003) looked at the effects of waterborne sound from underwater impact and vibro-piling on brown trout in cages in Southampton Water. (Brown trout were used as a model for salmon, which were the species of interest but were not readily available). No obvious signs of trauma that could be attributed to sound exposure were found in any fish examined, and no increase in activity or startle response was seen with vibro-piling. During impact piling, the noise at the nearest cages reached levels at which salmon were expected to react strongly, but the brown trout showed little reaction.

In another study, pile driving associated with the removal and reconstruction of a harbour jetty adjacent to an important Atlantic salmon river in Scotland was monitored by Hawkins (2006), the main concern again being the impact of resultant noise on salmon migrating through the lower part of the river estuary. Impact piling was found to generate high sound levels in the water which could have been detected by salmon at considerable distances from the source. It was concluded that the sound pressure levels (SPLs) and sound exposure levels (SELs) were unlikely to have killed fish, but close to the pile-driver would have been high enough to injure or induce hearing loss in some species of fish. As salmon could not be observed during the exercise, it was not possible to determine whether they reacted adversely to the noise generated, but there was a risk that their upstream migration may have been delayed or prevented with consequent effects upon spawning populations.

Therefore, although salmon are relatively insensitive to sound, it seems likely that the noise levels generated using impact piling methods could be detected by fish at some distance from the source.

Within the confines of the river channel, this could interfere with migrations of smolts to sea during April/May and returning adult fish from September through to December. Any effects are likely to be sub-lethal and would potentially delay migration and/or interfere with spawning activity in the locality; in this sense, the impacts would likely be temporary and would not eliminate completely these key phases of the life cycle. Potential impacts on fish migrations and spawning are therefore considered to be of ***Moderate*** magnitude.

Effects on salmonid eggs

Mechanical shock is a well-documented causative factor for mortality during the salmonid egg incubation stage following fertilisation, when sensitivity is extremely high (Crisp, 1993). Vibro-piling would have the potential to cause some vibration, but the mechanical shock associated with driven piling methods is a more likely cause of impact on eggs because of the requirement for repeated percussive blows. Indeed, it has been shown that pile driving and other activities such as egg transport and handling in fish culture facilities, and controlled explosions during mining and quarrying pile driving, are factors that have caused egg mortality (Crisp, 1993; Jensen, 2003).

It is concluded that the potential impact of impact piling *on salmonid eggs* would be of ***Moderate*** magnitude.

15.5.3.5 Release of other pollutants

The construction works on the river banks and within the channel in the case of the Tullybrannigan, pose a risk of spillage of diesel, petrol, oils and lubricants associated with plant use and liquid storage. Any use of concrete also poses a risk to aquatic species such as invertebrates and fish. Crossing of temporary flumes/ bridges also poses a risk of spillage of such pollutants. Oils and petroleum in particular can have large impacts on aquatic species, and depending on the extent of the incident, a spillage may reduce respiration rates by altering oxygen exchange at the water-air interface or cause complete elimination of invertebrates and fish from streams (Mason, 1997). In addition, emulsifiers and dispersants used to remove oil are highly toxic to fish and may also increase their susceptibility to other toxic compounds. It is therefore expected that chemical spills could potentially cause impacts of ***Major*** magnitude in the Shimna and of ***Moderate*** magnitude in the Tullybrannigan; these effects are greater than would be expected from sediment run-off because of direct toxicity and environmental persistence.

15.6 Mitigation & Enhancement Measures

15.6.1 Construction

15.6.1.1 Sediment release and entrainment

Measures to address sediment release and entrainment are thoroughly described in Section 13 (Drainage & the Water Environment), and are summarised below:

Construction Environmental Management Plan

As detailed in Section 13 (Drainage & the Water Environment), the Construction Environmental Management Plan (CEMP) must include an Erosion Prevention and Sediment Control Plan which would aim to minimise erosion by reducing disturbance and stabilising exposed materials. The CEMP should also consider control measures to minimise any release of mobilised sediment which may occur, despite the erosion control measures.

Managing Runoff and Silty Water

Mitigation measures to minimise the generation of silt-laden runoff are also outlined in Section 13 and include:

- Planning of site works so that activities likely to generate silt-laden runoff are carried out during drier months (if possible), and erosion of surface soils is controlled;

- Seasonal weather patterns should be taken into consideration when programming and planning construction activities;
- Attenuation measures should be designed to cope with one-off extreme precipitation events so that they cannot be overwhelmed resulting in polluted runoff reaching the main watercourse;
- Stockpiles and areas of exposed ground should be kept to a minimum, to reduce sediment runoff. They should be located well away from drains and watercourses (by a minimum distance of 10m where the land is flat, and further if there is a slope to a watercourse), stabilised as soon as possible (e.g. seeded or geotextile mats), and bunded by earth or silt fences (if required) at the toe of the stockpile to intercept silt-laden runoff during rainfall events;
- Stockpiles shall not be located where there is a steep slope towards a watercourse;
- Existing vegetation should be retained where possible to stabilise soil and prevent erosion. Areas where vegetation clearance is required should be kept to a minimum, and the works divided into phases, with seeding and planting of the phases that are complete;
- A minimum of a 10m vegetative buffer shall be maintained adjacent to watercourses except where works are specifically required to the watercourse e.g. Tullybrannigan; and
- Vehicle/ plant access crossings of watercourse shall be minimised using designated crossing points and existing road infrastructure only (single temporary crossing in the Tullybrannigan). Mud shall be controlled at entry and exits to the site using wheel washes and/or road sweepers.

15.6.1.2 Loss of habitat and associated fish mortality

Timing of works

Construction of the piling platform in the Tullybrannigan should be avoided when sensitive life-stages are present (incubating eggs/ fry). Overlap across life-stage and species migration periods precludes a period when there is a zero risk. However, DAERA require that in-stream works are conducted between 01st May and 30th September to avoid the more critical salmonid spawning season and egg incubation phases, 01 October – 30 April (DAERA, 2011).

Fish rescue

A fish rescue and re-location exercise would be required in the Tullybrannigan reach immediately prior to construction of the piling platform to remove any fish present and prevent fish mortalities likely to result from the deposition and compaction of granular materials in the channel. The fish rescue operation would be carried by an approved contractor using electric fishing techniques; the fish would be re-located a sufficient distance upstream of the works reach. This operation would require Section 14 authorisation under the Fisheries Act, 1966, which would be issued by DAERA Inland Fisheries.

The temporary loss of usable habitat in this reach is minimal and could not be mitigated during the construction phase.

15.6.1.3 Obstruction of fish passage

The temporary crossing required in the Tullybrannigan reach from the south bank to the piling platform would consist of 2 or 3 large diameter pipes embedded in the river bed according to the UK guidelines for designing culverts to maintain fish passage (Balkham *et al*. 2010), with the following key points which are relevant to fish passage:

- Avoidance of a significant drop in water level at the inlet or outlet;
- Provision of adequate flow depth for fish passage;
- Provision of a natural bed; and
- Avoidance of a local increase in flow velocities.

The temporary crossing would therefore be installed so that water depth and flow velocities would be as similar as possible to the main river channel, and approved by DAERA Inland Fisheries which has

also issued specific guidance on protection of fisheries during river construction works (DAERA, 2011).

15.6.1.4 Noise and vibration

Vibro-piling

Sheet piling should be carried out by non-percussive methods such as vibration or vibro-piling to reduce the potential for generation of noise and vibration and the potential impacts on fish migrations, spawning activity and fish egg survival.

Timing of works

Piling operations within 25m of the channel at sensitive locations (e.g. spawning areas on the Shimna) should, if possible, be avoided when sensitive life-stages are present (incubating eggs/ fry). Overlap across life-stage and species migration periods precludes a period when there is a zero risk. DAERA require that in-stream works are conducted between 01st May and 30th September to avoid the more critical salmonid spawning season and egg incubation phases, 01 October – 30 April (DAERA, 2011). This would also largely avoid the peak period of adult salmon and sea trout runs in the Shimna, typically September to December.

15.6.1.5 Release of other pollutants

Measures to minimise accidental spillage and the release of pollutants are outlined in Section 13 and include:

- Storage of oils and diesel, along with the general maintenance and re-fuelling of plant, should be restricted to impermeable bunded areas with a minimum 110% storage capacity and remote from surface waters or areas where any spillages could easily reach a surface water.
- All hazardous substances on-site shall be controlled in accordance with The Control of Substances Hazardous to Health Regulations (Northern Ireland) 2003 (as amended) (COSHH Regulations).
- Refuelling of plant and machinery shall take place at least 10m away from watercourses using a mobile fuel bowser and restricted to designated areas on hard standing. Vehicles must not be left unattended during refuelling operations and fixed plant shall be self-bunded. All water runoff from designated refuelling areas shall be channelled to an oil separator or an alternative treatment system prior to discharge.
- Spill kits and oil absorbent material must be carried by mobile plant and located at vulnerable locations.
- Care must be taken whilst using shuttering oils when preparing formwork.
- An Emergency Response Plan shall be prepared by the appointed Contractor and included as part of the CEMP, and construction workers trained to respond to spillages.
- Concrete mixing must be undertaken in designated impermeable areas, at least 10m away from a watercourse or surface water drain to reduce the risk of runoff entering a watercourse.
- Equipment, batching and ready-mix lorry washing and cleaning should be washed-out on site into a designated area that has been designed to contain wet concrete / wash waters.

In addition, the Contractor would be required to properly assess risk and devise mitigation measures for those activities not already covered by statutory requirements. Where possible, risks would be designed-out of the programme of works.

15.6.2 Operation

15.6.2.1 Loss of habitat in the Tullybrannigan River

Loss of spawning and nursery habitat in the initial 30m stretch downstream of Beers Bridge due to compaction of the riverbed through construction of the piling platform could be mitigated through the

construction of a two-stage channel and enhancement of the riverbed in this reach. This would involve retention of a section of the uppermost 30m of the piling platform with restriction of normal river flows to a 4-5m wide low flow channel adjacent to the south bank. Materials used in construction of the piling platform in this limited 30m reach should be similar to the local gravel/ cobble/ sand substrates existing upstream of the bridge (the remainder of the platform may be of "suitable granular materials" as proposed in the works plan). In addition, the low flow channel should be enhanced through the addition of cobble/ boulder materials to develop a more irregular substrate which would increase the carrying capacity for juvenile salmonids. Restriction of the river to this low-flow channel would increase the flow rate therein, which would reduce settlement of fine sediment and would further add to the carrying capacity for juvenile fish.

The remainder of the area subject to piling platform would not be suitable for enhancement due to the influence of the impoundment and its effect on flow and water depth.

15.6.2.2 Removal of bankside tree cover

As stated, the vast majority of the existing riparian bankside vegetation would be retained and a Negligible impact is predicted. However, a programme of re-planting would in any case be initiated in the areas cleared of trees.

15.6.2.3 Access to river for recreational angling

No mitigation would be required with regard to access.

15.7 Residual Effects

Potential impacts of the Proposed Scheme on fisheries and aquatic ecology in the Shimna and Tullybrannigan rivers were measured against proposed mitigation measures, as a means of assessing the residual effects associated with the scheme. It is the residual effects of the scheme that most accurately reflect the overall predicted impacts on fisheries and the aquatic environment during the construction and operation phases.

15.7.1 Construction

15.7.1.1 Sediment release and entrainment

Following implementation of the full range of recommended mitigations, the potential for sediment run-off would be largely eliminated and would be reduced from Minor (Tullybrannigan) or Moderate (Shimna) magnitude to ***Negligible*** and of ***Neutral significance.***

15.7.1.2 Loss of habitat and associated fish mortality

Fish rescue and relocation would prevent any fish mortality in the Tullybrannigan reach and, although the temporary loss of habitat could not be mitigated, the overall impact would reduce to a ***Negligible magnitude*** of ***Neutral significance***.

15.7.1.3 Obstruction of fish passage

Installation of the recommended temporary crossing allowing for fish passage would result in a residual impact of ***Negligible magnitude*** and of ***Neutral significance***.

15.7.1.4 Noise and vibration

Adoption of recommended non-percussive piling techniques and judicious timing of the works in sensitive areas would result in predicted residual impacts of ***Negligible magnitude*** and of ***Neutral significance*** with regard to fish migrations, spawning activity and fish egg mortality.

15.7.1.5 Release of other pollutants

Adoption of the specified measures to minimise accidental spillage and the release of pollutants would result in predicted residual impacts of ***Negligible magnitude*** and of ***Neutral significance***.

15.7.2 Operation

15.7.2.1 Loss of habitat in the Tullybrannigan River

Enhancement of the river channel in this area would result in positive residual impact predicted to be of ***Minor positive magnitude*** and of ***Slight/Moderate significance***.

15.7.2.2 Removal of bankside tree cover

With no mitigation required, the residual impact would remain of ***Negligible magnitude*** and of ***Neutral significance***.

15.7.2.3 Access to river for recreational angling

With no mitigation required, the residual impact would remain of ***Negligible magnitude*** and of ***Neutral significance***.

15.8 Summary & Conclusions

This section of the Environmental Statement assessed the impact of the Proposed Scheme on the fisheries and aquatic ecology features of potentially impacted reaches of the Shimna and Tullybrannigan rivers.

The Shimna is one of seven Index Rivers monitored by the Department of Agriculture, Environment & Rural Affairs (DAERA) to provide the basis for salmon management throughout Northern Ireland. It is also a renowned recreational fishery with stocks of salmon and sea trout.

Both the Shimna and Tullybrannigan reaches were assessed as of at least *High* sensitivity due to the presence of juvenile salmon in significant numbers, but the Shimna reach was elevated to *Very High* sensitivity due to its ASSI designation.

The risk of potential negative impacts is associated mainly with the construction phase of the scheme, although there is some potential for negative impacts during the operational phase.

Impacts during the construction phase were assessed with regard to sediment run-off and the release of other pollutants, loss of river habitat and resultant fish mortality, and noise and vibration from construction of flood defences. Similarly, impacts during the operation phase related to loss of river habitat, removal of bankside tree cover and reduced access for recreational angling.

It was concluded that where potential negative impacts were identified, they would be mitigated in the project design phase through inclusion of a range of measures which would ensure that the scheme would have a neutral effect on fisheries and the aquatic environment in general.

16. Conclusions

16.1 Introduction

This section outlines the conclusions of the Proposed Scheme and the main likely significant cumulative effects and is structured as follows:

- Assessment of Cumulative Environmental Effects – an assessment of main likely significant cumulative effects;
- Summary of Environmental Effects – a summary section of the findings of each technical assessment; and
- Schedule of Environmental Commitments – a summary of proposed mitigation measures.

16.2 Assessment of Cumulative Environmental Effects

As detailed in Sub-Section 1.3.3, the ES should include such information referred to in Schedule 2A to the Drainage Order 1973, as substituted by The Drainage (Environmental Impact Assessment) Regulations (Northern Ireland) 2017, that is reasonably required to assess the environmental effects of any proposed drainage works and which the Department can, having regard in particular to current knowledge and methods of assessment, reasonably be required to compile. This includes a description of the likely significant effects of the works on the environment resulting from, inter alia, the accumulation of effects with other existing or approved works, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources.

Cumulative effects are the total effect caused by the sum of past, present and reasonably foreseeable future actions. They can result from incremental changes caused by interactions between effects arising from a scheme and/or interaction with the effects from other developments. With regards to the Proposed Scheme, cumulative effects are considered in the following ways:

- Multiple effects from the Proposed Scheme, and from different schemes (of similar or different types), upon the same resource; such as the effect on a single community of noise from several sources or landtake and damage due to hydrological change, affecting several sites of the same habitat; and
- Incremental effects arising from a number of small actions, including ongoing maintenance operations, having developed or developing over time.

There are two types of cumulative impact that are to be considered in the EIA of the Proposed Scheme. These are:

- Cumulative impacts from a single project (i.e. Interaction of Impacts); and
- Cumulative impacts from different projects (in combination with the Proposed Scheme being assessed).

16.2.1 Defining the Study Area

For the assessment of cumulative effects, the spatial boundary of the receptor/resource with potential to be affected directly or indirectly needs to be defined. As the study area has been set for each individual topic, the assessment of cumulative effects has adopted the same spatial extent of the study areas addressed in each of the respective technical assessments.

16.2.2 Determining Significance of Cumulative Effects

When considered in isolation, the environmental effects of the Proposed Scheme upon any single receptor/resource may not be significant. However, when individual effects are considered in combination, the resulting cumulative effect may be significant. The focus in assigning significance to

cumulative effects should be determined by the extent to which the impacts can be accommodated by the receptor/resource.

Thresholds (limits beyond which cumulative change becomes a concern) and indicative levels of acceptable performance of a receptor/resource may also aid the assessment process.

The following factors should be considered in determining the significance of cumulative effects:

- Which receptors/resources are affected?
- How will the activity or activities affect the condition of the receptor/resource?
- What are the probabilities of such effects occurring?
- What ability does the receptor/resource have to absorb further effects before change becomes irreversible?

The cumulative effects are assessed against the significance criteria outlined in Table 18.1.

Table 16.1: Determining Significance of Cumulative Effects

Significance	Effects
Severe	Effects that the decision-maker must take into account as the receptor/resource is irretrievably compromised.
Major	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.
Minor	Effects that are locally significant.
Not Significant	Effects that are beyond the current forecasting ability or are within the ability of the resource to absorb such change.

16.2.3 Cumulative impacts from a single project (i.e. Interaction of Impacts)

The interaction of impacts arises from the combined action of a number of different environmental topic-specific impacts upon a single receptor/resource (e.g. the removal of vegetation would have a landscape, visual and ecological effect and an individual residential receptor can be affected by air, noise and visual impacts, etc.).

The technical assessments in this ES (Sections 7 – 15) have assessed the likely significant interacting impacts within each section. During the assessment process, co-ordination took place between assessment specialists to ensure that interacting impacts were identified, assessed and, where appropriate, mitigated. Table 16.2 outlines the likely significant interacting impacts and sections where they have been assessed.

Table 16.2: Interaction of Impacts on the Proposed Scheme

	Air Quality& Climate	Cultural Heritage	Biodiversity – Terrestrial Ecology,	Landscape & Visual	Population & Health	Noise and Vibration	Drainage & the Water Environment	Geology & Soils	Biodiversity – Fisheries & Aquatic Ecology
Air Quality & Climate			✓		✓				
Cultural Heritage				✓			✓	✓	
Biodiversity – Terrestrial Ecology	✓			✓	✓	✓	✓	✓	✓
Landscape & Visual		✓	✓		✓				
Population & Health	✓		✓	✓		✓			
Noise and Vibration			✓		✓				✓
Drainage & the Water Environment		✓	✓					✓	✓
Geology & Soils		✓	✓				✓		
Biodiversity – Fisheries & Aquatic Ecology			✓			✓	✓		

With reference to Table 16.2, it is evident that considering the nature of the environment affected and the tension between the natural and human environment with the meeting of the riparian corridors of the converging Shimna, Tullybrannigan and Burren rivers (and associated wetlands) with the residential and amenity areas of Newcastle Town that Biodiversity – Terrestrial Ecology, Population & Humana Health and Drainage & the Water Environment would have the greatest interaction of impacts from the combined action of a number of different environmental topic-specific impacts. These have been addressed accordingly within the respective technical sections.

In no case would the interaction of impacts from the combined action of a number of different environmental topic-specific impacts result in a cumulative effect that is any worse than being locally significant. On this basis, the significance of cumulative effect would either not be significant or Minor Adverse at worst.

16.2.4 Cumulative impacts from different projects

Cumulative impacts may arise from the combined effects of a number of different projects, in combination with the project being assessed, on a single receptor/resource. This can include multiple impacts of the same or similar type from a number of projects upon the same receptor/resource.

Projects that should be included in the cumulative impact assessment include:

- Development projects with valid planning permissions, and for which a formal EIA was a requirement or for which non-statutory EIA has been undertaken.

Information on planning applications within the study area was obtained from PublicAccess for Planning Applications Website and has been assessed as appropriate within the Population & Human Health assessment (Section 11) and where necessary throughout other technical sections (i.e. Noise & Vibration (Section 12) and Landscape & Visual (Section 10)).

A review of planning applications online via the PublicAccess Website has confirmed that no potential cumulative impacts can be expected in the local area with existing development or development not yet begun, but for which planning permission exists.

Whilst this project is associated with other flood alleviation schemes which have been constructed in the Newcastle area (i.e. Burren River Flood Alleviation Scheme), there are no other live applications for similar schemes to make this an integral part of a more substantial project.

16.3 Summary of Environmental Effects

Table 16.3 provides a collective summary of the environmental effects described throughout each of the previous technical Sections (7-15), taking into account the effectiveness of measures (where appropriate) to mitigate adverse impacts, thus allowing for the overall significance of effect to be rated. It also provides comments on what the equivalent environmental effect would be if the Proposed Scheme were not constructed. Specifically, the following have been tabulated:

- Description of Predicted Impact (with the Proposed Scheme);
- Mitigation Objective and Commitment;
- Sensitivity / Value of Receptor;
- Duration of Impact (Short / Long-Term);
- Magnitude of Impact (with Mitigation);
- Significance of Effect (with Mitigation); and
- Description of Likely Effects (without the Proposed Scheme).

As Table 16.3 only provides a brief summary of the overall environmental effects, reference should be made to individual technical sections of this ES for further explanation and understanding.

Table 16.3: Summary of Environmental Effects

Impact Item no.	Description of Predicted Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of Impact (Short/Long-Term)	Magnitude of Impact (with Mitigation)	Significance of Effect (with Mitigation)	Description of Likely Effects (without the Proposed Scheme)
	With Proposed Scheme						Do-Nothing
Air Quality (Section 7)							
7.1	The Proposed Scheme would not give rise to operational phase emissions other than those associated with routine maintenance	None proposed.	Sensitive	Long-Term	N/A	Negligible	No perceptible change in local air quality conditions. Air quality in the vicinity of the study area would remain at ambient levels as currently typical of the area
7.2	There would be no significant impact on climate as a result of the Proposed Scheme as it has no energy requirements during operation, and thus there would be no emission impacts.	None proposed.	Sensitive	Long-Term	N/A	Negligible	No perceptible change in climatic conditions
7.3	Potential for nuisance, and health & safety impacts associated with generation of excessive dust, emissions and odour during construction. Approximately 504 properties would be within 200m of the proposed works	Comprehensive measures to reduce dust, emissions and odour impacts to be included and implemented as part of the CEMP.	Sensitive	Short-Term	Imperceptible / Small Adverse	Negligible	No perceptible change in local air quality conditions.
Cultural Heritage (Section 8)							
8.1	Discovery of unknown / unrecorded archaeological heritage within footprint of proposed works and any other areas of topsoil stripping.	Monitoring / stripping / trial-trenching of the area of proposed works. Any discovered archaeology should be recorded prior to removal.	Unknown (Likely Low)	Long-Term	High (potentially)	Moderate Adverse (potentially)	No significant change to the baseline cultural heritage resource

Impact Item no.	Description of Predicted Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of Impact (Short/Long-Term)	Magnitude of Impact (with Mitigation)	Significance of Effect (with Mitigation)	Description of Likely Effects (without the Proposed Scheme)
	With Proposed Scheme						Do-Nothing
8.2	The Proposed Scheme would have a permanent physical impact and impact to setting through flood walls being tied into New Bridge (IHR 03558:000:00)	Clad sheet piles would match existing stonework of bridge while existing vegetation along river bank would be retained screening the flood walls.	Low	Long-Term	Low Adverse	Minor Adverse	No significant change to the baseline cultural heritage resource
Biodiversity – Terrestrial Ecology (Section 10)							
9.1	Pollution or silt laden runoff from the site during construction could potentially enter European designated sites (Murlough SAC, Eastern Mournes SAC, and Carlingford Marine pSPA) via the Shimna River. Any impact on water quality could cause a negative effect on breeding success / winter feeding of selection feature bird species by affecting ability to feed.	Best practice drainage management would be implemented throughout the development process by the Contractor. Pollution Prevention Guidance – Standing Advice (DAERA Planning and Environment, 2016) and Discharges to the Water Environment – Standing Advice (DAERA Planning and Environment, 2017) must be adhered to, and suitably implemented into the CEMP, where relevant.	International	Short-Term (with potential long-term and persistent consequences)	Not Significant	Would not significantly impact the selection features of any of the European sites in the vicinity or beyond.	No significant changes in habitats or habitat condition are likely to occur within the designated site.
9.2	Potential construction phase impacts on Shimna River ASSI and SLNCI comprise water quality impacts, which could cause a negative effect on aquatic features such as salmonid fish. Additional impacts include deposition of dust on foliage of associated riverine habitats, and disturbance of protected	As above. Avoid works during the Salmonid spawning season and egg incubation phases (1 October – 30 April) at waters of fisheries significance. Appropriate site management during in-stream and bank works outside of this period would ensure that the channel remains passable for	National / Local	Short-Term	Not Significant	Would not significantly impact the selection features of the designated site in the vicinity or beyond.	No significant changes in habitats or habitat condition are likely to occur within the designated site.

Impact Item no.	Description of Predicted Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of Impact (Short/Long-Term)	Magnitude of Impact (with Mitigation)	Significance of Effect (with Mitigation)	Description of Likely Effects (without the Proposed Scheme)
	With Proposed Scheme						Do-Nothing
	species via noise and vibration.	migratory Salmonids at all times. The Contractor shall prepare an Air Quality Management Plan (AQMP) and incorporate the relevant mitigation measures within; reflecting the requirements of best practicable means and level of risk.					
9.3	Habitat clearance (including broadleaved semi-natural woodland and dense scrub) is required both within and bordering the Shimna River ASSI boundary and SLNCI. This would result in habitat loss, which includes the spread of invasive species.	As above. Habitat loss should be kept to a minimum where possible. An Invasive Species Management Plan shall be prepared and implemented to prevent the spread of invasive species during construction. It would be included as a sub-plan of the CEMP.	National / Local	Medium-Term (with potential long-term and persistent consequences)	Not Significant	Would not significantly impact the selection features of the designated site in the vicinity or beyond.	No significant changes in habitats or habitat condition are likely to occur within the designated site. Trees and woody vegetation would further mature to provide greater suitability for bats and breeding birds respectively.
9.4	Pollution or silt laden runoff from the site during construction could potentially enter Nationally designated sites (Mournes Coast ASSI and Murlough ASSI) via the Shimna River. Any impact on water quality could cause a negative effect on breeding success / winter feeding of selection feature bird species by affecting ability to feed.	Best practice drainage management would be implemented throughout the development process by the Contractor. Pollution Prevention Guidance – Standing Advice (DAERA Planning and Environment, 2016) and Discharges to the Water Environment – Standing Advice (DAERA Planning and Environment, 2017) must be adhered to, and suitably implemented into	National	Short-Term (with potential long-term and persistent consequences)	Not Significant	Would not significantly impact the selection features of the designated site in the vicinity or beyond.	No significant changes in habitats or habitat condition are likely to occur within the designated site.

Impact Item no.	Description of Predicted Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of Impact (Short/Long-Term)	Magnitude of Impact (with Mitigation)	Significance of Effect (with Mitigation)	Description of Likely Effects (without the Proposed Scheme)
	With Proposed Scheme						Do-Nothing
		the CEMP, where relevant.					
9.5	Vegetation clearance is required across the site; habitat loss would facilitate the construction area of the flood wall itself, but also would facilitate contractor working areas and possible contractor compounds.	Habitat loss should be kept to a minimum where possible. Vegetation clearance should be completed outside of the bird breeding season, or if this is not possible, then an ECoW should first check the area for ecological constraints, especially for nesting birds and roosting bats.	Local	Medium to Long-Term	Significant at Local-County geographic scale	This habitat loss is reversible and would regenerate from surrounding similar habitat. Ample semi-natural woodland would remain in the vicinity of the site.	No significant changes in habitats or habitat condition are likely to occur. Trees and woody vegetation would further mature to provide greater suitability for bats and breeding birds respectively.
9.6	Areas of habitat which would be lost to the scheme contain stands of invasive species. Habitat clearance within 7m of any plant of knotweed (both Japanese and Giant) may result in the further spread of the species within habitat across the site and wider area.	An Invasive Species Management Plan shall be prepared and implemented to prevent the spread of invasive species during construction. It would be included as a sub-plan of the CEMP.	Local	Medium to Long-Term	Significant at Local-County geographic scale	Control of invasive species within the works area.	Invasive Species growth likely to continue unabated.
9.7	Potential otter impacts associated with the operation stage include the loss of otter commuting habitat and potential (terrestrial) breeding sites; otter breeding holts sometimes occur in woodland close to waterbodies/courses. There is also the possibility of severance of habitat connectivity as a result of the proposed wall.	Prescriptive Otter mitigation detailed within Sub-Section 9.6.5.1	Local	Medium to Long-Term	Significant at Local-County geographic scale	Local	The potential value of the subject lands to species of conservation value such as otter would continue, provided that the current landscape management of parkland (of relatively low intensity) was maintained.

Impact Item no.	Description of Predicted Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of Impact (Short/Long-Term)	Magnitude of Impact (with Mitigation)	Significance of Effect (with Mitigation)	Description of Likely Effects (without the Proposed Scheme)
	With Proposed Scheme						Do-Nothing
9.8	Badger is a nationally protected species and they are susceptible to impacts from development such as disturbance or direct impacts on their places of refuge. They are therefore a material consideration during the planning process. There were no badger breeding or resting sites identified within the ZoI of the Proposed Scheme. However, badgers are present in the vicinity, and may establish new setts.	A pre-construction survey for badger must be carried out within the proposed site and accessible environs within the ZoI (i.e. 25 m) immediately prior to works commencing, to determine if any breeding or resting sites have become newly established since the surveys completed in summer 2018. Any areas which are cleared of vegetation in order to facilitate temporary working areas or compounds should be reinstated with like-for-like native planting, thus minimising the impact of habitat severance and loss to badger.	Local	Medium to Long-Term	Significant at Local-County geographic scale	Local - due to the relatively limited nature of vegetation clearance in suitable badger habitat, it is considered that there is ample suitable habitat for badger commuting and foraging both within the site and the wider area	The potential value of the subject lands to species of conservation value such as badger would continue, provided that the current landscape management of parkland (of relatively low intensity) was maintained.
9.9	Two trees of Moderate suitability to host a bat roost, and numerous trees of Low suitability to host a bat roost would be felled in order to facilitate the scheme.	A suitable pre-construction survey (e.g. endoscoping under licence, emergence/re-entry survey) must be carried out immediately prior to felling, in order to inform a suitable mitigation strategy. To compensate for the loss of suitable roost sites, five no. woodcrete bat boxes suitable for bats of the Pipistrellus genus must be erected within the site, mounted on mature trees to be retained in areas away from disturbance and	Local	Medium to Long-Term	Significant at Local-County geographic scale	Local - due to the relatively limited nature of vegetation clearance in suitable bat habitat, it is considered that there is ample suitable habitat for bat commuting and foraging both within the site and the wider area.	The potential value of the subject lands to species of conservation value such as bats would continue, provided that the current landscape management of parkland (of relatively low intensity) was maintained.

Impact Item no.	Description of Predicted Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of Impact (Short/Long-Term)	Magnitude of Impact (with Mitigation)	Significance of Effect (with Mitigation)	Description of Likely Effects (without the Proposed Scheme)
	With Proposed Scheme						Do-Nothing
		prior to work commencing on site. Bat boxes must be erected under the guidance of a suitably experienced ecologist / ECoW.					
9.10	There were no red squirrel dreys identified in the vicinity of the Proposed Scheme. However, despite a lack of survey evidence, red squirrel are known to be present in the vicinity, and may establish new dreys.	A pre-construction survey for red squirrel must be carried out within the proposed site immediately prior to works commencing, to determine if any breeding or resting sites have become newly established since the surveys completed in summer 2018. No further mitigation is recommended.	Local	Medium to Long-Term	Significant at Local-County geographic scale	Not Significant	The potential value of the subject lands to species of conservation value such as red squirrel would continue, provided that the current landscape management of parkland (of relatively low intensity) was maintained.
9.11	As a result of the Proposed Scheme, there would be extensive loss of woodland and scrub nesting habitat.	Vegetation clearance must be restricted to the non-breeding season (i.e. carried out from September to February inclusive). For the avoidance of doubt, it should be noted that birds may nest in grass and low scrub, in addition to trees. Any vegetation clearance work which is required within the bird breeding season must be approved by a suitably experienced ecologist / ECoW, who will make a detailed check of any suitable vegetation for nests prior to	Local	Medium to Long-Term	Significant at Local-County geographic scale	Local - due to the relatively limited nature of vegetation clearance in suitable bat habitat, it is considered that there is ample suitable habitat for birds and foraging both within the site and the wider area.	No significant changes in habitats or habitat condition are likely to occur. Trees and woody vegetation would further mature to provide greater suitability for breeding birds.

Impact Item no.	Description of Predicted Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of Impact (Short/Long-Term)	Magnitude of Impact (with Mitigation)	Significance of Effect (with Mitigation)	Description of Likely Effects (without the Proposed Scheme)
	With Proposed Scheme						Do-Nothing
		vegetation / tree removal, and advise the contractor of any exclusion zones around potential or confirmed nests. A range of bird box styles, suited to various different species found on site are recommended to compensate for the loss of suitable nest sites.					
Landscape & Visual (Section 10)							
10.1	In terms of construction, the landscape effects of the Proposed Scheme would be limited to those associated with the removal of mature vegetation within construction working areas to accommodate the scheme. This would have a direct impact on the tree cover in the area, although the design aims to minimise the effects on riparian vegetation immediately adjacent to the river's edge. The introduction of new, but not uncommon to the area, man-made structures would slightly increase the built-up character. The main receptors of visual effects would be residents of the nearest dwellings with views of the proposed working areas and temporary storage compounds, as well as	Implementation of mitigation measures at construction phase would not significantly reduce the impacts of construction on landscape as the key effects would arise from the removal of vegetation. The protection of existing vegetation to be retained in accordance with BS 5837:2012 and use of existing roads where feasible would minimise landscape effects at construction stage.	Medium Landscape Value of the study area, and the Landscape Susceptibility and Sensitivity to change ranges from Medium-High to High	Medium to Long-Term (Temporary)	Minor Adverse in the wider area and Moderate – Major Adverse within the site itself.	Effective implementation and establishment of the proposed mitigation measures would have a positive impact and help 'soften' landscape and visual effects associated with the Proposed Scheme, particularly for areas located in proximity to the proposed development site. In the medium to long-term, the perception of adverse landscape and visual effects would reduce in tandem with the maturing of proposed planting. Sensitive design of proposed	In landscape terms, if the scheme did not go ahead, the proposed development site would remain as a riverine and amenity area covered with riparian vegetation and susceptible to flooding. In visual terms, available views of the proposed development site would remain similar although changes would occur to existing vegetation due to maturing, pruning or natural decay. Intermittent flooding of houses and amenity areas would have temporary visual effects.

Impact Item no.	Description of Predicted Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of Impact (Short/Long-Term)	Magnitude of Impact (with Mitigation)	Significance of Effect (with Mitigation)	Description of Likely Effects (without the Proposed Scheme)
	With Proposed Scheme						Do-Nothing
	motorists travelling along the road network in the near vicinity of the site. The visual effects would arise as a result of machinery, increased traffic and work carried out in the working areas.					restoration contained within the landscape / restoration plan would gradually integrate the Proposed Scheme into the surrounding environment.	
10.2	In terms of operation, the use of stone cladding to walls, retention of existing vegetation along river banks, and replacement of the removed vegetation would help integrate the Proposed Scheme with the existing environment. The Proposed Scheme would be read as part of the wider landscape where similar embankments and walls are an existing feature.	Ensuring the landscape management programme / restoration plan identified previously is implemented during the lifetime of the Proposed Scheme to protect and reinforce bank side vegetation with the aim of ensuring landscape framework remains dominant; Ongoing landscape maintenance and debris cleaning from river channel and adjacent areas; and Ongoing maintenance and replacement of failing elements within the proposed wall and other associated structures forming part of the scheme.	Medium Landscape Value of the study area, and the Landscape Susceptibility and Sensitivity to change ranges from Medium-High to High	Short-term (temporary)	Minor Adverse in the wider area and Moderate – Major Adverse within the site itself.	The residual effect on the landscape and landscape character, following establishment of mitigation measures, would reduce to Minor Adverse and not significant. The visual effects would reduce in their significance.	As above.
Population & Human Health (Section 11)							
11.1	A total of four private properties would be subject to private land loss impacts as a result property boundary demolition to accommodate the flood walls.	Private land agreements with the landowners currently exist and allow for the disturbance caused due to the installation of the new wall along their	Medium	Long-Term	Minor Adverse	Slight Adverse	No change from existing conditions. Property would remain to be at risk from flooding

Impact Item no.	Description of Predicted Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of Impact (Short/Long-Term)	Magnitude of Impact (with Mitigation)	Significance of Effect (with Mitigation)	Description of Likely Effects (without the Proposed Scheme)
	With Proposed Scheme						Do-Nothing
		property curtilage					
11.2	Proposed Scheme would result in the long-term positive socio-economic impact of improved flood protection (the primary aim of the Proposed Scheme)	The Proposed Scheme is a form of mitigation	High	Long-Term	Moderate – Major Beneficial	Major-Moderate positive significance effects are anticipated.	Flooding and the associated risk of flooding would continue to have detrimental socio-economic impacts upon the study area.
11.3	Proposed Scheme would result in long-term positive impacts from improved flood protection of the residents and visitors to Newcastle from a Health, well-being and safety perspective.	The Proposed Scheme is a form of mitigation	High	Long-Term	Minor Beneficial	Minor-Moderate positive significance effects are anticipated.	Flooding and the associated risk of flooding would continue to have detrimental socio-economic impacts upon the study area.
11.4	No long-term adverse impacts associated with reduced access to greenspace and angling opportunities and enjoyment due to the introduction of flood walls and severance impacts.	The scheme would include installation of picnic tables at Islands Park Carpark. The scheme would also include two new re-graded paths over the grass mound at Islands Park Carpark. These new paths have been incorporated into the Park to maintain public access similar to the current situation.. Similarly, the pathway incorporated to maintain pedestrian access into Tipperary Wood. No permanent lighting would be installed. The setting back of the flood defences from the river's edge also facilitates continued access to this	High	Long-Term	Negligible – Minor Adverse	With mitigation such as careful selection of wall cladding materials, restoration of footways and sensitive re-design of public spaces; result in an anticipated residual impact of minor adverse significance.	No perceptible change.

Impact Item no.	Description of Predicted Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of Impact (Short/Long-Term)	Magnitude of Impact (with Mitigation)	Significance of Effect (with Mitigation)	Description of Likely Effects (without the Proposed Scheme)
	With Proposed Scheme						Do-Nothing
		important riparian corridor.					
Noise & Vibration (Section 12)							
12.1	The Proposed Scheme would not give rise to operational phase noise emissions other than those associated with routine maintenance	None proposed.	Sensitive	Long-Term	N/A	Negligible	There would not be any perceptible change in noise and vibration conditions.
12.2	In terms of construction noise impacts, without mitigation, 4 Receptors would be subject to a Moderate Negative daytime construction noise impact, 10 Receptors subject to a Major Negative daytime construction noise impact and 35 Receptors subject to a Substantial Negative daytime construction noise impact as a result of the worst-case scenario piling operation.	It will be necessary to apply engineering controls at source and utilise a more noise sensitive method of piling to reduce negative impacts. A range of good site practices shall be adopted in order to mitigate construction phase noise and vibration; these would be defined within a Construction Environmental Management Plan (CEMP).	Sensitive	Short-Term	47 Receptors subject to a Negligible construction noise impact; and 2 Receptors subject to a Moderate Negative daytime construction noise impact (consideration shall be given to the use of site or activity boundary acoustic barriers to screen neighbouring receptors).	Based on the likely magnitude of the construction noise impacts and the sensitivity of the identified receptors, the overall significance of construction noise effects is assessed at worst as Minor Negative, assuming the developed mitigation strategy is in place.	There would not be any perceptible change in noise and vibration conditions.
12.3	In terms of construction related annoyance, without mitigation, 4 Receptors would be subject to a Minor Negative daytime construction vibration impact; and 40 Receptors subject to a Moderate Negative daytime construction vibration impact.	It will be necessary to apply engineering controls at source and utilise a more noise sensitive method of piling to reduce negative impacts. A range of good site practices shall be adopted in order to mitigate construction phase noise and vibration; these would be defined within a Construction Environmental	Sensitive	Short-Term	Impacts would be Minor Negative at all receptors.	Based on the likely magnitude of the construction vibration impacts and the sensitivity of the closest identified receptors, the overall significance of construction vibration effects is assessed as Negligible.	There would not be any perceptible change in noise and vibration conditions.

Impact Item no.	Description of Predicted Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of Impact (Short/Long-Term)	Magnitude of Impact (with Mitigation)	Significance of Effect (with Mitigation)	Description of Likely Effects (without the Proposed Scheme)
	With Proposed Scheme						Do-Nothing
		Management Plan (CEMP).					
Drainage & the Water Environment (Section 16)							
13.1	The Proposed Scheme would only require the realignment of one drainage ditch.	Any local drainage discharging to the Shimna River would be fitted with a flap vale to prevent back water flooding. The discharge points or locations would not be altered as part of the scheme, avoiding any hydromorphological impacts associated with modifying or changing outfall locations.	High to Very High	Long-Term	Negligible	Neutral	Under the Do-Nothing scenario, it is not envisaged that there would be any perceptible change in the water environment
13.2	The Proposed Scheme would have the potential to impact upon groundwater by altering flow paths.	Sheet pile walls would be used as a structural component of the flood defences, and would also act as a seepage cut-off, blocking the natural seepage during a flood event from the river and up through the ground.	Medium	Long-Term	Negligible	It is considered that the effect is likely to be very localised and at worst Minor Adverse.	Under the Do-Nothing scenario, it is not envisaged that there would be any perceptible change in the water environment
13.3	The Proposed Scheme would facilitate the through flow of water within the Shimna Catchment. However, in itself, this shall not be a source of emissions that would constitute any perceptible change in terms of biological elements, physiochemical elements, specific pollutants or priority elements.	The containment of flows within the river channel and its functional floodplain would benefit water quality, as polluting substances that may be present in the undefended floodplain would be less likely to be able to enter the watercourse.	High to Very High	Long-Term	Negligible	Minor Beneficial	Under the Do-Nothing scenario, it is not envisaged that there would be any perceptible change in the water environment

Impact Item no.	Description of Predicted Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of Impact (Short/Long-Term)	Magnitude of Impact (with Mitigation)	Significance of Effect (with Mitigation)	Description of Likely Effects (without the Proposed Scheme)
	With Proposed Scheme						Do-Nothing
13.4	Uncontrolled sediment erosion and contaminated silty runoff discharging to surface waters during construction. Excavation and earthworks would have significant potential to contribute to elevated suspended solids in the Shimna River and Tullybrannigan River during construction.	CEMP must include an Erosion Prevention and Sediment Control Plan (submitted to NIEA – PP) prior to commencement of any works. Appropriate site management during in-stream and works adjacent to the Tullybrannigan River and Shimna River outside of the fish migration and spawning period would ensure that the channel remains passable for migratory Salmonids at all times. Construct an impermeable temporary stormwater runoff retention bund with suitable load-bearing material on the upper part of the southern river bank (adjacent to the FCA).	Low to High	Short-Term	Negligible / Minor	Neutral to Moderate Adverse	No change from existing baseline.
13.5	Risk of pollution due to accidental spillage from construction activities carried out within or near a watercourse.	Measures would be taken and procedures put in place to minimise the risk and potential effects of spillage incidents.	Low to High	Short-Term	Negligible / Minor	Neutral to Moderate Adverse	No change from existing baseline.

Impact Item no.	Description of Predicted Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of Impact (Short/Long-Term)	Magnitude of Impact (with Mitigation)	Significance of Effect (with Mitigation)	Description of Likely Effects (without the Proposed Scheme)
	With Proposed Scheme						Do-Nothing
Geology & Soils (Section 14)							
14.1	No designated or non-designated sites of geological or geomorphological interest would be directly affected.	None proposed.	Low	N/A	Negligible	Neutral	No change from existing baseline.
14.2	There would be no significant impacts on solid or drift geology, or on soils of the region.	None proposed.	Low	Long-Term	Minor	Neutral	No change from existing baseline.
14.3	Potential areas of contaminated land may be encountered at a number of locations throughout the area of the scheme.	Where contaminated land is encountered, further investigation would be necessary, including a contaminated land risk assessment to assess the appropriate remediation/mitigation measures.	N/A	Long-Term	Negligible	Neutral	No change from existing baseline.
Biodiversity – Fisheries & Aquatic Ecology (Section 15)							
15.1	Sediment release and entrainment	Following implementation of the full range of recommended mitigations, the potential for sediment run-off would be largely eliminated and would be reduced from Minor (Tullybrannigan) or Moderate (Shimna) magnitude to Negligible and of Neutral significance.	High	Short-term	Negligible	Neutral	Under the Do-Nothing scenario, it is not envisaged that there would be any perceptible change in the water environment

Impact Item no.	Description of Predicted Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of Impact (Short/Long-Term)	Magnitude of Impact (with Mitigation)	Significance of Effect (with Mitigation)	Description of Likely Effects (without the Proposed Scheme)
	With Proposed Scheme						Do-Nothing
15.2	Loss of habitat and associated fish mortality	Fish rescue and relocation would prevent any fish mortality in the Tullybrannigan reach and, although the temporary loss of habitat could not be mitigated, the overall impact would reduce to a Negligible magnitude of Neutral significance.	High	Short-term	Negligible	Neutral	Under the Do-Nothing scenario, it is not envisaged that there would be any perceptible change in the water environment
15.3	Obstruction of fish passage	Installation of the recommended temporary crossing allowing for fish passage would result in a residual impact of Negligible magnitude and of Neutral significance.	High	Short-term	Negligible	Neutral	Under the Do-Nothing scenario, it is not envisaged that there would be any perceptible change in the water environment
15.4	Noise and vibration	Adoption of recommended non-percussive piling techniques and judicious timing of the works in sensitive areas would result in predicted residual impacts of Negligible magnitude and of Neutral significance with regard to fish migrations, spawning activity and fish egg mortality.	High	Short-term	Negligible	Neutral	Under the Do-Nothing scenario, it is not envisaged that there would be any perceptible change in the water environment
15.5	Release of other pollutants	Adoption of the specified measures to minimise accidental spillage and the release of pollutants would result in predicted residual impacts of Negligible magnitude and of Neutral	High	Short-term	Negligible	Neutral	Under the Do-Nothing scenario, it is not envisaged that there would be any perceptible change in the water environment

Impact Item no.	Description of Predicted Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of Impact (Short/Long-Term)	Magnitude of Impact (with Mitigation)	Significance of Effect (with Mitigation)	Description of Likely Effects (without the Proposed Scheme)
	With Proposed Scheme						Do-Nothing
		significance.					
15.6	Loss of habitat in the Tullybrannigan River	Enhancement of the river channel in this area would result in positive residual impact predicted to be of Minor positive magnitude and of Slight/Moderate significance.	High	Long-term	Minor Beneficial	Slight/Moderate significance.	Under the Do-Nothing scenario, it is not envisaged that there would be any perceptible change in the water environment
15.7	Removal of bankside tree cover	With no mitigation required, the residual impact would remain of Negligible magnitude and of Neutral significance	High	Medium-term	Negligible	Neutral	Under the Do-Nothing scenario, it is not envisaged that there would be any perceptible change in the water environment
15.8	Access to river for recreational angling	With no mitigation required, the residual impact would remain of Negligible magnitude and of Neutral significance.	High	Long-term	Negligible	Neutral	Under the Do-Nothing scenario, it is not envisaged that there would be any perceptible change in the water environment

16.4 Summary of Environmental Effects

As described throughout each of the previous chapters, there are instances where the environmental effects associated with the Proposed Scheme may be of such a magnitude as to warrant mitigation measures. These measures are deemed necessary to minimise environmental impacts during the operation, construction and/or maintenance phases of the Proposed Scheme.

This Schedule of Environmental Commitments (Table 16.4) provides a collective summary of the proposed mitigation measures to ensure compliance during and beyond the construction contract period. As a prescriptive part of the construction and maintenance contract requirements, this schedule sets out responsibilities to ensure that measures are not only implemented, but monitored and inspected to ensure effective implementation on site and that all measures are correctly adhered to. Specifically, the following have been tabulated:

- Mitigation measure item number;
- Approximate location of mitigation measure;
- Mitigation objective and commitment;
- Potential mitigation measure;
- Potential timing of the mitigation measure;
- Potential monitoring requirements; and
- Potential additional consultation proposed.

As described in the schedule, there may be a requirement for additional consultation to be carried out during the contract period (i.e. with statutory bodies and other interested parties). Consequently there would be potential for revision to the proposed mitigation measures described in Table 16.4 and throughout each of the technical chapters as the design proceeds; however, these would be in agreement between DfI Rivers, the Contractor and the interested/affected party.

Table 16.4 only provides a brief summary of the overall committed mitigation measures. Reference should be made to individual Chapters of the ES for more detail and further explanation.

Table 16.4: Summary of Environmental Effects

Mitigation Item No.	Location	Mitigation Objective and Commitment	Potential Mitigation Measure	Potential timing of Mitigation Measure	Potential Monitoring Requirements	Potential additional Consultation Required
	Air Quality & Climate					
AQ1	Within & beyond proposed works	To minimise the amount of dust and emissions (including odour) produced during the construction works	The Contractor shall prepare an Air Quality Management Plan (AQMP) (also referred to as a Dust Minimisation Plan (DMP)) and incorporate the relevant mitigation measures within; reflecting the requirements of best practicable means and level of risk. This shall be included as part of the CEMP. Comprehensive measures to reduce dust, emissions and odour impacts to be included and implemented as part of the CEMP. Regular site inspections shall be undertaken by the Contractor's CEMP-C/ Environmental Site Representative to monitor compliance with the AQMP, record inspection results, and make an inspection log available to the relevant authorities/environmental bodies and the Employer's Project Manager when requested.	In advance of, and concurrent with construction	Monitoring of works to ensure compliance with requirements and standards	NMDDC
AQ2	Within & beyond proposed works	Reduce risk of deposition of dust on foliage of associated riverine habitats, and disturbance of protected species via noise and vibration.	The Contractor shall prepare an Air Quality Management Plan (AQMP) and incorporate the relevant mitigation measures within; reflecting the requirements of best practicable means and level of risk.	Concurrent with construction	Monitoring of works to ensure compliance with requirements and standards	-
	Cultural Heritage					
CH1	In the vicinity of the proposed works	Minimise the permanent physical impact and impact to setting at New Bridge	Clad sheet piles would match existing stonework of bridge while existing vegetation along river bank would be retained screening the flood walls.			
CH2	In the vicinity	Minimise the impact if	If unexpected archaeological remains or artefacts are	During construction	Monitoring of works to	Consultant

	of the proposed works	unknown/unrecorded archaeological heritage is unearthed.	discovered during construction work, work in that area would cease and the area would be protected. An unexpected finds procedure would be included in the over-arching Method Statement for archaeology. The Archaeological Consultant and DfC HED would be notified, and the unexpected find protocol would be implemented.		ensure compliance with requirements and standards	archaeologist , DfC - HED

Biodiversity – Terrestrial Ecology

BTE1	In the vicinity of the proposed works	Prevent pollution or silt laden runoff from the site from potentially entering European designated sites (Murlough SAC, Eastern Mournes SAC, and Carlingford Marine pSPA) via the Shimna River.	Any impact on water quality could cause a negative effect on breeding success / winter feeding of selection feature bird species by affecting ability to feed. Best practice drainage management would be implemented throughout the development process by the Contractor. Pollution Prevention Guidance –Standing Advice (DAERA Planning and Environment, 2016) and Discharges to the Water Environment – Standing Advice (DAERA Planning and Environment, 2017) must be adhered to, and suitably implemented into the CEMP, where relevant.	During construction	Monitoring of works to ensure compliance with requirements and standards	Consultant Ecologist, NIEA – Natural Heritage
BTE2	In the vicinity of the proposed works	Prevent impacts on water quality during the construction phase on Shimna River ASSI and SLNCI.	Avoid works during the Salmonid spawning season and egg incubation phases (1 October – 30 April) at waters of fisheries significance. Appropriate site management during in-stream and bank works outside of this period would ensure that the channel remains passable for migratory Salmonids at all times.	During construction	Monitoring of works to ensure compliance with requirements and standards	Consultant Ecologist, NIEA – Natural Heritage
BTE3	In the vicinity of the proposed works	Reduce risk of deposition of dust on foliage of associated riverine habitats, and disturbance of protected species via noise and vibration.	The Contractor shall prepare an Air Quality Management Plan (AQMP) and incorporate the relevant mitigation measures within; reflecting the requirements of best practicable means and level of risk.	During construction	Monitoring of works to ensure compliance with requirements and standards	Consultant Ecologist, NIEA – Natural Heritage
BTE4	In the vicinity of the proposed works	Control the spread of invasive species. Habitat clearance within 7m of any plant of knotweed (both Japanese and Giant) may result in the further	An Invasive Species Management Plan shall be prepared and implemented to prevent the spread of invasive species during construction. It would be included as a sub-plan of the CEMP.	During construction	Monitoring of works to ensure compliance with requirements and standards	Consultant Ecologist, NIEA – Natural Heritage

		spread of the species within habitat across the site and wider area.				
BTE5	In the vicinity of the proposed works	Prevent pollution or silt laden runoff from the site entering Nationally designated sites (Mournes Coast ASSI and Murlough ASSI) via the Shimna River.	Best practice drainage management would be implemented throughout the development process by the Contractor. Pollution Prevention Guidance –Standing Advice (DAERA Planning and Environment, 2016) and Discharges to the Water Environment – Standing Advice (DAERA Planning and Environment, 2017) must be adhered to, and suitably implemented into the CEMP, where relevant.	During construction	Monitoring of works to ensure compliance with requirements and standards	Consultant Ecologist, NIEA – Natural Heritage
BTE6	In the vicinity of the proposed works	Minimise habitat loss and vegetation clearance to accommodate contractor working areas and possible contractor compounds. Habitat loss should be kept to a minimum where possible.	Vegetation clearance should be completed outside of the bird breeding season, or if this is not possible, then an ECoW should first check the area for ecological constraints, especially for nesting birds and roosting bats.	Prior to construction	-	Consultant Ecologist, NIEA – Natural Heritage
BTE7	In the vicinity of the proposed works	Reduce potential impacts on otter including the loss of otter commuting habitat and potential (terrestrial) breeding sites. There is also the possibility of severance of habitat connectivity as a result of the proposed wall.	ECoW should undertake a pre-construction survey for otter activity within the original study area, as a means of establishing the current status of otters. The following mitigation must be adhered to avoid impacts on otter during the construction phase of the scheme: • All works must be largely restricted to daylight hours, so as to cause as little disturbance as possible. The use of artificial lighting during the construction period should be limited and construction activities during hours of darkness should be avoided. Lighting should be kept to essential locations only, with the position and direction of lighting being designed to minimise intrusion and disturbance to river corridors and their nature conservation value. Use of full cut-off lanterns would minimise light spillage onto adjacent areas; • If noisy or large machinery is required within 30m of otter resting places, then use of such machinery must cease at least two hours before sunset; • Drainage and attenuation ducts should restrict otter entry, and any temporary features which are liable to entrap wildlife should be covered or have a means of	In advance of and concurrent with construction	To be detailed in method statement	Consultant Ecologist, NIEA – Natural Heritage

			escape; • Any excavation / trench must either be covered or fenced-off at the end of each working day. If this is not practicable, a means of escape for any animal which may fall in (e.g. mammal ladder or ramps) must be provided; • Water sources which may be used by otter must be safeguarded (pollution guidance must be adhered to).			
BTE8	In the vicinity of the proposed works	Reduce potential impacts on badger, a nationally protected species are susceptible to impacts from development such as disturbance or direct impacts on their places of refuge.	A pre-construction survey for badger must be carried out within the proposed site and accessible environs within the ZoI (i.e. 25 m) immediately prior to works commencing, to determine if any breeding or resting sites have become newly established since the surveys completed in summer 2018. Any areas which are cleared of vegetation in order to facilitate temporary working areas or compounds should be reinstated with like-for-like native planting, thus minimising the impact of habitat severance and loss to badger.	In advance of and concurrent with construction	To be detailed in method statement	Consultant Ecologist, NIEA – Natural Heritage
BTE9	In the vicinity of the proposed works	Two trees of Moderate suitability to host a bat roost, and numerous trees of Low suitability to host a bat roost would be felled in order to facilitate the scheme.	A suitable pre-construction survey (e.g. endoscoping under licence, emergence/re-entry survey) must be carried out immediately prior to felling, in order to inform a suitable mitigation strategy. To compensate for the loss of suitable roost sites, five no. woodcrete bat boxes suitable for bats of the Pipistrellus genus must be erected within the site, mounted on mature trees to be retained in areas away from disturbance and prior to work commencing on site. Bat boxes must be erected under the guidance of a suitably experienced ecologist / ECoW.	In advance of and concurrent with construction	To be detailed in method statement	Consultant Ecologist, NIEA – Natural Heritage
BTE10	In the vicinity of the proposed works	Reduce potential impacts on Red squirrel, which are known to be present in the vicinity, and may have established new dreys since previous surveys.	A pre-construction survey for red squirrel must be carried out within the proposed site immediately prior to works commencing, to determine if any breeding or resting sites have become newly established since the surveys completed in summer 2018. No further mitigation is recommended.	In advance of and concurrent with construction	To be detailed in method statement	Consultant Ecologist, NIEA – Natural Heritage
BTE11	In the vicinity of the proposed works	Reduce impacts as a result of extensive loss of woodland and scrub nesting habitat.	Vegetation clearance must be restricted to the non-breeding season (i.e. carried out from September to February inclusive). For the avoidance of doubt, it should be noted that birds may nest in grass and low scrub, in	In advance of and concurrent with construction	To be detailed in method statement	Consultant Ecologist, NIEA – Natural Heritage

			addition to trees. Any vegetation clearance work which is required within the bird breeding season must be approved by a suitably experienced ecologist / ECoW, who will make a detailed check of any suitable vegetation for nests prior to vegetation / tree removal, and advise the contractor of any exclusion zones around potential or confirmed nests. A range of bird box styles, suited to various different species found on site are recommended to compensate for the loss of suitable nest sites.			

Landscape & Visual

LV1	Within footprint of the proposed works	Reduce/soften landscape and visual impacts of the proposed scheme.	Implementation of landscape management programme/restoration plan. Use of stone cladding to walls, retention of existing vegetation along river banks and replacement of removed vegetation with native vegetation.	During detailed design and construction	Planting operations to be supervised during construction and inspected during maintenance period to ensure survival and establishment.	Consultant Landscape Architect
LV2	In the vicinity of the proposed works	To minimise damage to existing vegetation.	Protect existing vegetation in proximity to the site in line with BS5837:2012.	During construction	Protection measures to be inspected and monitored during construction.	NIEA – Natural Heritage

Population & Human Health

PH1	North bank of River Shimna, downstream from Bryansford Road bridge.	Realignment and regrading of footways across flood wall embankment.	Replacement footways, accessible for all NMUs to be implemented across embankment at a suitable gradient, to allow continued access to Islands Park.	During detailed design and construction		
PH2	At affected properties	Minimise impacts to private land.	Ensure appropriate liaison with landowners to discuss finish of affected property boundaries.	Prior to construction		Affected landowners

Noise & Vibration

NV1	Within footprint and vicinity of the proposed works	Limiting potential impact to noise sensitive locations, and ensure that noise and vibration is effectively and sensitively managed during construction.	The appointed contractor shall be required to undertake liaison with NMDDC and the local community to ensure that noise and vibration during construction is effectively and sensitively managed. This is particularly important for works in the vicinity of the Autism Initiatives facility on Bryansford Road. There are a number of mitigation measures which are considered appropriate and of good working practice for all construction contracts. These measures are detailed in BS5228 (2009), 'Noise and Vibration Control on Construction and Open Sites'. Typical measures would include positioning of static plant as far away from receptors as possible, using well-maintained plant, temporary screening, enclosures, restricting works (where feasible) to daytime and staggering high vibration activities such as piling and jack hammering. Other guidance includes: • HSE Dust and Noise in the Construction Process CRR 73 HSE Books 1995; • HSE Noise at Work – Guidance for Employers on the Control of Noise at Work Regulations 2005; and • BRE Control of Dust from Construction and Activities 2003.	During construction	Monitoring of works to ensure compliance with requirements and standards	NMDDC, local community

Drainage & the Water Environment

DWE1	Proposed Works	Ensure no sediment mobilisation or release of pollutants into the adjacent watercourses, or risk of contamination to groundwater.	The documents listed below provide key guidance on likely impacts on the water environment as a result of construction, and the methods for controlling impacts. The guidance given in these documents should be followed as closely as is practicable. • C648 'Control of Water Pollution from Linear Construction Projects' (CIRIA, 2006); • C532 'Control of water pollution from construction sites: guidance for consultants and contractors' (Masters-Williams et al., 2001); • SP156 'Control of water pollution from construction	During construction	Monitored on-site during construction to ensure effectiveness of measures.	NIEA – WMU / DAERA – Inland Fisheries

			sites – guide to good practice' (Murnane et al., 2002); and • 'Engineering in the Water Environment Good Practice Guide – Temporary Construction Methods' (Scottish Environment Protection Agency (SEPA), 2009). Consideration should also be given to the Ulster Angling Federation's '*Construction Works - Actions to Prevent Pollution*' guidelines, which requires that an additional clear and demonstrable effort is needed by the Contractor to prevent pollution and as a minimum identifies a range of procedures which should be followed. Site works should be planned so that activities likely to generate silt-laden runoff are carried out during drier months (if possible), and erosion of surface soils is controlled. Seasonal weather patterns should be taken into consideration when programming and planning construction activities. A Construction Environmental Management Plan (CEMP) must include an Erosion Prevention and Sediment Control Plan and this must be submitted to NIEA - WMU prior to commencement of any works.			
DWE2	In Shimna River/ Tullybranniga n River	Ensure no impact to migratory salmonid fish passage.	Appropriate site management during in-stream and bank works outside of this period would ensure that the channel remains passable for migratory Salmonids at all times.	During Construction		DAERA – Inland Fisheries
	Geology & Soils					
GS1	Within & beyond proposed works	Remediate any areas of contaminated land which may be encountered.	Any areas of contaminated land should be fully investigated and dealt with in accordance with the advice of the relevant authorities, and if necessary, special disposal arrangements for excavated material may be required. Any contaminated materials encountered during the construction would have to be appropriately remediated on-site or disposed of at an appropriately licensed landfill site.	During Construction	-	NIEA – WMU NMDDC

			• 'Engineering in the Water Environment Good Practice Guide – Temporary Construction Methods' (Scottish Environment Protection Agency (SEPA), 2009). Consideration should also be given to the Ulster Angling Federation's '*Construction Works - Actions to Prevent Pollution*' guidelines, which requires that an additional clear and demonstrable effort is needed by the Contractor to prevent pollution and as a minimum identifies a range of procedures which should be followed. Site works should be planned so that activities likely to generate silt-laden runoff are carried out during drier months (if possible), and erosion of surface soils is controlled. Seasonal weather patterns should be taken into consideration when programming and planning construction activities. A Construction Environmental Management Plan (CEMP) must include an Erosion Prevention and Sediment Control Plan and this must be submitted to NIEA - WMU prior to commencement of any works.			
DWE2	In Shimna River/ Tullybrannigan River	Ensure no impact to migratory salmonid fish passage.	Appropriate site management during in-stream and bank works outside of this period would ensure that the channel remains passable for migratory Salmonids at all times.	During Construction		DAERA – Inland Fisheries

Geology & Soils

GS1	Within & beyond proposed works	Remediate any areas of contaminated land which may be encountered.	Any areas of contaminated land should be fully investigated and dealt with in accordance with the advice of the relevant authorities, and if necessary, special disposal arrangements for excavated material may be required. Any contaminated materials encountered during the construction would have to be appropriately remediated on-site or disposed of at an appropriately licensed landfill site. In line with NIEA - Waste Management Unit's requirements, if a potentially contaminating source has been identified, a suitable risk assessment and remediation strategy (if required) should be submitted and agreed to mitigate all risks.	During Construction	-	NIEA – WMU NMDDC
GS2	Within footprint of the proposed works	Manage invasive species and prevent their spread.	An Invasive Species Management Plan shall be prepared and implemented to prevent the spread of invasive species during construction. It would be included as a sub-plan of the CEMP.	During Construction	Monitored on-site during construction to ensure effectiveness of measures.	NMDDC

Biodiversity – Fisheries & Aquatic Ecology

BFA1	In Shimna River/ Tullybrannigan River	Ensure silt-laden runoff is prevented from discharging to surface waters.	The Construction Environmental Management Plan (CEMP) must include an Erosion Prevention and Sediment Control Plan which would aim to minimise erosion by reducing disturbance and stabilising exposed materials. The CEMP should also consider control measures to minimise any release of mobilised sediment which may occur, despite the erosion control measures. Mitigation measures to minimise the generation of silt-laden runoff also include: • Planning of site works so that activities likely to generate silt-laden runoff are carried out during drier months (if possible), and erosion of surface soils is controlled; • Seasonal weather patterns should be taken into consideration when programming and planning construction activities; • Attenuation measures should be designed to cope with one-off extreme precipitation events so that they cannot be overwhelmed resulting in polluted runoff reaching the main watercourse; • Stockpiles and areas of exposed ground should be kept to a minimum, to reduce sediment runoff. They should be located well away from drains and watercourses (by a minimum distance of 10m where the land is flat, and further if there is a slope to a watercourse), stabilised as soon as possible (e.g. seeded or geotextile mats), and bunded by earth or silt fences (if required) at the toe of the stockpile to intercept silt-laden runoff during rainfall events;	During Construction	Monitored on-site during construction to ensure effectiveness of measures.	NIEA – WMU / DAERA – Inland Fisheries

			• Stockpiles shall not be located where there is a steep slope towards a watercourse; • Existing vegetation should be retained where possible to stabilise soil and prevent erosion. Areas where vegetation clearance is required should be kept to a minimum, and the works divided into phases, with seeding and planting of the phases that are complete; A minimum of a 10m vegetative buffer shall be maintained adjacent to watercourses except where works are specifically required to the watercourse e.g. Tullybrannigan; and • Vehicle/ plant access crossings of watercourse shall be minimised using designated crossing points and existing road infrastructure only (single temporary crossing in the Tullybrannigan). Mud shall be controlled at entry and exits to the site using wheel washes and/or road sweepers.			
BFA2	Tullybrannigan River	Impacts on fish spawning season.	Construction of the piling platform in the Tullybrannigan should be avoided when sensitive life-stages are present (incubating eggs/ fry). Overlap across life-stage and species migration periods precludes a period when there is a zero risk. However, DAERA require that in-stream works are conducted between 01st May and 30th September to avoid the more critical salmonid spawning season and egg incubation phases, 01 October – 30 April.	During Construction	Monitored on-site during construction to ensure effectiveness of measures.	DAERA – Inland Fisheries
BFA3	Within footprint of the proposed works	Minimise the risk of accidental spillage and release of pollutants into watercourses.	Measures to minimise accidental spillage and the release of pollutants include: • Storage of oils and diesel, along with the general maintenance and re-fuelling of plant, should be restricted to impermeable bunded areas with a minimum 110% storage capacity and remote from surface waters or areas where any spillages could easily reach a surface water. • All hazardous substances on-site shall be controlled in accordance with The Control of Substances Hazardous to Health Regulations (Northern Ireland) 2003 (as amended) (COSHH Regulations). • Refuelling of plant and machinery shall take place at least 10m away from watercourses using a mobile fuel bowser and restricted to designated areas on hard standing. Vehicles must not be left unattended during refuelling operations and fixed plant shall be self-bunded. All water runoff from designated refuelling areas shall be channelled to an oil separator or an alternative treatment system prior to discharge. • Spill kits and oil absorbent material must be carried by mobile plant and located at vulnerable locations. • Care must be taken whilst using shuttering oils when preparing formwork. • An Emergency Response Plan shall be prepared by the appointed Contractor & included as part of the CEMP, & construction workers trained to respond to spillages. • Concrete mixing must be undertaken in designated impermeable areas, at least 10m away from a watercourse or surface water drain to reduce the risk of runoff entering a watercourse. • Equipment, batching and ready-mix lorry washing and cleaning should be washed-out on site into a designated area that has been designed to contain wet concrete / wash waters.In addition, the Contractor would be required to properly assess risk and devise mitigation measures for those activities not already covered by statutory requirements. Where possible, risks would be designed-out of the programme of works.	During Construction	Monitored on-site during construction to ensure effectiveness of measures.	DAERA – Inland Fisheries
BFA4	Within footprint of the proposed works	Piling operations should use non-percussive methods to reduce impact on fish migrations, spawning activity and fish egg survival.	Piling operations within 25m of the channel at sensitive locations (e.g. spawning areas on the Shimna) should, if possible, be avoided when sensitive life-stages are present (incubating eggs/ fry). Overlap across life-stage and species migration periods precludes a period when there is a zero risk. DAERA require that in-stream works are conducted between 01st May and 30th September to avoid the more critical salmonid spawning season and egg incubation phases, 01 October – 30 April (DAERA, 2011). This would also largely avoid the peak period of adult salmon and sea trout runs in the Shimna, typically September to December.	During Construction	Monitored on-site during construction to ensure effectiveness of measures.	DAERA – Inland Fisheries

17. Glossary of Terms

17.1 References

17.1.1 Introduction

- RPS (2009) 'Burren & Shimna Rivers Flood Investigation Report'
- RPS (2015) 'Shimna River, Newcastle Feasibility Study for Flood Risk Investigation'
- North East Flood Risk Management Plan (2015)
- Rivers Agency (2003) 'Newcastle Urban Area Assessment of the Flood Levels'
- Preliminary Flood Risk Assessment (2011)
- RPS (2016) Shimna River, Newcastle Flood Risk Assessment Economic Appraisal.
- Ards Borough and Down District (2009) Ards Down Area Plan 2015

17.1.2 Air Quality & Climate

- Institute of Air Quality Management, (2014) Guidance on the assessment of dust from demolition and construction

17.1.3 Cultural Heritage

- ADS (2003). Ashleigh House, Tollymore, Newcastle, Down in Excavations.ie- Database of Irish Excavation Reports.
- DoE (2013) Banbridge/Newry and Mourne Area Plan (BNMAP) 2015 Strategic Plan Framework
- DRD, 2010 Regional Development Strategy 2035
- Harris, W (1744). The ancient and present state of the County of Down. Published by E. Ershaw.
- Jope, E.M. Scottish Influences in the North of Ireland: Castles with Scottish Features, 1580-1640 in the Ulster Journal of Archaeology Vol.14, 1951.
- Lewis, S. (1837). A Topographical Dictionary of Ireland. S. Lewis & Co. 87, Aldersgate Street, London.
- MacManus, C (2003). Ashleigh Manor, Bryansford, Newcastle, Down Excavations.ie- Database of Irish Excavation Reports.
- Ministry of Finance (1966). An Archaeological Survey of County Down: HMSO.
- Nicol, S. (2011). Castlewellan Road, Tollymore, Co. Down in Excavations.ie- Database of Irish Excavation Reports.
- Scott, B. (2012). The Ulster Port Books 1612-15 edited by R.J. Hunter. Ulster Historical Foundation.

17.1.4 Biodiversity

- CIEEM (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, freshwater and coastal, 2nd edition.
- Colhoun, K. and Cummins, S., 2013. Birds of Conservation Concern in Ireland 2014–2019. Irish Birds, 9(4), pp.523-544.
- Collins, J (ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust, London.

- Cumins, S., Fiser, J., McKeever, R.G., McNaghten, L., and Crowe, O. (2010) Assessment of the distribution and abundance of kingfisher Alcedo atthis and other riparian birds on six SAC river systems in Ireland. BirdWatch Ireland, Wicklow, Ireland.
- DAERA (2016) The Biodiversity Duty – Guidance for public bodies, DAERA, Belfast.
- DAERA Planning and Environment (2016) Pollution Prevention Guidance: Standing advice for planning officers and applicants seeking planning permission for developments which may impact upon the water environment, Issue 02.
- DAERA Planning and Environment (2017a) Badgers. Advice for planning officers and applicants seeking planning permission for land which may impact on Badgers. DAERA, Belfast
- DAERA Planning and Environment (2017b) Discharges to the water environment: Standing planning advice for developments that may require consent to discharge under the Water (NI) Order 1999, Issue 02.
- DAERA Planning and Environment (2017c) Otters. Advice for planning officers and applicants seeking planning permission for land which may affect otters. DAERA, Belfast
- DAERA Planning and Environment (2017d). Hedgerows, Advice for planning officers and applicants seeking planning permission for land which may impact on hedgerows, DAERA, Belfast.
- DAERA Planning and Environment (2017e). Priority Habitats, Advice for planning officers and applicants seeking planning permission for land which may impact on hedgerows, DAERA, Belfast.
- DAERA Planning and Environment (2017f). Wild Birds. Advice for planning officers and applicants seeking planning permission for land which may impact on wild birds. DAERA, Belfast.
- DAERA Planning and Environment (2017g) Bats. Advice for planning officers and applicants seeking planning permission for land which may affect bats. DAERA, Belfast.
- Department of the Environment (NI) – Northern Ireland Environment Agency, (2013) Planning Policy Statement 2 Natural Heritage.
- Department of the Environment (NI), (2013) Planning Policy Statement 2 Natural Heritage.
- DOE (2009) Ards and Down Area Plan 2015.
- DOE (2015) Valuing Nature: A Biodiversity Strategy for Northern Ireland to 2020. DOE, Northern Ireland.
- Harris, Creswell & Jefferies (1989). Surveying Badgers. An occasional publication of the mammal society – No 9. Mammal Society, London.
- JNCC (2010) Handbook for Phase 1 Habitat survey. A technique for environmental audit. JNCC, Peterborough
- Joint Nature Conservation Committee (2010). Handbook for phase 1 habitat survey – a technique for environmental audit. Joint Nature Conservation Committee, Peterborough.
- Newry, Mourne and Down District Council (2017) Newry, Mourne and Down Local Biodiversity Action Plan, 2017-2022.
- Newry, Mourne and Down District Council (2018) Newry, Mourne and Down Local Development Plan 2030.
- Newry, Mourne and Down District Council (2018) Newry, Mourne and Down Local Development Plan 2030, Newry, Mourne and Down: Newry, Mourne and Down District Council.
- NIEA (2011) Badgers and Development.
- NIEA (2017) Badger Survey: NIEA Specific Requirements
- NIEA (2017) Badger Survey: NIEA Specific Requirements
- NIEA (2017) Otter Survey: NIEA Specific Requirements
- NIEA (2017) Otter Survey: NIEA Specific Requirements

- NIEA (2017) Red Squirrel Survey: NIEA Specific Requirements
- Planning Portal NI (2018) Public Access Portal. http://epicpublic.planningni.gov.uk/publicaccess/ Accessed: 07/08/18.
- Smiddy and O'Halloran (1998) Breeding biology of the grey wagtail Motacilla cinerea in southwest Ireland, Bird Study, 45:3, 331-336, DOI: 10.1080/00063659809461104.
- Stace, C. (2010). New Flora of the British Isles, 3rd edition, UK: Cambridge University Press.
- The Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995 (as amended).
- The Planning Service (2004) Planning and Policy Statement 8. Open Space, Sport and Outdoor Recreation, Belfast: The Planning Service.
- The Planning Service (2009a) Down District Settlement Proposals. Ards Down Area Plan 2015. Volume 1, Northern Ireland: The Planning Service.
- The Planning Service (2009b) Plan Strategy, Policy Framework and Countryside Proposals.
- Ards Down Area Plan 2015. Volume 3, Northern Ireland: The Planning Service.
- The Wildlife (Northern Ireland) Order 1985 (as amended).
- Wildlife and Natural Environment Act (Northern Ireland) 2011.

17.1.5 Landscape & Visual

- 'Guidelines for Landscape and Visual Impact Assessment' (GLVIA), 3rd Edition, 2013, Landscape Institute & IEMA
- 'Guidelines for Landscape and Visual Impact Assessment' (GLVIA), 2nd Edition, 2002, Landscape Institute & IEMA
- 'Photography and Photomontage in Landscape and Visual Impact Assessment', Landscape Institute Advice Note 01/2011;
- Regional Landscape Character Areas Assessment – Northern Ireland Environment Agency / Department of Agriculture, Environment and Rural Affairs

17.1.6 Population and Human Health

- SEPA (2015) 'Assessing the Significance of Impacts - Social, Economic, Environmental'
- RPS (2016) Shimna River, Newcastle Flood Risk Assessment Economic Appraisal
- Scottish Executive 2007 Exploring the Social Impacts of Flood Risk and Flooding in Scotland
- Ards Down Area Plan 2015. Volume 3, Northern Ireland: The Planning Service
- Newry, Mourne and Down Tourism Strategy 2017-2021
- South East Coast Masterplan for Newcastle 2013
- Rivers Agency (2003) Newcastle Urban Area Assessment of the Flood Levels

17.1.7 Drainage & the Water Environment

- NIEA – Water Management Unit (WMU) Guidance Note 'Carrying out a Water Framework Directive (WFD) Assessment on EIA Developments'.
- Design Manual for Roads and Bridges (DMRB) 11.3.10 Annex IV; Reporting of Significance of Potential Effects
- NIEA (2015) North Eastern RBMP
- South Down Local Management Area (LMA) Action Plan and Update' (2013)
- UKTAG (2007) Recommendations on Surface Water Classification Schemes for the purposes of the Water Framework Directive Report'

- British Geological Survey (2005) A groundwater vulnerability screening methodology for Northern Ireland Report
- Geological Survey Northern Ireland (2005) Water Framework Directive – Aquifer Classification Scheme for Northern Ireland
- Shimna River, Newcastle Feasibility Study for Flood Risk Investigation (2015)
- Construction Industry Research and Information Association (2006) C648 Control of Water Pollution from Linear Construction Projects
- Masters-Williams et al., (2001) C532 'Control of water pollution from construction sites: guidance for consultants and contractors'
- Murnane et al. (2002) SP156 Control of water pollution from construction sites – guide to good practice.
- Scottish Environment Protection Agency (2009) Engineering in the Water Environment Good Practice Guide – Temporary Construction Methods.
- UKTAG (2008) UK Environmental Standards and Conditions (Phase 2).
- The Ulster Angling Federation Construction Works - Actions to Prevent Pollution.

17.1.8 Geology & Soils

- NIEA Regulatory Position Statement (May 2016) – Low Risk Construction Activities.
- Causeway Geotech (2018) Ground Investigation Report
- Geotechnical and Environmental Services (2014)
- Ards Down Area Plan 2015. Volume 3, Northern Ireland: The Planning Service
- Joint Agency Technical Guidance WM2 'Interpretation of the definition and classification of hazardous waste' (3rd edition, August 2013)

17.2 Acronyms

- AA - Appropriate Assessment
- AADT - Annual Average Daily Traffic
- AEP – Annual Exceedance Probability
- AFI - Areas for Further Investigation
- AONB – Area of Outstanding Natural Beauty
- APIS- Air Pollution Information System
- AQMA - Air Quality Management Area
- ASSI – Area of Special Scientific Interest
- BAP - Biodiversity Action Plan
- BBS - Breeding Bird Survey
- BCDR – Belfast and County Down Railway
- BCT - Bat Conservation Trust
- BEP - Bad Ecological Potential
- BES ─ Bad Ecological Status
- BGS – British Geological Survey
- BNMAP - Banbridge/Newry and Mourne Area Plan
- BTO - British Trust for Ornithology
- CAFE - Clean Air for Europe

- CEDaR - Centre for Environmental Data and Recording
- CEF - Construction Employers Federation
- CEMP – Construction Environment Management Plan
- CIEEM - Chartered Institute of Ecology and Environmental Management
- CoCP - Code of Construction Practice
- COSHH – Control of Substances Hazardous to Health
- DAERA - Department of Agriculture, Environment and Rural Affairs
- DARD – Department of Agriculture and Rural Development
- DEFRA – Department for Environment, Food & Rural Affairs
- DfC - Department for Communities
- DfI Department for Infrastructure
- DMP – Dust Management Plan
- DMRB – Design Manual for Roads and Bridges
- DOENI – Department of Environment Northern Ireland
- DRD - Department for Regional Development
- EA – Environment Agency
- EcIA - Ecological Impact Assessment
- ECoW - Ecological Clerk of Works
- EEC – European Economic Community
- EIA – Environmental Impact Assessment
- EMP - Environmental Management Plan
- EMS – Environmental Management Systems
- EPS - European protected species
- ES – Environmental Statement
- ESCR - Earth Science Conservation Review
- EU – European Union
- FIPG - Flood Investment and Planning Group
- FPS – Flood Prevention Scheme
- FRMP - Flood Risk Management Plan
- FRISM - Flood Risk Metric tool
- GEP - Good Ecological Potential or better
- GES - Geotechnical and Environmental Services
- GES - Good Ecological Status
- GHG – Greenhouse Gas
- GI – Ground investigation
- GIS – Geographic Information System
- GLVIA - Guidelines for Landscape and Visual Impact Assessment
- GPP – Guidance for Pollution Prevention
- GPS - Global Positioning System
- GSNI – Geological Survey Northern Ireland

- HED - Historic Environment Division
- HES - High Ecological Status
- HRA – Habitats Regulations Assessment
- IEMA - Institute of Environmental Management & Assessment
- IROPI - Imperative Reasons of Overriding Public Interest
- ISNI – Investment Strategy for Northern Ireland
- JNCC – Joint Nature Conservation Committee
- LAQM - Local Air Quality Management
- LBAP – Local Biodiversity Action Plan
- LCA – Landscape Character Assessment
- LDP – Local Development Plan
- LLPA - Local Landscape Policy Area
- LNR - Local Nature Reserves
- MEP - Moderate Ecological Potential
- MCZ – Marine Conservation Zone
- MES – Moderate Ecological Status
- NE RBD - North Eastern River Basin District
- NIEA – Northern Ireland Environment Agency
- NIMDM - Northern Ireland Multiple Deprivation Measure
- NIRLCA - Northern Ireland Regional Landscape Character Assessment
- NISMR – Northern Ireland Sites and Monuments Record
- NISRA - Northern Ireland Statistics and Research Agency
- NIRLCA - Northern Ireland Regional Landscape Character Assessment
- NMDDC - Newry, Mourne and Down District Council
- NMU – Non-motorised user
- NPPF - National Planning Policy Framework
- NTS – Non Technical Summary
- OSNI - Ordnance Survey Northern Ireland
- PEA - Preliminary Ecological Appraisal
- PEP - Poor Ecological Potential
- PES - Poor Ecological Status
- PID - Photo Ionization Detector
- PFG- Programme for Government
- PFRA – Preliminary Flood Risk Assessment
- PPE – Post-Project Evaluation
- PPG – Planning Policy Guidance
- PRF - Potential roost features
- PRONI - Public Record Office Northern Ireland
- pSPA - proposed Special Protection Area
- RBD – River Basin District

- RBMP – River Basin Management Plan
- RLCA - Regional Landscape Character Area
- RDS- Regional Development Strategy
- RG- Regional Guidance
- SAC – Special Area of Conservation
- SEA – Strategic Environmental Assessment
- SEPA – Scottish Environmental Protection Agency
- SFG - Spatial Framework Guidance
- SFRA - Significant Flood Risk Areas
- SLNCI - Site of Local Nature Conservation Importance
- SMART - Specific, Measurable, Attainable, Relevant and Timely
- SS – Suspended solids
- SPA – Special Protection Area
- SuDS- Sustainable urban Drainage Systems
- SWMP - Site Waste Management Plan
- TMP – Traffic Management Plan
- TPO – Tree Preservation Order
- UK- United Kingdom
- UKSO – UK Soil Observatory
- WANE – Wildlife and National Environment
- WAC - Waste Acceptance Criteria
- WFD – Water Framework Directive
- WMU – Waste Management Unit
- ZOI - Zone of influence
- ZTV – Zone of Theoretical Visibility