BURNFOOT FLOOD RELIEF SCHEME

Constraints Study

IBE1760
F02
January 2022

COUNTY DONEGAL
FLOOD RELIEF SCHEMES

Comhairle Contae Dhún na nGall
Donegal County Council

Tionscadal Éireann
Project Ireland
2040

OPW
Oifig na nOibreacha Poiblí
Office of Public Works

rpsgroup.com

Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
D02	Report	MM	BQ	MM	17/09/2021
F01	Report	MM	BQ	MM	07/12/2021
F02	Report	MM	BQ	MM	14/01/2022

Approval for issue

Mark Magee  14th January 2022

The report has been prepared for the exclusive use and benefit of our client and solely for the purpose for which it is provided. Unless otherwise agreed in writing by RPS Group Plc, any of its subsidiaries, or a related entity (collectively 'RPS') no part of this report should be reproduced, distributed or communicated to any third party. RPS does not accept any liability if this report is used for an alternative purpose from which it is intended, nor to any third party in respect of this report. The report does not account for any changes relating to the subject matter of the report, or any legislative or regulatory changes that have occurred since the report was produced and that may affect the report.

The report has been prepared using the information provided to RPS by its client, or others on behalf of its client. To the fullest extent permitted by law, RPS shall not be liable for any loss or damage suffered by the client arising from fraud, misrepresentation, withholding of information material relevant to the report or required by RPS, or other default relating to such information, whether on the client's part or that of the other information sources, unless such fraud, misrepresentation, withholding or such other default is evident to RPS without further enquiry. It is expressly stated that no independent verification of any documents or information supplied by the client or others on behalf of the client has been made. The report shall be used for general information only.

Prepared by:

Mark Magee
Senior Associate - Senior Associate - Water Environment

Enterprise Fund Business Centre, Business Park Road, Ballyraine
Letterkenny, Co. Donegal F92 AF43

T +353 74 916 1927
E mark.magee@rpsgroup.com

Prepared for:

Donegal County Council

Lorraine Arbuckle
Executive Engineer

CFRAM Unit
Water Services Capital Office
Donegal County Council
County House
Lifford, Co. Donegal, F93 Y622

T: +353 74 9172500
E: larbuckle@donegalcoco.ie

Contents

List of Tables

List of Figures

List of Appendices

EXECUTIVE SUMMARY

Introduction

The brief for Burnfoot Flood Relief Scheme requires that the "*Consultant shall undertake a series of desk studies, considerations with all relevant stakeholders, and organise preliminary field investigations by their competent experts in the relevant disciplines to identify issues that might be relevant to, or impose constraints on, the design and construction of the schemes*." The issues considered in this Constraints Study should at a minimum reflect the scope of an Environmental Impact Assessment (EIA) in accordance with the requirements of the EIA Directive 2014/52/EU:

(a) Population, Human Health
(b) Biodiversity
(c) Land, Soil, Water, Air and Climate
(d) Material Assets, Cultural Heritage and the Landscape
(e) The interaction between the factors referred to in point (a) to (d)

The output of the Constraints Study is to be used in multi criteria analysis of the options, ultimately informing selection of the preferred option (the Scheme) being taken forward to Stage II of the project "Planning". The desktop and field surveys outlined below are those that would be typical for a Constraints Study. More specialist or detailed study may be required at the environmental assessment stage.

Background

Burnfoot has had a history of serious flooding: the most recent occurring in August 2017. Up to 30 homes were flooded mostly in Líos Na Greíne and Páirc an Ghrianáin and at least seven local businesses were affected. Roads in the area where damaged and a local Waste Water Treatment Plant suffered considerable damage.

The flooding was due to a high intensity rainfall event which focussed on the north west of the country and in particular Inishowen. The Burnfoot River exceeded its banks, particularly on the lower, south bank of the river upstream of the R238 (Main Street) bridge. The R238 is an important regional road. The R238 bridge was impassable during the event leading to long diversions for emergency services and the local community trying to access either the other side of the village or the rest of the Inishowen Peninsula. There is some evidence that the high intensity nature of the rainfall also led to flooding from other drains and watercourses in the area.

The Office of Public Work's North Western Flood Risk Management Plan (FRMP) identified a strategy and a set of measures for cost-effective and sustainable, long-term management of flood risk in Burnfoot. The next step is Project Level Assessment, Development of the Flood Relief Scheme and the preparation of a Constraints Study as part of the Environmental Impact Assessment which will inform the engineering design,

Engineering Development and Design is being advanced in parallel with the Environmental Assessment of the Flood Relief Scheme. The Engineering team will ensure the preferred option accounts for all existing and new information emerging since the FRMP. It will be further informed by the Environmental Constraints Study and input from the public. The Burnfoot Flood Relief Scheme will be delivered in following stages:

- Stage I: Scheme Development and Design
- Stage II: Planning
- Stage III: Detailed Construction Design and Tender
- Stage IV: Construction
- Stage V: Handover of Works

Information has been gathered with due regard to the likely environmental impacts of the proposed Scheme and the statutory requirements for EIA as set out in EU Directives and associated other Irish legislation. Key sources of this information were an Opening Public Consultation held online from the 9th of November to the 21st of December 2020 and a Collaborative Workshop with other government agencies in January 2021.

The Constraints Study identified a number of constraints that need to be considered in the design of the proposed Scheme.

Population and Human Health

While it is predicted that there would be adverse increases in ambient levels of environmental health determinants directly attributed to the construction and operation of the flood relief scheme (such as air quality), the magnitude of these changes is likely to be minimal and not sufficient to quantify any measurable adverse change in population health outcomes.

The Flood Relief Scheme will offer the opportunity to provide a significant benefit from a socio-economic perspective and reduce the risk of flooding to the 20 at risk residential properties and the associated impacts on human health and socio economics. This will facilitate the continued provision of direct, indirect and induced socio-economic benefits, not only on a local scale, but also at a regional scale. Some of these socio-economic benefits have the potential to positively influence health and wellbeing at an individual level in the short-term and at the population level in the long term.

Biodiversity

The Burnfoot River is not listed on the Water Framework Directive Register for Protected areas, although Lough Swilly, which is hydrologically connected to Inch Lough and thus the lower Burnfoot River, is placed on the Register as a designated shellfish area and as an SAC and SPA for the protection of habitats and species dependent on the maintenance or improvement in water status. Due to the Burnfoot Rivers hydrological connectivity to the downstream protected areas, in order to protect designated aquatic and bird life, there a number of constraints the proposed Scheme must consider. In particular, the proposed Scheme must ensure that the conservation and protection of downstream protected species and their habitats are considered, most notably otter (Lutra lutra), breeding/nesting wildfowl and Sandwich Tern colonies, which are regarded as one of the best populations in the country. During Wetland Bird Surveys (WeBs), large numbers of wildfowl and gulls were recorded, with whooper swan, black-headed gull and greylag geese in particular. Further specialist surveys cannot be determined at this stage in the proposed Scheme. Due to the sensitive nature of the aquatic life in the waterbody all in-stream works should be carried out during the period May to September. It is encouraged that the proposed Scheme includes more radical thinking and considers provision of flood storage to reduce the impact on the levels at Inch Lough.

The key constraints from a terrestrial perspective include the significant number and intensity of invasive species. The nature of the works has the potential to spread invasive species which could be detrimental to the aquatic environment. During field surveys, both Japanese knotweed and rhododendron were identified. An Invasive Species Management Plan has been prepared and all works which have the potential to aid the spread of invasive species must implement a biosecurity protocol. There are a number of trees that have potential for roosting bats and will require further more detailed survey as the proposed Scheme progresses. Overwintering birds and the potential for disturbance also needs to be considered during option appraisal as outlined above in the context of the SPA but also under the Wildlife Acts.

Land, soil, water, air & climate

At present, the water bodies within the study area are not achieving their EU Water Framework Directive (WFD) objectives due to a number of different pressures, the most significant of which are classified as agriculture, quarries, urban wastewater and domestic wastewater systems (septic tanks). A key issue is that the Flood Relief Scheme may impact on the hydromorphology (the physical condition of the water bodies affected) and this will require detailed consideration in the assessment of the FRS given the potential to impact on ecology. Construction impacts will also be a key consideration as pollutants can impact on the biology and supporting water quality condition of the water bodies.

The nature of the soils and subsoils (predominantly wet soils) mean that there are limited groundwater surface water interactions and the dominant pathways are surface water or near surface pathways. This means that overland flow or drainage ditches will be the main pathway for contaminants to enter the water environment and this will need to be managed as such during the construction and operation of the proposed Scheme. However, given the extensive outcropping in the area and limited depth to groundwater there are areas of extreme groundwater vulnerability.

Cognisance must be given to avoid impacting groundwater aquifers during the option selection process. Poor aquifers of bedrock are generally the main class of aquifer in close proximity to the proposed Scheme; therefore there will be limited impact on groundwater resource.

Noise, air quality and climate will be impacted during the construction phase of the proposed Scheme. There will be airborne emissions associated with the Scheme during construction phase, however after it becomes operational there will be limited impact on air quality. The main impacts to the atmosphere during this stage are the generation and dispersion of construction dusts during the proposed works (minor earthworks and general construction), emissions associated with construction traffic and greenhouse gas emissions. It is not envisaged that the proposed Scheme will have long term detrimental effect on the noise environment within the Study Area, however noise during the construction phase of the proposed Scheme may have a temporary local adverse impact on the environment.

Material assets, cultural heritage and the landscape

The primary constraints for material assets within the study area are the utilities and existing wastewater, water and transport infrastructure. Buildings or structures of significance include those that have been identified to be at risk of flooding and the R238 regional road which is within the study area. The ability of the existing R238 road bridge to withstand extra lateral loading at the upstream face should flood risk management measures increase flows through the structure needs to be considered given its importance as only main road link to Inishowen. The waste water treatment plant is a key constraint due to its proximity to the proposed Scheme.

Constraints of architectural and cultural heritage significance include a total of six Record of Monuments and Places (RMP) sites recorded within 1km of the edge of the proposed Scheme. Sites from the prehistoric period (cairn) right through to the monastic (souterrain) period are among those recorded. A majority of the sites in the surrounding area are prehistoric in date, including ringforts and cists. None of these sites will be directly affected by the proposed Scheme.

The landscape will be appraised in the environmental assessment to describe the landscape character areas which enable the categorisation of landscape sensitivity. Given the location of the proposed Scheme in the South Inishowen Farmland Landscape Character Area (LCA) 10, and the views and prospects from Grianan Slopes & lowlands LCA 11, the scenic amenity is classified as high to extremely high means that the landscape character is very sensitive and the scenic amenity will require careful consideration in the further environmental assessment of the options and emerging proposed Scheme. At a county scale it is unlikely that designated views and prospects as per the County Development plan will be impacted however a more local assessment will be required for the detailed environmental assessment.

The key constraints for the Burnfoot Flood Relief Scheme are:

- The Burnfoot River is hydrologically connected to Inch Lough which is placed on the Register of Protected Areas as a designated shellfish area and as an SAC and SPA for the protection of habitats and species dependent on the maintenance or improvement in water status.
- The proposed Scheme must ensure that the conservation and protection of downstream protected species and their habitats are considered, most notably otter (Lutra lutra), breeding/nesting wildfowl and Sandwich Tern colonies.
- Due to the sensitive nature of the aquatic life in the waterbody all in-stream works should be carried out during the period May to September. Atlantic salmon, brown trout, European eel and migratory sea trout are amongst the sensitive species noted.
- It is encouraged that the proposed Scheme includes more radical thinking and considers provision of flood storage to reduce the impact on the levels at Inch Lough.
- The key constraints from a terrestrial perspective include the significant number and intensity of invasive species. During field surveys, both Japanese knotweed and rhododendron were identified.
- There are a number of trees that have potential for roosting bats and will require furthermore detailed survey as the proposed Scheme progresses.

- Overwintering and breeding birds and the potential for disturbance also needs to be considered during option appraisal as outlined above in the context of the SPA but also under the Wildlife Acts.
- The proposed Scheme may increase the impact on the hydromorphological status of the water bodies which is currently listed as a contributing element preventing rivers from achieving their EU WFD objectives.
- Construction impacts will be a key consideration as pollutants can impact on the biological and physico chemical elements of WFD status and sensitive species.
- Overland flow or drainage ditches will be the main pathway for contaminants to enter the water environment and will need to be managed as such during the construction and operation of the proposed Scheme.
- Noise during the construction phase of the proposed Scheme may have a temporary local adverse impact on the environment and migratory fish.
- Buildings or structures of significance include those that have been identified to be at risk of flooding and the R238 regional road and bridge which is within the study area. The waste water treatment plant and package plants for housing developments withing the floodplain are key constraints due to potential impact on sensitive receptors including the dwellings that they service.
- A more detailed archaeological evaluation process and subsequent environmental impact assessment will be undertaken to ensure the known and standing monuments, architectural and cultural heritage sites are avoided. Specific mitigation requirements to address potential ‘unknowns’ can only be identified as items for review once the location of any chosen preferred option is defined.

1 INTRODUCTION

1.1 Background

The brief for the Burnfoot Flood Relief Scheme requires that the *"Consultant shall undertake a series of desk studies, consultations with all relevant stakeholders, and organise preliminary field investigations by their competent experts in the relevant disciplines to identify issues that might be relevant to, or impose constraints on, the design and construction of the schemes."*

The issues considered in this Constraints Study should at a minimum reflect the scope of an Environmental Impact Assessment (EIA) in accordance with the requirements of the EIA Directive 2014/52/EU:

a) Population, Human Health

b) Biodiversity

c) Land, Soil, Water, Air and Climate

d) Material Assets, Cultural Heritage and the Landscape

e) The interaction between the factors referred to in points a) to d).

The output of the Constraints Study is to be used in multi criteria analysis of the options, ultimately informing selection of the preferred option (the Scheme) being taken forward to Stage II. The desktop and field surveys outlined below are those that would be typical for a Constraints Study. More specialist or detailed study may be required at the environmental assessment stage.

1.2 Overview of the Scheme

The Burnfoot River flows from east to west draining a narrow valley before flowing under the R238 and through the village. It meets the Skeoge River to the west of the village before both drain out to Lough Swilly via a tidal lagoon behind Inch Island. The Skeoge River drains an area including the outskirts of Derry City and then flows in a north westerly direction, through Bridgend and past the south west of the village to meet the Burnfoot River. The Burnfoot River is subject to flash flooding with the flat, reclaimed agricultural lands downstream subject to combined coastal and river flooding.

Burnfoot has had a history of serious flooding: the most recent occurring in August 2017. Up to 30 homes were flooded mostly in Líos Na Greíne and Páirc an Ghrianáin and at least seven local businesses were affected. Roads in the area were damaged and a local Waste Water Treatment Plant suffered considerable damage.

The flooding was due to a high intensity rainfall event which focussed on the north west of the country and in particular Inishowen. 73mm of rainfall was recorded in an 8 hour period at the Malin Head hourly rainfall gauge which is estimated to be greater than a 1 in 100 year return period rainfall event. The Burnfoot River exceeded its banks, particularly on the lower, south bank of the river upstream of the R238 (Main Street) bridge. The R238 is an important regional road. The R238 bridge was impassable during the event leading to long diversions for emergency services and the local community trying to access either the other side of the village or the rest of the Inishowen Peninsula. There is some evidence that the high intensity nature of the rainfall also led to flooding from other drains and watercourses in the area.

Following on from the North Western and Neagh Bann Catchment Flood Risk Assessment and Management (NWNB CFRAM)[1] Study, the next stage is the Development of the Flood Relief Scheme and this report summarises the Constraints Study that is being undertaken as part of the Environmental Impact Assessment which will inform the engineering design. The Flood Risk Management Plan (FRMP)[2] preferred option for the Burnfoot involves the implementation of hard defences to protect against the 1% Annual Exceedance Probability (AEP) fluvial event (100 year return period) with an average height of 2.1m and a total length of

[1] Further information and CFRAM reports can be found at https://www.floodinfo.ie/publications/

[2] https://s3-eu-west-1.amazonaws.com/docs.floodinfo.opw/floodinfo_docs/Final_FRMPs_For_Publication/FRMP_Final2018_RiverBasin_01.pdf

0.6km. The Study Area for the Environmental Constraints Study, Burnfoot Town and CFRAM flood defence proposals are shown on the map below (Figure 1.1). Whilst the FRMP identified this as the preferred option, this project level assessment will reconsider all potential options and ultimately the Constraints Study will inform early optioneering as well as engineering design.

1.2.1 Scheme Development and Design

Engineering Development and Design is being advanced in parallel with the Environmental Assessment of the Flood Relief Scheme. The range of engineering measures typically considered includes but are not limited to those listed in Section 1.2.2. The Engineering team will revisit the list to ensure the preferred option accounts for all existing and new information emerging since the CFRAM Study. It will be further informed by the Environmental Constraints Study and input from the public.

1.2.2 Potential Flood Relief Measures

1. Do nothing (i.e.,, implement no new flood alleviation measures)
2. Non-Structural Measures (e.g., flood warning system or individual property protection)
3. Relocation of Properties and/or infrastructure
4. Reconstruction of Properties and/or infrastructure to a higher level
5. Flow Diversion (e.g., river diversion or flood flow bypass channel)
6. Flow Reduction (e.g., upstream catchment management or Flood Storage)
7. Flood Containment through construction of Flood Defences
8. Increase Conveyance of Channel (upstream and/or through and/ or downstream of the town)
9. Sediment Deposition and Possible Sediment Traps
10. Pumping of storm water from behind Flood Defences

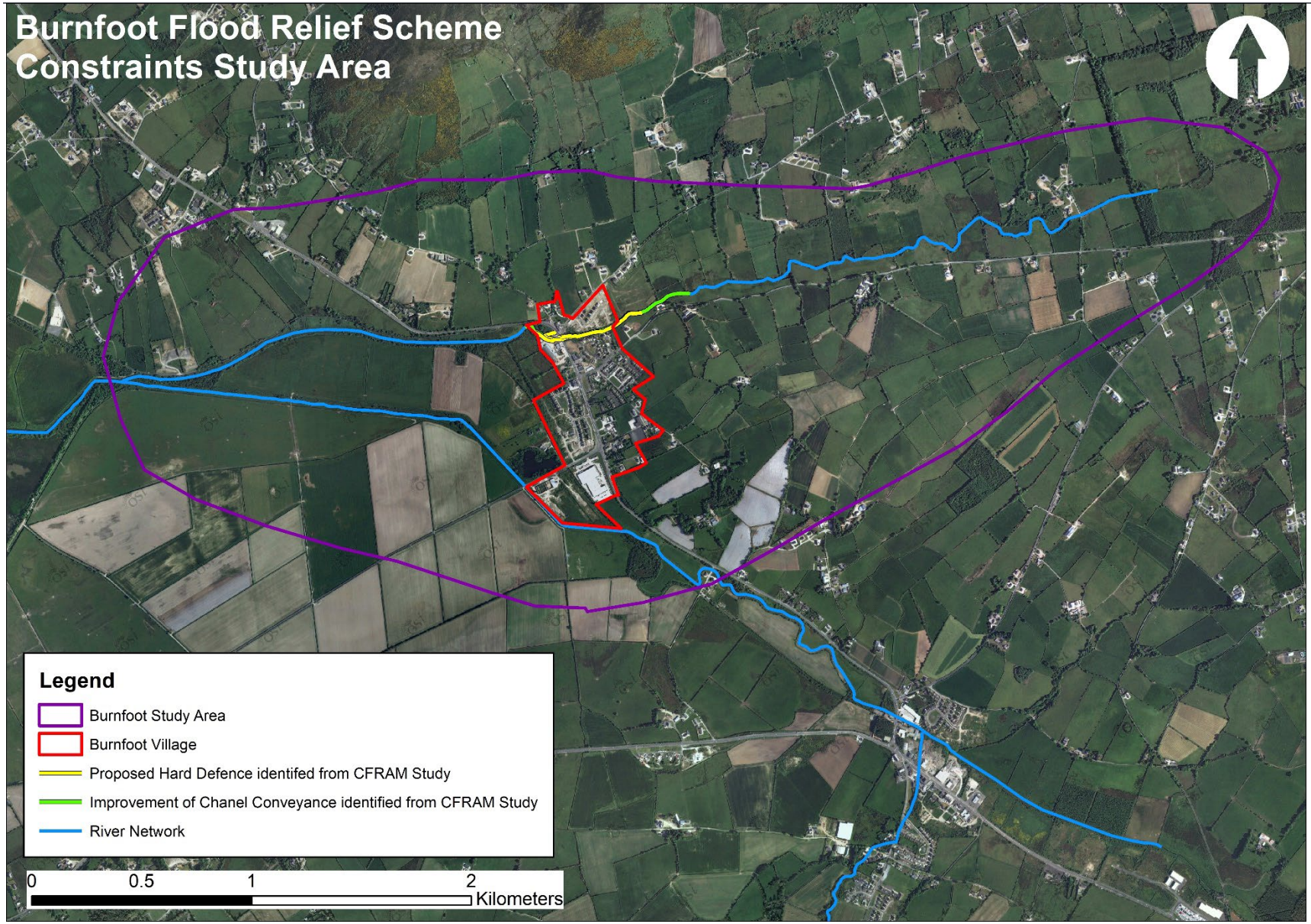


Figure 1.1: Burnfoot Flood Relief Scheme Study Area

1.2.3 Stages in the Project

The Burnfoot Flood Relief Scheme will be delivered in the following Stages:

Stage I: Scheme Development and Design

Stage I involves the collection of all relevant data. A survey specification is being prepared, tendered and managed and hydrological and hydraulic analysis of the study area is being carried out. A full cost-benefit analysis of the Scheme is also being undertaken. The Constraints Study undertaken in this stage has ultimately informed the outcomes of this Constraints Report. It will identify the key environmental issues associated with the proposed Scheme which may be impacted upon by possible flood alleviation measures and/or which may impose constraints on the viability and/or design of these measures. Environmental assessments are being undertaken to determine the impact of the proposed Scheme and environmental sensitivities within the study area.

Stage II: Planning

Stage II will involve preparation of all documentation required to progress the Scheme through the necessary planning, including public display, and other statutory processes.

Stage III: Detailed Construction Design and Tender

Stage III will involve detailed design, preparation of tender documents and a public competition to appoint a main works contractor.

Stage IV: Construction

Construction will be carried out by a works contractor, under supervision of the consultant, following a public procurement competition. A Functioning Scheme will be in place at the end of stage IV.

Stage V: Handover of Works

Commission of the completion certificate. Preparation of a financial analysis report for the project. 'As-Built' surveys, 'As-Built' flood mapping and an updated Climate Change Adaption plan will be prepared.

The Constraints Study is the first stage in the assessment of the environmental impacts of the Burnfoot Flood Relief Scheme. The environmental assessment stages of the process are outlined in Table 1.1.

1.3 Scope of the Constraints Study

Information has been gathered with due regard to the likely environmental impacts of the proposed Scheme, and the statutory requirements for EIA as set out in EU Directives and associated Irish legislation.

1.4 Consultation

Consultation has taken place with focused statutory consultees as part of the initial Constraints Study. A summary of the outcome of the Opening Public Consultation and Opening Collaborative Workshop is provided in Section 2 and 3. The environmental Constraints Study will provide the basis of further environmental consultation with wider statutory and non-statutory consultees.

Table 1.1: Environmental Assessment during the Project Stages

Project Stage	Environmental Assessment	Engineering Assessment
Stage I	• Environmental Baseline Surveys • Constraints Study (to inform the Constraints Report) • Invasive Species Survey and Management Plan • Environmental Assessment of viable options • Appropriate Assessment Screening	• Topographical Surveys • Hydrological Analysis • Hydraulic Modelling and Mapping • Scheme analysis and development

Project Stage	Environmental Assessment	Engineering Assessment
	• Environmental Impact Assessment (EIA) Scoping and Consultation • Environmental Impact Assessment (EIA) Screening • Natura Impact Statement (NIS) • Environmental Impact Assessment Report (EIAR) • Outline Construction Environmental Management Plan	• Option appraisal based on Multi-criteria analysis • Climate Change adaptation analysis • Identification of preferred option
Stage II	• Consultation • Development Consent Process	• Consultation • CPO process • Land Holding impact reports
Stage III	• Input into detailed Design	• Condition Surveys • Detailed Design • Advanced Works • Tender preparation and tender period
Stage IV	• Final Construction Environmental Management plan	• Construction Supervision
Stage V	• Input into scheme completion report	• Burnfoot substantial completion • Additional Procurement/testing • Update Climate Change adaption report • Review of landowner impact reports • Scheme completion report • H&S File • Data Handover

2 OPENING PUBLIC CONSULTATION

2.1 Opening Public Consultation

2.1.1 Format of the Public engagement and the Opening Public Consultation

Various news and social media outlets were used to advertise the Opening Public Consultation (OPC), these included,

- Highland Radio
- County Donegal Flood Relief Scheme website (http://www.countydonegalfrs.ie)
- Donegal County Council website (https://www.donegalcoco.ie/)

DCC issued a press release on their website and social media platforms on 9th November 2020. DCC also briefed local elected members and other community representatives ahead of the launch of the OPC. The OPC was well publicised locally through the distribution of OPC Packs which included a letter detailing the proposed Scheme, newsletter, brochure and questionnaire. Packs were delivered to properties deemed to be at risk as assessed by the CFRAM Study.

Scheme Brochures and Questionnaires (Appendix A) were available through the online portal for the duration of the consultation. Responses from questionnaires were received via Microsoft Forms, post and email.

The OPC was held as an online event through the project website (https://countydonegalfrs.ie) via online portals for each of the scheme areas from 9th November 2020 until the 21st December 2020. A traditional OPC in person event was not held due to the ongoing COVID-19 public health emergency.

2.2 Analysis of Responses - Burnfoot

In total, nine responses (four online, five by post) to the questionnaire were received. All of the respondents live or work within the study area and all have been directly affected by flooding. A summary of the key information is outlined in the following sections.

2.2.1 Flooding Information

Question 4 respondents were asked if they have been affected by previous flood events and to provide specific information including dates (Question 5) and type of property affected (Question 6). Of those who responded, most had residential property affected (78%) while others had lands affected (11%). The remaining respondents did not indicate what type of property had experienced flooding.

Question 8 asked for the source of flooding with most respondents expressing the opinion that flooding occurred directly from the river. Additionally, 33% expressed the opinion that flooding also occurred from overland flow and 11% expressed that flooding also occurred from drains (although no distinction has been made between land or road drains).

Question 11 asked if respondents had put any measures in place to reduce the impact of flooding. 44% of those who responded had put some measures in place. The majority noted that they installed floodgates and flood barriers on doors of properties.

2.2.2 Flooding Alleviation

In Question 12, asked for the respondent's opinion on how the issue of flooding could be resolved. Respondents noted the following flood relief measures;

- Defences (2)
- Removal of an existing embankment (2)
- Dredging the river / improved drainage (3)
- Slowing the flow / storage (i.e., Natural Water Retention Measures) (2)

2.2.3 Environmental Topics

In Question 13 respondents were given six environmental constraints and asked how important these were to the development of a Flood Relief Scheme, ranging from very important to unimportant. The majority of responses considered all six of the environmental topics presented as 'moderately important' or higher. 'Water Quality' was considered the most important constraint with 56% of respondents indicating this is 'very important'. 'Angling, Tourism & Recreation' and 'Landscape and Visual Amenity' scored the lowest, with 33% indicating these constraints are 'of little importance' and 22% indicating they are 'unimportant'. One respondent did not answer this question. Overall responses to this question are summarised in **Table 2.1**.

Table 2.1: Importance of Environmental Topics to Respondents at Burnfoot

Environmental topics	Very Important	Important	Moderately Important	Of Little Importance	Unimportant
Biodiversity, Flora & Fauna	22%	33%	11%	11%	22%
Land use and Agriculture	22%	22%	22%	22%	11%
Water Quality	56%	33%	11%	0%	0%
Architectural and Cultural Heritage	22%	11%	33%	11%	22%
Landscape and Visual Amenity	22%	11%	11%	33%	22%
Angling, Tourism & Recreation	22%	22%	0%	33%	22%

2.2.4 Further Comments

In Question 14 respondents were asked to comment on the proposed Scheme or constraints. Comments have been summarised in **Table 2.2**, three respondents left this section of the questionnaire blank.

Table 2.2: Comments in Relation to the Proposed Scheme or Constraints at Burnfoot

Respondent No.	Comment
BT01	The respondent expressed the view that further information will be required before they could give a definitive answer to this question.
BT04	Respondent highlighted that flora and fauna have traditionally suffered during the construction and operation of hard defences. Furthermore, the respondent expressed the opinion that the implementation of effective hard defences is likely to face significant challenges when considered alongside the likely impact of climate change and specifically sea level rise in the downstream area. The respondent expressed the opinion that relocation may be the most sustainable and suitable option.
BT05	Respondent noted that during the 2017 flood, oil from parked vehicles impacted the respondent's home.
BT06	Respondent expressed that there is too much consultation and reporting before going ahead and building a flood defence. They note that money was granted to protect properties in 2018 and feel the flood defences should be prioritised.
BT08	Respondent indicated that all of the environmental constraints are important factors to consider, however they feel that residential property and business should take priority as planning permission was given for them.
BT09	Respondent outlined the effect of flooding on residents lives. They note flooding has occurred more than once and the issue of flood risk has been raised 'for years'.

3 OPENING COLLABORATIVE WORKSHOP

3.1 Aims

The Burnfoot Flood Relief Scheme (FRS) Opening Collaborative Workshop took place on 19th January 2021 via online video conference.

The main aims of the Opening Collaborative Workshop were defined as:

- Establishing goals and objectives from each relevant section within Donegal Council and other public sectors.
- Determining if and how these goals and objectives may inform design features for the proposed Scheme that would bring added value through a joined up approach to public sector working providing multiple benefits and resulting in a more locally valuable and acceptable project.

3.2 Invitees/Attendees

A total of twenty-six stakeholders attended the workshop from a number of different organisations:

- Donegal County Council Flood Relief Scheme Unit;
- Donegal County Council Area Roads;
- Donegal County Council Housing Provision;
- Donegal County Council Planning;
- Donegal County Council Road Design – Greenways;
- Donegal County Council Road Design;
- Donegal County Council Water Environment;
- Inland Fisheries Ireland (IFI);
- Irish Water (IW);
- Local Authority Waters Programme (LAWPRO);
- McAdam Design;
- National Monuments Service (NMS);
- National Parks and Wildlife Service (NPWS);
- Office of Public Works (OPW);
- RPS;
- Northwest Greenway Project.

There were also invitations issued to other stakeholders who were unable to attend including representatives of Department of Agriculture, Department of Infrastructure (DFI) Roads and Rivers (Northern Ireland), Irish Water and the EPA.

3.3 Collation of Workshop Comments

The workshop began with a presentation led by RPS, which detailed the proposed Scheme from both an engineering and environmental perspective. The following aspects were covered: aims of the workshop, the background of the scheme, progress to date, future stages and timeline, factors to consider and information on the “Break-out Session” to be undertaken.

All attendees were then divided into three “Break-Out” groups to further discuss any issues, constraints or opportunities they felt could inform the development of the proposed Scheme. Each group was facilitated by a chairperson, who recorded notes during the session. Each attendee was issued a questionnaire pro-forma in PDF and MS Word format which could be completed during the break-out session.

The Table 3.1 below details the collective comments received by the attendees.

Table 3.1: Overall summary of workshop

Themes	Issues raised
Infrastructure	Various issues in relation to existing and proposed infrastructure was highlighted during the breakout sessions. These included: • There are currently 8 vacant properties in Páirc na Grianán owned by DCC. • The existing WwTP is not protected and new WwTP is a long term plan for Burnfoot/Bridgend. The existing WwTP will revert to a pumping station with new scheme by Irish Water. • LAWPRO noted urban wastewater treatment is driving poor status in the Burnfoot River, measures will have to come in from other projects to improve status by 2027. It was noted upstream in catchment there was high status water quality in 1990s but has since dropped to good status. There is potential for improvement if WwTP is improved. The damage associated with flooding to the WwTP will be considered in the Benefit Cost Ratio (BCR) for the scheme. • DCC_WE highlighted the upstream nature of the 2017 flood event. The WwTP was out of commission during this event and significant discharges out of Páirc na Grianán at this location. • The NW Greenway and Burnfoot FRS environmental assessments should be aligned to ensure consistency. Cumulative effects need to be addressed. Opportunities for design collaboration between the two schemes was identified and should be investigated through consultant review. • Lands identified in the County Donegal Development Plan (2018-2024) for a bypass around Burnfoot have not been progressed and are not likely to impact on the preferred scheme for CFRAM. • There is a nationwide drive to avoid empty properties and measures to allow these properties to be habitable again as soon as possible should be considered. • Interim measures would only provide interim relief and not to the 1% AEP that the main scheme will provide. These will therefore make no difference from a flood insurance perspective. • Concerns for the impact of proposed housing in Derry and increase to urban drainage.
Flood extent and design considerations	• Engineering works that will result in increased stream velocities due to the constriction of flows needs to assess the potential implications for the bridge structure, particularly scour, to compromise the structural integrity. • The FRS Project team is looking at opportunity mapping for natural flood retention measures. The catchment could lend itself to slowing the flow and/or upstream/passive storage, or a combination of all providing dual benefit to the environment and engineering. • It was suggested that defences are set back as far as possible and built sympathetically into environment, maintaining riparian corridors. • Any undiscovered archaeological sites should be dealt with appropriately. • Regarding monuments and protected buildings, OPW will be procuring project archaeology services for all flood relief schemes in coming months to ensure archaeological and architectural heritage is appropriately considered. • There is the potential for undiscovered archaeology given the presence of pre-historic features already recorded in the area. There will be the need for archaeological survey for any works to channel and riparian areas. Historical mapping does indicate standing stones and old forts which may not be obvious now. • There are large areas of reclaimed land downstream of the village that have limited archaeological potential however they could have shipwrecks and the

Themes	Issues raised
	National Monument Service database will be reviewed to see if there is any evidence of ships or submerged landscapes in the area.
Environmental Constraints	A variety of environmental constraints were noted during the sessions. These are summarised below: • The potential of removing the embankments in the vicinity of the confluence with the Burnfoot and Skeoge Rivers to allow more floodplain connectivity and flooding of the lands behind the embankment to reduce the impact of flood waters on Inch Lough Wildlife Reserve. • NPWS highlighted overwintering birds foraging near Burnfoot tend to be habitually used to human activity so disturbance from works in the village is unlikely to be significant. • Breeding birds is an issue, particularly ground nesting birds around the periphery of the wildfowl reserve at Inch Lough. Previous significant flood events have resulted in the Lough levels rising by 3-4ft resulting in the loss of an estimated 5000-6000 nests. • Sandwich Tern colonies are one of national significance being one of the best populations in the country. • Lough Swilly SAC does have nitrogen and phosphorus input issues, but to date it cannot be determined if the scheme will impact on this. • An Invasive Species (ISMP) has been prepared and will be implemented throughout the project.

4 POPULATION & HUMAN HEALTH

4.1 Introduction

This section applies a broad socio-economic model of health that encompasses conventional health impacts such as disease, accidents and risk, along with wider socio-economic health determinants vital to achieving good health and wellbeing. As such, the chapter combines a public health assessment (which focuses on environmental determinants of health), and a socio-economic assessment; providing additional commentary on how changes to some socio-economic factors have the potential to influence health and wellbeing.

This chapter draws from and builds upon detailed project information and the wider technical disciplines within the Constraints Study (most notably, Noise, Vibration, Air Quality and Climate; Water Quality and Hydromorphology; and Material Assets) to communicate the potential influence upon population and human health by these disciplines. For the sake of brevity, this chapter does not seek to repeat text or replicate data from the wider constraints chapters.

4.2 Assessment Methodology

4.2.1 Relevant Policy and Guidance

The Environmental Protection Agency's Draft Guidelines on the information to be contained in EIAR (and therefore this Constraints Study) (EPA Ireland, 2017), highlights the amendments to Article 3(1) of amended European Union (EU) Environmental Impact Assessment (EIA) Directive which states that:

> *"The environmental impact assessment shall identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of a project on the following factors: a) population and human health; […]"*

It is important to ensure that methods employed in a particular population and health assessment are proportionate and tailored to meet the assessment requirements of the Project in question, which can differ considerably depending on the scale and nature of a proposal and are further influenced by local context and varying community circumstance and sensitivity.

The environmental assessment methodology for the Burnfoot Flood Relief Scheme will follow a source-pathway-receptor model to identify and assess population and health effects that are plausible and directly attributable to the Flood Relief Scheme. Where a source-pathway-receptor linkage exists, it is then the nature of the specific hazard source or positive influence; the magnitude of impact via the pathway of exposure; and the sensitivity of the receptor that will determine what level of health risk or benefit is predicted, if any.

When defining potential population and health determinants associated with a proposed Scheme, it is also useful to consider three broad domains of public health practice: health protection (i.e., environmental objective thresholds set to be protective of health); health promotion (i.e., ways in which to support healthy lifestyles, improve socio-economic status and address inequality); and health care (i.e., provision, effectiveness and equity of access to healthcare services).

4.2.2 Approach

The overarching approach will be to draw from and build upon the wider technical outputs of the environmental assessment to facilitate more health conscious planning and test the proposed Scheme for its potential impact (both adverse and beneficial) on population and health.

4.2.2.1 Baseline

Different communities have varying susceptibility to population and health effects (both adverse and beneficial) as a result of social and demographic structure, behaviour and relative economic circumstance. The approach to defining the baseline involves the collation and interpretation of published demographic, socio-economic and existing health and health care data. From this, potential changes due to the Flood Relief Scheme can be investigated and their significance of effect assessed. Understanding the existing baseline socio-economic

and health status within the study area also supports bespoke mitigation and community support initiatives tailored to local circumstance and need, where appropriate.

4.2.2.2 Appraisal

The appraisal maps the information and health determinants against the baseline and receptor sensitivity to assess the magnitude of impact and significance of potential population and health effects (both adverse and beneficial), that would be directly attributed to the Flood Relief Scheme during construction and operation phases, and further considers any cumulative impact.

4.2.3 Study Area

Environmental health determinants (such as changes to air quality and waste emissions) are likely to have a local impact where potential change in hazard exposure is limited by physical dispersion characteristics. As a result, and where available, the study area for health-specific baseline statistics relating to population and health effects focus on the electoral divisions (EDs) immediately adjacent to Burnfoot, i.e., Birdstown ED and Fahan ED, using Ireland averages as comparators. Where data for EDs are not available, statistics relating to Donegal or the Border Region are collected using the Ireland average as a comparator.

Socio-economic health determinants (such as employment and related income generation) have a wider geographic scope of influence than environmental health determinants. The willingness to commute significant distances to work indicates that the study area for socio-economic baseline statistics relating to population and health effects should have a wider focus (i.e., Donegal or the Borders Region), using the Ireland average as a comparator.

4.2.4 Limitations of the Assessment

The population and health assessment will partially draw from and build upon the technical outputs from other environmental issues, and as a consequence are bound by the same limitations and assumptions therein applied.

4.3 Receiving Environment

4.3.1 Existing Baseline Conditions

The County Donegal Development Plan 2018-2024, National Spatial Strategy 2002-2020 and the following open source websites and datasets have been used in order to develop the population and health baseline: SAPMAP (CSO, 2011; CSO, 2016); Eurostat (European Commission, n.d.); Institute of Public Health (IPH, n.d.); and Pobal (Pobal, 2016).

The remainder of this section summarises the findings of the full population and health baseline data collection and analysis.

4.3.2 Spatial Planning Policy

Figure 4.1 illustrates an overview of the Irish Planning System and the importance of policy in the assessment of planning applications. The relevant planning policies are set out for each level within the hierarchy in the sections that follow.

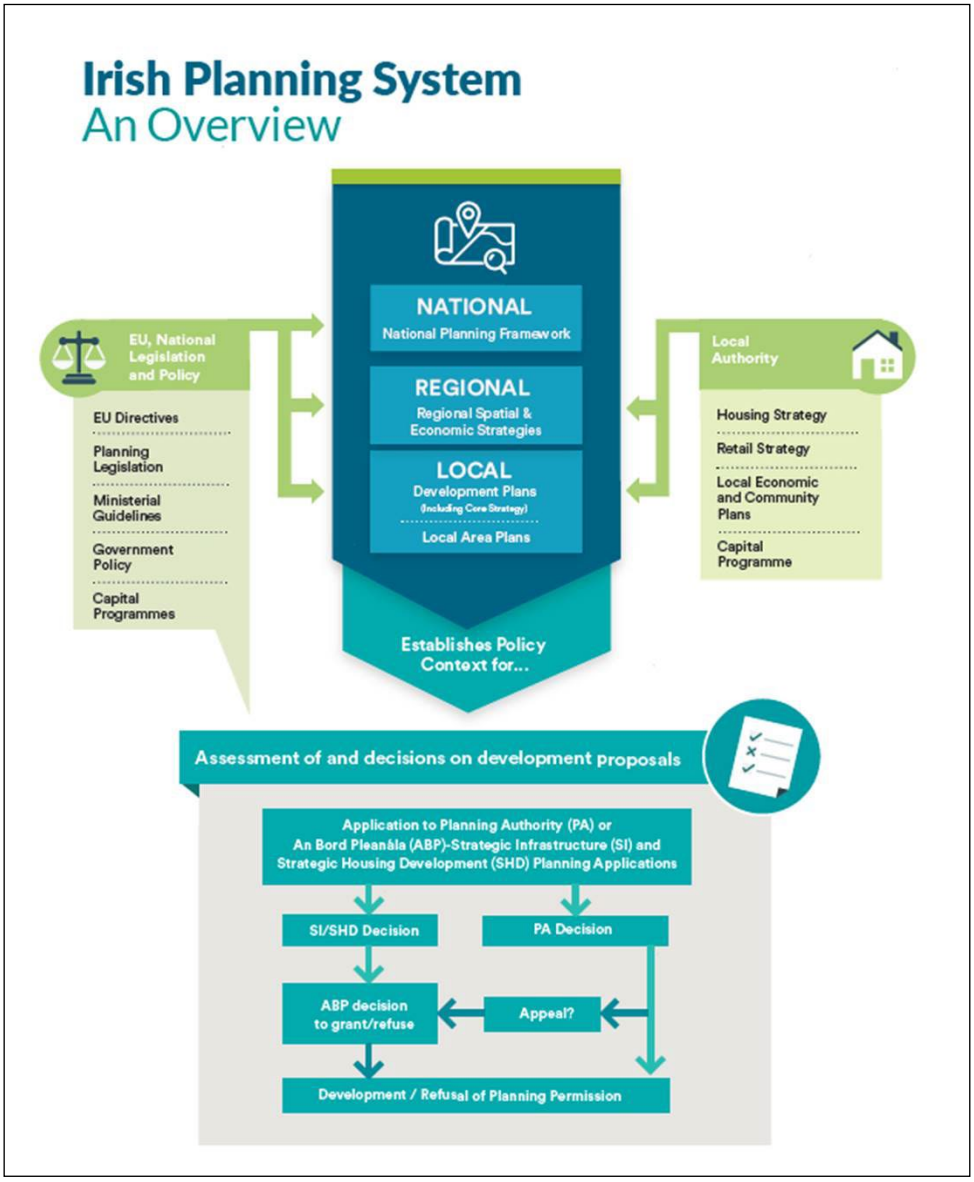


Figure 4.1: Planning Policy Hierarchy (Department of Housing, Planning and Local Government, 2018)

4.3.2.1 Relevant National Planning and Development Policy

Project Ireland 2040 National Planning Framework

Project Ireland 2040 National Planning Framework, published in July 2018, is the primary articulation of spatial, planning and land use policy within Ireland. The NPF Strategy in relation to flood risk requires a cross sectoral approach and the consideration of future flood risk in the area of planning and development management and the planning and design of infrastructure. In particular the core objectives of the Planning System and Flood Risk Management Planning Guidelines DEHLG 2009 are promoted, i.e.,

- avoiding inappropriate development in areas at risk of flooding;
- avoiding new developments increasing flood risk elsewhere, including that which may arise from surface run off;
- ensuring effective management of residual risks for development permitted in floodplains;
- avoiding unnecessary restriction of national regional or local economic and social growth; and

- improving the understanding of flood-risk and ensure flood risk management in accordance with best practice.

The development of the Burnfoot Flood Relief Scheme needs to ensure it is consistent with the final bullet point in particular. The Strategic Flood Risk Assessment (SFRA) for the National Planning Framework reinforces the key concepts of the precautionary principle and the sequential approach, and the connection with the National Climate Change Adaption Strategy and the EU Water Framework Directive demonstrating the need for an integrated approach between the National Planning Framework and other strategic plans.

The framework recognises the importance of the Northern and Western Region and justifies a particular focus in the Framework. This is due to the lower level of urbanisation compared to other regions, proximity to the border and the risk posed by Brexit.

Specifically, in relation to Donegal the Framework acknowledges that the region is spatially unique due to its extensive coastline but also the relationship to Northern Ireland. In addition to enhancing the connectivity for the regional area the framework supports the enabling of growth and competitiveness to support the strong links that exist between border region and Northern Ireland.

4.3.2.2 Relevant Regional Planning and Development Policy

Regional Authority Planning Guidelines 2010-2022

The Border *Regional Authority Planning Guidelines 2010-2022* were prepared in 2010. These Regional Planning Guidelines are prescriptive in setting out a planning framework for the proper planning and development of the Region and ensuring that sustainable communities are provided for in the coming years. The Guidelines provide a long term planning framework for the Region and have been closely aligned with the National Spatial Strategy and National Development Plan in Ireland and the Regional Development Strategy in Northern Ireland.

There are a number of Regional Flood Risk Policies (FRP) contained within the guidelines with the most relevant to the Burnfoot Flood Relief Scheme being FRP2 and FRP10:

FRP2 "Where new or upgraded flood/coastal defences are shown to be essential to protect existing development, all such proposals shall be subject to the Floods and Habitats Directive and all other statutory requirements."

FRP10 "Recognising the concept of coastal evolution and fluvial flooding as part of our dynamic physical environment, an adaptive approach to working with these natural processes shall be adopted."

4.3.2.3 Relevant Local Planning and Development Policy

County Donegal Development Plan 2018-2024

The County Donegal Development Plan 2018-2024 outlines flood risk management strategies for the management of development, including related polices which will be carried out in accordance with the Flood Risk Management Guidelines for Planning Authorities, surface water management and sustainable urban drainage (SuDS). In the context of Flood Relief Schemes Policy F-P-6 states:

It is a policy of the Council to consider the development of long and short-term flood remediation works, including embankments, sea defences, drainage channels, and attenuation ponds to alleviate flood risk and damage to livelihoods, property and business subject to environmental considerations including potential impact on designated shellfish water and, fresh water pearl mussel catchment areas, compliance with Article 6 of the Habitats Directive, best practice in Coastal Zone Management and the Marine Resource and Coastal Management policies of this Plan.

Burnfoot is a Layer 3 settlement, 'Rural Towns and Open Countryside' as defined in the County Development Plan 2012-2018 (as varied). Burnfoot zoning extents are shown in *Volume II, Figures*. Layer 3 settlements comprise the County's network of smaller rural towns together with their surrounding rural hinterlands. The core strategy recognises that Layer 3 is a critical component of the social, community and cultural identity of the County and that strengthening of rural communities is essential in order to ensure the survival of the unique character of the county. In order to continue to support the strengthening of rural communities, the core strategy targets an additional population of 5,029 people by 2024 and a further 13,058 by 2038 forming an important

component of the County's critical mass. The Flood Relief Scheme in Burnfoot will ensure that the rural community is strengthened and will therefore facilitate the achievement of the settlement strategy for the County.

4.3.3 Demographic and Socio-economic

The settlement of Burnfoot had a recorded population of 450 in the 2016 census a slight decrease (3%) from the population recorded in 2011 which was 466. A similar trend was noted in the electoral division of Birdstown which had a population of 1,312 in the 2016 census a small decrease from the 1,324 recorded in the 2011 census. The Fahan electoral division showed a different trend than that of Birdstown, with a population of 1,697 in the 2016 census an increase from the 1,670 recorded in the 2011 census. The small decrease in population in Burnfoot and Birdstown Electoral division between the years of 2011 and 2016 is in contrast to the national population growth experienced over the same period, i.e., 3.8 %. The settlement figures differ from those of the electoral division as the settlement boundary is only partially located within the boundary of the electoral division.

The levels of unemployment in Burnfoot (9.3%) during the 2016 census is lower when compared to the national average (12.9%). The electoral divisions of Birdstown and Fahan have a similar or higher unemployment rate than the national average, of 12.6% and 16% respectively based on the 2016 census.

Deprivation statistics are derived for Birdstown EDs using the Pobal All-Island HP Deprivation Index (2016). The most recent statistics show that the population living within the "small area" the Flood Relief Scheme is located within the Birdstown ED (ID 057015001) are categorised as "marginally below average", with a relative deprivation index score of -3.32. While the "small area" located within the Fahan ED (ID 057063007) are categorised as "disadvantaged", with a relative deprivation index score of -12.3.

4.3.4 Physical Health

Both male and female life expectancy nationally is increasing with male life expectancy consistently lower than female life expectancy. Healthy life expectancy (i.e., the number of years a person is in good health), is also generally increasing for both males and females, with male healthy life expectancy again consistently lower than female healthy life expectancy.

The hospital admission rate for diseases of the circulatory system (Figure 4.2) are generally lower in Donegal compared to the national average and has remained relatively static over the years. Hospital admissions for diseases of the respiratory system in Donegal are higher than the national average and have seen increase numbers in the recent past with a slight decrease in 2015.

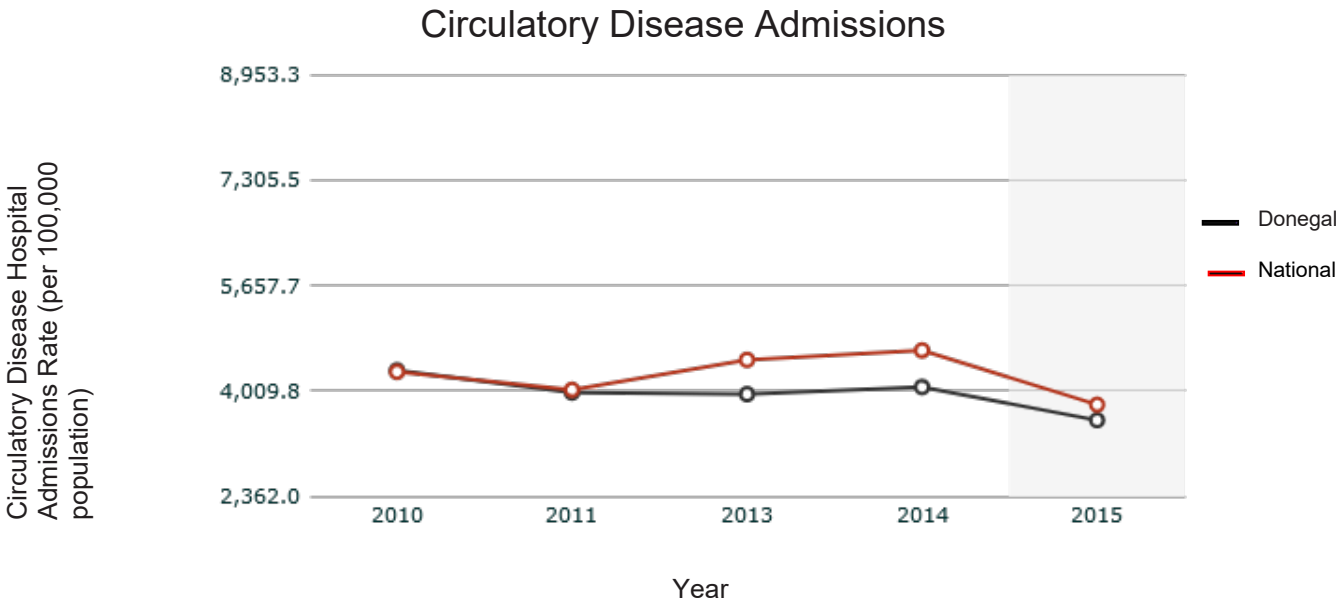


Figure 4.2: Circulatory Disease Admissions (Source Public Health Well Community Profiles)

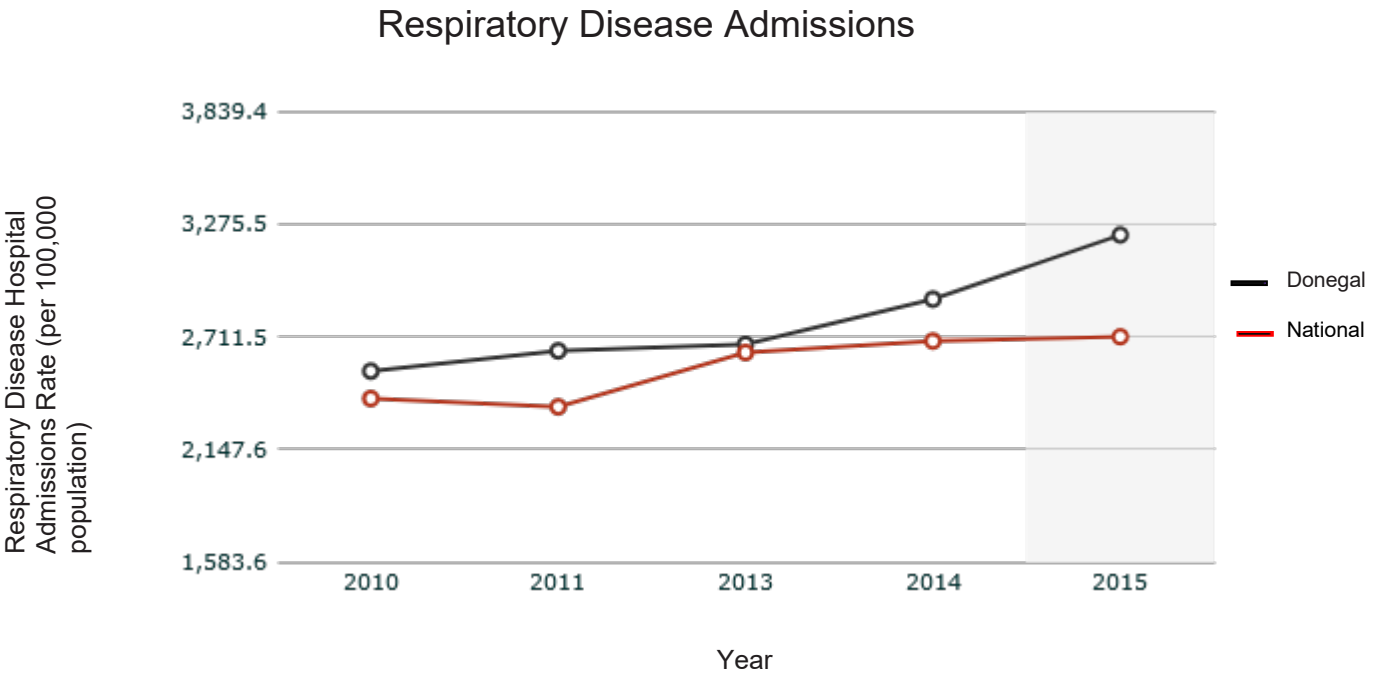


Figure 4.3: Respiratory Disease Admissions (Source Public Health Well Community Profiles)

The proportion of the population within the study area, settlement of Burnfoot (11.5%) and Birdstown ED (10.2%) with a disability is lower than the national average (13.5%) based on 2016 census information, while the Fahan ED (14.7%) is higher than the national average. The all-age all-cause mortality figure in Dublin City is lower than the national average.

The cancer mortality rate within Donegal fluctuates year-on-year but has generally remained above the national average (Figure 4.4). The respiratory disease mortality rate within Donegal has fluctuated between

80 -100 deaths per 100,000 population over the years and was generally higher than the national average, however the most recent rates are very similar (Figure 4.5). The circulatory disease mortality rate within Donegal has remained relatively static over the years but remains consistently higher than the national average (Figure 4.6).

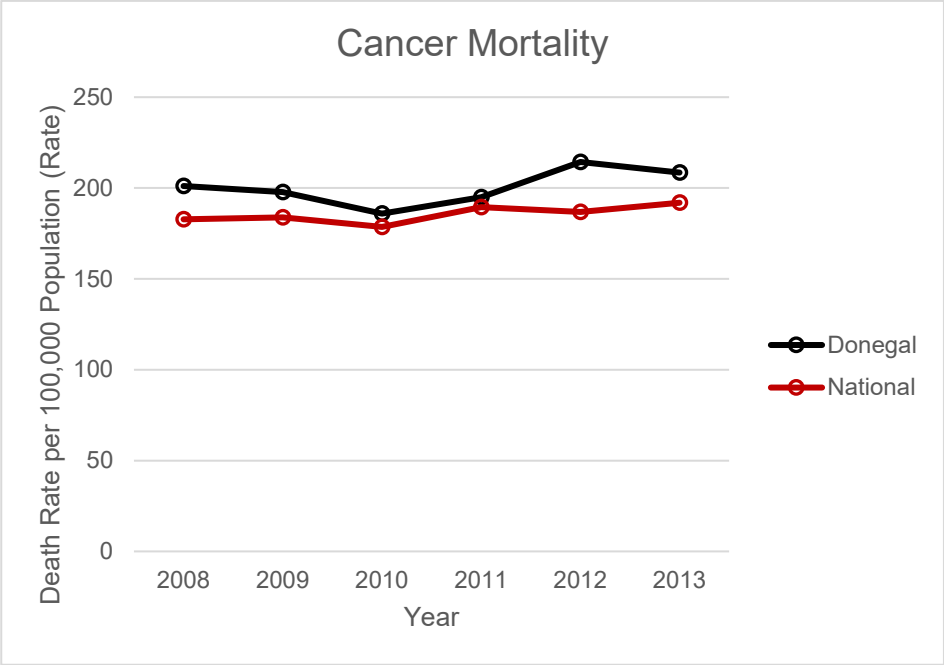


Figure 4.4: Cancer Mortality Rates (Source Statbank (DHA12)

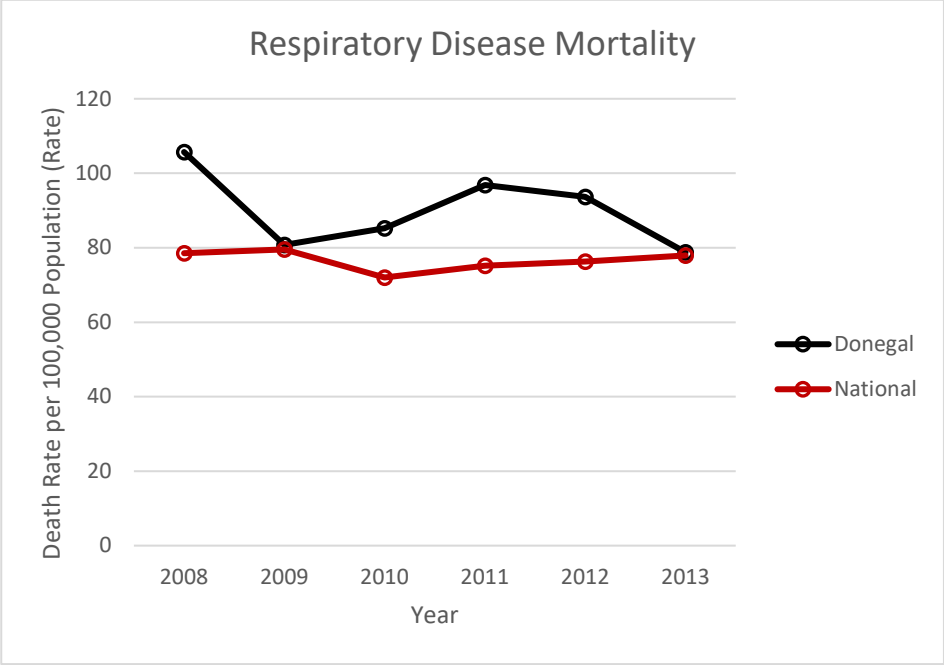


Figure 4.5: Respiratory Disease Mortality (Source Statbank (DHA12)

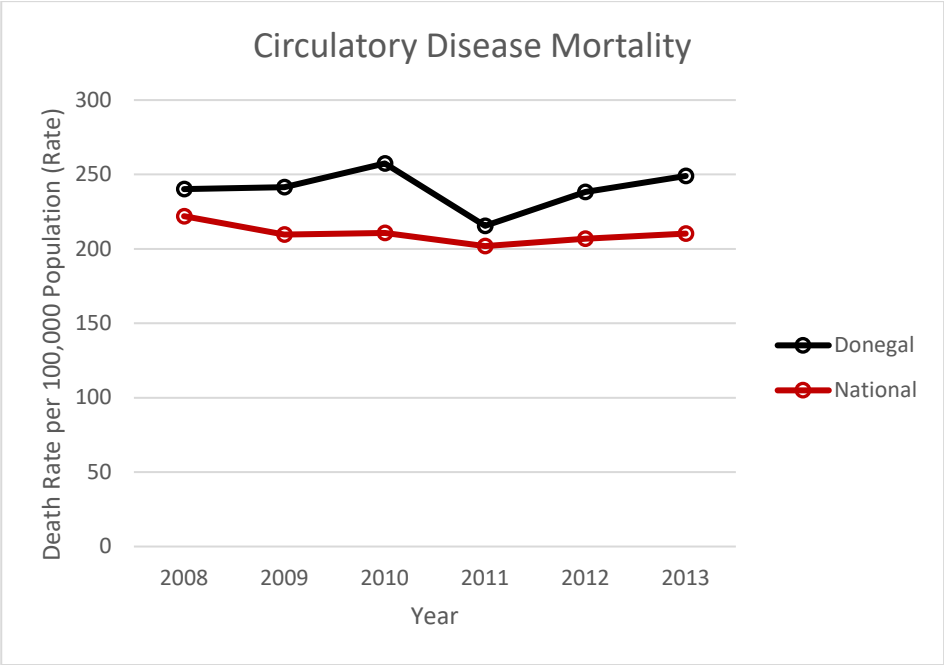


Figure 4.6: Circulatory Disease Mortality Rates (Source Statbank (DHA12)

4.3.5 Mental Health

Suicide rate within Donegal shows a generally consistent trend but remains consistently below the national average year-on-year, with the exception of 2015 (Figure 4.7).

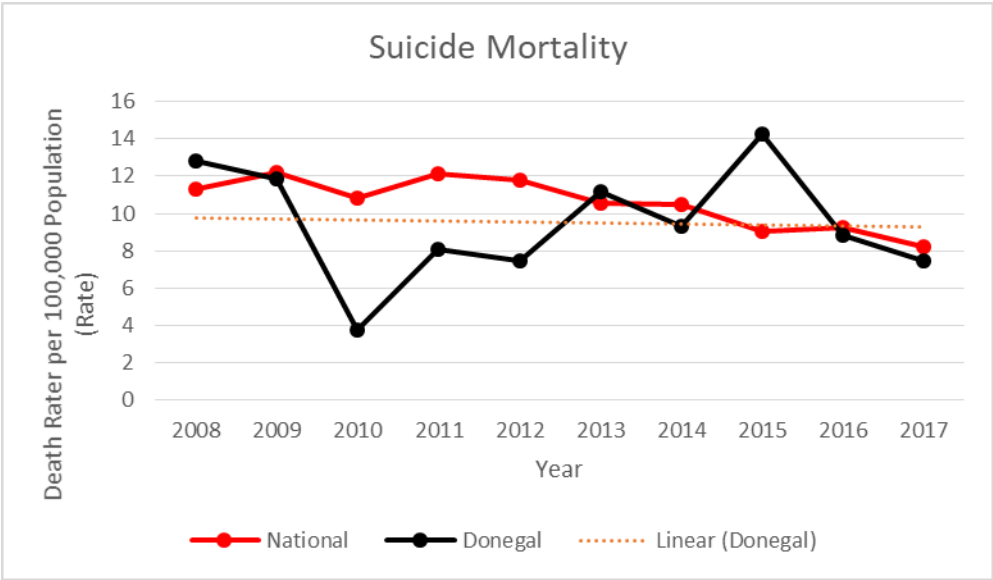


Figure 4.7: Suicide Mortality (Source Statbank (DHA12)

4.3.6 Lifestyle

Obesity in Donegal has seen an increase in levels and based on the most recent figures is now higher than the national average and is increasing, following the national trend (Figure 4.8). In addition, there is a higher proportion of the population in Donegal who are physically inactive compared to the national average.

Figure 4.8: Obesity Levels (Source Public Health Well Community Profiles)

The rate of hospital admissions for alcohol related conditions within Donegal are similar to the national average and is increasing following the national trend (Figure 4.9). The rate of hospital admissions for drug related conditions within Donegal is lower than the national average and has remained relatively static over the years (Figure 4.10). Smoking prevalence within Donegal increased between 2002 and 2007, following the national trend. Smoking prevalence in Donegal is lower than the national average (Figure 4.11).

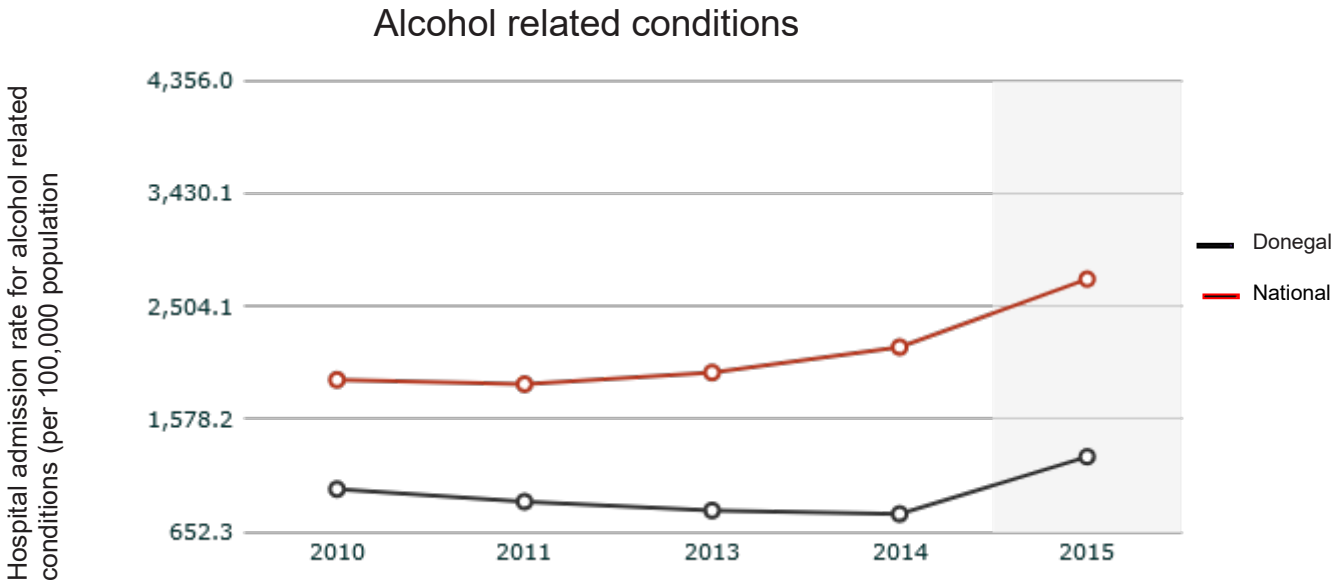


Figure 4.9: Alcohol Related conditions (Source Public Health Well Community Profiles)

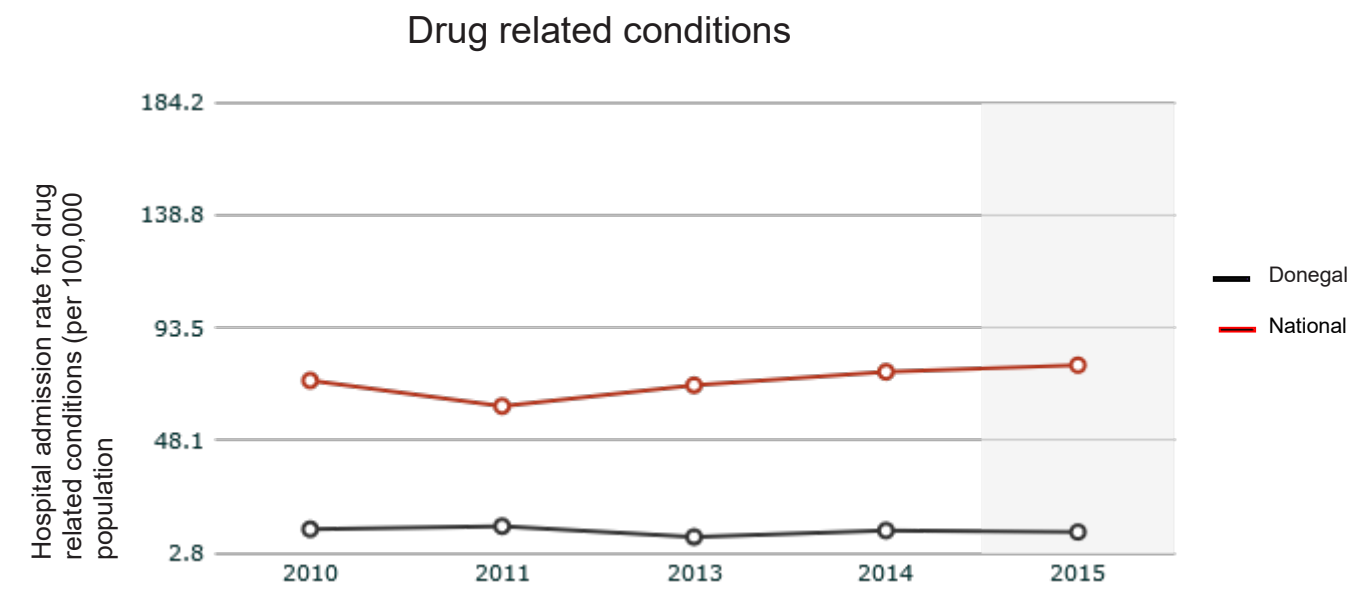


Figure 4.10: Drug related conditions (Source Public Health Well Community Profiles)

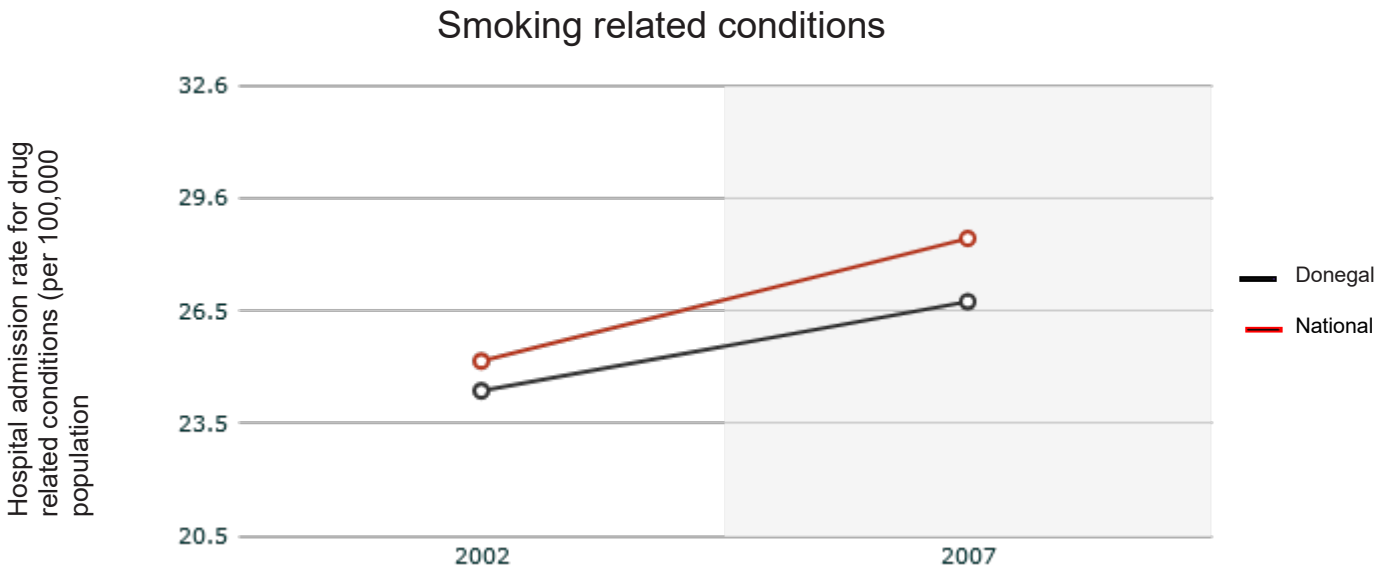


Figure 4.11: Smoking Prevalence (Source Public Health Well Community Profiles

4.3.7 Tourism

Tourism is one of Ireland's most important economic sectors, contributing 5.6 billion (excluding receipts paid to Irish carriers by foreign visitors) in 2019 alone (Fáilte Ireland, 2021). Furthermore, it increases the necessity for employment in the Irish hospitality sector.

Ireland is split into 8 different regions in respect to tourism, with Donegal located in the Border region. In 2019, the Border region accounted for 19.5% of the total number of tourists to the country and 9% of the overall total tourism expenditure.

Fáilte Ireland estimated that in 2019, tourists to Ireland primarily engaged in hiking/cross-country walking, cycling, golf, equestrian and angling. All of these activities are widely accessible throughout Donegal and the Border tourism region. However, none of the most popular free or paid sites are located within Donegal

currently. Donegal has huge potential in terms of tourism in these outdoor reactional activities and this is acknowledged in the current Donegal County Development Plan (2018-2024).

Tourists to Burnfoot can visit nearby Inch Wildfowl Reserve, Wild Ireland, Derry City and enjoy hiking and golfing activities throughout Inishowen. Inch Levels is one of eight pilot trial sites being enhanced as a walking and recreational area as part of the Atlantic Area Trail Gazers Project. The impact of flooding particularly the flooding of the main access to these facilities, the R238, can have a significant impact on tourism and subsequently impact local and regional economy.

4.3.8 Community Facilities

There is one primary school in Burnfoot, St. Mura's National School. This has approximately 214 pupils. There are no secondary schools in Burnfoot. Students travel to Buncrana for second level education.

4.3.9 Recreational Use, Amenity and connectivity to waterways

Burnfoot has recreational activities provided at Aileach Youth and Community Centre, as well as sporting club facilities like that of Aileach football club, Burt GAA football club and Halfway Karting. The Burnfoot River itself and the downstream Inch Wildlife Reserve and Walkway into which it flows are also a key recreational aspect within the town for local angling and local recreation. The impact of the scheme on the river and downstream amenities at the wildlife reserve are key constraints. Amenity and tourism constraints are shown in *Volume II, Figures (Constraints – Amenity Tourism)*.

4.3.10 Industry and Business

Burnfoot is a Layer 3 settlement, "Rural Towns and Open Countryside". Burnfoot is located within 14.0 kilometres of the large urban centres of Derry and Letterkenny. Industry in Burnfoot varies from community based businesses such as the butchers, beauticians, stationary/printing business and bars and elsewhere industrial business, E&I Engineering Ltd.

4.3.11 Conclusion

Demographic and housing stock statistics show that there is limited population growth in Burnfoot, the Birdstown ED and Fahan ED. Generally, employment, and income levels are all below the national averages and Burnfoot is classified as marginally below average in terms of the deprivation index. Currently in Burnfoot, there are 20 residential properties at risk of flooding, this number may be subject to change as the scheme develops.

The proposed Scheme must be cognisant of the tourism role of the Burnfoot River and downstream amenities connected to the river, including the Inch Wildlife Reserve and walkway, which are key for angling and tourism in the area. Therefore connectivity and protection of the river for recreational needs is vital.

Overall, the local community surrounding Burnfoot Flood Relief Scheme are not considered particularly sensitive to population and health effects resulting from changes to environmental or socio-economic health determinants. However, the impact of flooding on the homes and businesses affected can have a significant impact on the wellbeing of those affected. In particular, there is potential for human health to be impacted through the flooding of waste water infrastructure within the floodplain. This will be discussed further in Section 9.2.3

4.4 Key Constraints

The FRS offers an opportunity to mitigate the risk of flooding currently affecting residential properties, waste water infrastructure and businesses. Flooding of the R238 is also a constraint that requires consideration given that this is an important commuter route for the local community and a tourism gateway for employment and education and access to critical community services.

There are also the constraints associated with the potential nuisance effects from the construction of the scheme such as noise and air emissions and the potential impact on the water environment affecting residents,

businesses and recreation in proximity to the works. The landscape and visual effects can also impact on the population and human health once the FRS has been constructed.

These issues will be considered during the development of the scheme and the selection of the preferred option.

4.5 Conclusion

While it is predicted that there would be adverse increases in ambient levels of environmental health determinants directly attributed to the construction and operation of the Flood Relief Scheme (such as air quality), the magnitude of these changes is likely to be minimal and not sufficient to quantify any measurable adverse change in population health outcomes.

The Flood Relief Scheme will offer the opportunity to provide a significant benefit from a socio-economic perspective and reduce the risk of flooding to the residential properties at risk of flooding and the associated impacts on human health and socio economics. This will facilitate the continued provision of direct, indirect and induced socio-economic benefits, not only on a local scale, but also at a regional scale. Some of these socio-economic benefits have the potential to positively influence health and wellbeing at an individual level in the short-term and at the population level in the long term.

Overall, it can therefore be concluded that in terms of population and health, the significant positive socio-economic effects will outweigh the negligible effects relating to minor increases in environmental health determinants that may arise from the proposed Scheme.

5 BIODIVERSITY

5.1 Overview

Ireland has obligations under EU law to protect and conserve biodiversity. This relates to habitats and species both within and outside designated sites. Nationally, Ireland has developed a Biodiversity Plan which has been updated to cover the period 2017-2021 to address issues and halt the loss of biodiversity, in line with international commitments. In accordance with Target 4.3 "Optimised benefits for biodiversity in Flood Risk Management Planning and Drainage Schemes" of Ireland's National Biodiversity Action Plan 2017-2021, the proposed Scheme will ensure that Flood Risk Management (FRM) planning and associated SEA, EIA and AA, minimises the loss of biodiversity and ecosystem services through policies to promote more catchment-wide and non-structural flood risk management measures. The overall target for Ireland's National Biodiversity Plan is that biodiversity loss and degradation are reduced and progress is made towards substantial recovery by 2021. This follows on to the European Commission EU Biodiversity Strategy to 2030 which has a headline target to halt the loss of biodiversity and ecosystem services by 2030, to restore ecosystems in so far as is feasible and to step up the EU contribution to averting global biodiversity loss. This implements EU commitments under the Convention on Biological Diversity (1992).

Relevant legislative protections for biodiversity include EU Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (as amended) – (commonly referred to as the Habitats Directive) - and Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds (commonly referred to as the Birds Directive). These Directives are transposed into Irish law by the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011, as amended by S.I. No. 499 of 2013 and S.I. No. 355 of 2015) and requires that any plan or project not directly connected with or necessary to the management of a European Site but likely to have a significant effect on such a site must undergo an Appropriate Assessment in view of best scientific knowledge and in view of the conservation objectives of the site.

5.2 Fisheries & aquatic ecology

5.2.1 Policy and Legislation

Although the Burnfoot River is part of the Skeoge River system, which is a cross-border catchment, governance and administration of fisheries within the general area of the proposed Scheme is the responsibility of Inland Fisheries Ireland (IFI), as the Burnfoot River drains into Lough Swilly via Inch Lough.

IFI is the state agency responsible for the protection, management and conservation of inland fisheries in the Republic of Ireland. IFI was established in 2010 under the Inland Fisheries Act 2010 following the amalgamation of the Central Fisheries Board and the seven former Regional Fisheries Boards into a single agency.

Under the Fisheries Consolidation Act 1959 (No. 14 of 1959), the Inland Fisheries Act 2010, and the Inland Fisheries (Amendment) Act 2017, IFI has the responsibility to protect, manage and conserve the inland fisheries resource. The general functions are to promote, support, facilitate and advise the Minister on the conservation, protection, management, marketing, development and improvement of inland fisheries, including sea angling. Specific policy relevant to fisheries and aquatic biodiversity in this region includes:

- National Biodiversity Plan (2011)
- UK Biodiversity Action Plan (2007)
- Lough Swilly SAC
- 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).
- North Western International River Basin District Eel Management Plan (Inland Fisheries Ireland/Loughs Agency/DAERA).
- EC Habitats Directive (92/43/EEC);

- EU Water Framework Directive (2000/60/EC) [incorporating standards from the Fish Directive [Consolidated] (2006/44/EC) – this Directive was repealed in 2013];
- European Eel Regulation (EC) 1100/2007
- In respect to the Biodiversity Plan, fisheries enhancement measures will be considered in the tributaries affected by the proposed Scheme. These measures will be decided at a later date following specialist surveys.

5.2.2 Study Area

The study area for the fisheries and aquatic ecology constraints is largely based on a WFD river water body level for the desk top study, reviewing information available in the water body immediately upstream of the proposed Scheme and those water bodies downstream to the next major confluence or the coastal water body.

Field surveys undertaken to date have been based on the reach level with respect to mapping of salmonid habitat as presented in *Volume II, Figures (Constraints – Fisheries and Angling)*. Further field assessment in the form of juvenile fish stock surveys and macroinvertebrate surveys will be undertaken as the Scheme progresses.

5.2.3 Desktop Study

A desk study has been conducted to appraise baseline sensitivity pertaining to Fisheries and Aquatic Ecology. This included requests to IFI, EPA and NPWS to collate data on Conservation Designations, fish stocks and WFD status with information derived from the catchments.ie website and EPA data download geoportal. More detail on WFD Status, risk and significant pressures is provided in Section 6.

5.2.3.1 Inland Fisheries Ireland Datasets

5.2.3.1.1 Adult Salmon Runs and Conservation Limits

Management of salmon stocks in Ireland by IFI is now conducted on an individual river basis with the objective that each river must exceed its Conservation Limit (CL) for there to be any permitted exploitation of fish either by nets or rods. 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.

Data from adult runs based on fish counters, adult salmon rod catches, and juvenile stock surveys are used to set CLs, with the procedure described in the Report of the Scientific Sub-Committee (TEGOS, 2020). In essence, this involves the extrapolation of established stock and recruitment parameters from 13 monitored rivers in the North-east Atlantic area to Irish rivers using a Bayesian hierarchical stock and recruitment analysis (BHSRA) model. The model generates a CL based on the size of the river (wetted area) and its latitude, which is taken as the mid-point of the catchment area. Where adult count data are lacking, data on angling rod returns are used to estimate the number of returning adults in each river and thus total stock. However, no fish counter or rod catch data is available for the Burnfoot River such that a CL has not been defined.

5.2.3.1.2 Fisheries Habitat Assessment

No fish habitat survey data was available from IFI for the Burnfoot River.

5.2.3.1.3 Quantitative Fish Data

IFI monitoring of the fish community of rivers is used to classify fish status under the WFD. In 2015, IFI WFD fish monitoring was conducted at two sites, one immediately downstream of Burnfoot Bridge in Burnfoot, and a site ca. 2km upstream; both sites being adjacent to proposed hard defences or possible areas for Natural Water Retention Measures options. Both sites were assessed at Moderate Ecological Status based on the fish monitoring data collected.

Electrofishing data of the Burnfoot River from the WFD monitoring in 2015 showed that salmon were present at low densities in both sites while trout were present at higher densities. IFI catchment wide 5-minute

electrofishing data from 2008 and 2010 showed that salmon fry were present at Poor to Fair abundance from the vicinity of Burnfoot village to several kilometres upstream, whereas trout fry were present at Good to Excellent abundance.

The presence of downstream migrating sea trout smolts was confirmed in the Burnfoot River downstream of Burnfoot village in May 2020 sampling by PJA Ltd for the purposes of the FRS.

5.2.3.1.4 Angling

No angling data is available, although there are anecdotal accounts of recreational angling for sea trout and salmon on the lagoon side of Inch Lough, into which the Burnfoot ultimately flows via the lower Skeoge River. Locals also may fish for trout and possibly salmon in the Burnfoot River.

5.2.3.2 WFD Register of Protected Areas

The register of protected areas required under Article 6 of the WFD includes the following types of protected areas:

i. areas designated for the abstraction of water intended for human consumption;

ii. areas designated for the protection of economically significant aquatic species;

iii. bodies of water designated as recreational waters, including areas designated as bathing waters under Directive 76/160/EEC;

iv. nutrient-sensitive areas, including areas designated as vulnerable zones under Directive 91/676/EEC and areas designated as sensitive areas under Directive 91/271/EEC; and

v. areas designated for the protection of habitats or species where the maintenance or improvement of the status of water is an important factor in their protection, including relevant Natura 2000 sites designated under Directive 92/43/EEC (Habitats Directive) and Directive 79/409/EEC (Birds Directive).

The Burnfoot River is not listed on the register for any of these types of protection although Lough Swilly, which is hydrologically connected to Inch Lough and thus the lower Burnfoot River, is placed on the register as a designated shellfish area and as an SAC and SPA for the protection of habitats and species dependent on the maintenance or improvement of the status of these water bodies.

5.2.4 Field Surveys

An outline assessment of the watercourses adjacent to and downstream of the proposed hard defences and Natural Water Retention Measures (NWRM) areas was carried out in January 2021 and consisted of walkover surveys to assess general characteristics and fisheries habitat. This will be supplemented through a fish stock survey by electrofishing in due course when the timing is suitable and more knowledge on the emerging Scheme is available.

A summary of the nature of the reaches assessed in the context of fish habitat is provided below. *Volume II, Figures* provides the mapping locations of these surveyed reaches. The detailed fisheries and angling constraints map contained within *Volume II, Figures (Constraints – Fisheries & Angling)* illustrates the habitat classification in the main Burnfoot River and Carnashannagh Stream that could be potentially affected by the proposed Scheme. This classification is based on fish habitat surveys undertaken by the project team.

Carnashannagh Stream tributary of Burnfoot River (Located within the Burnfoot_SC_010 sub catchment)

The upper section of this stream is largely grade 3 salmonid nursery habitat with good flow and moderate quality stream bed. However, it is steep and has several potentially impassable culverts. In the lower reaches of the stream from the confluence with the main Burnfoot River, habitat quality is very poor due to shallow depth and a bed mainly comprising sand/ silt with little complexity. Above this there is an area of moderate flow with some pebbles and cobble consistent with grade 3 nursery; however, the stream then flows under the road via a concrete pipe culvert that is sloped and immediately upstream is an impassable falls ca. >1m high. This, and the poor habitat, would preclude any upstream movement of migratory trout from the main Burnfoot River but the presence of resident trout in the upper sections cannot be ruled out.

Burnfoot River - Lower section (Located within the Burnfoot_SC_010 sub catchment)

This survey section largely covers the main option locations for hard engineering for flood management in the vicnity of the bridge in Burnfoot village. Here, the Burnfoot River is low gradient with high levels of bed sediment composed of silt and sand. In the lower reach of the survey extent, significant deposits of pebbles occur that would be suitable for trout spawning though the quality is undermined by underlying deep fine sediment. There are good sections of moderate quality nursery habitat and holding pools with larger and deeper pools towards riverbends. A section of good quality nursery habitat (N2) occurs downstream of the main bridge in Burnfoot village. Overall, the section would support low numbers of juvenile trout and possibly salmon, and provide a corridor for upstream movement of pre-spawning adult resident and mirgatory (sea) trout and adult salmon. Whether lamprey spp. are present, and in particular, ammocoete larval stages (given the generally silty nature of many run margins) is unknown.

Burnfoot River – Upstream of Burnfoot village (Located within the Burnfoot_SC_010 sub catchment)

This survey section covers the main option locations for hard engineering for flood management. This section of the Burnfoot River is of low to moderate gradient although the level of silt within the riverbed is noticeably lower than downstream possibly due to improved flows. The landuse is a mixture of residential housing, embankments and pastoral grazing by cattle and sheep. Salmonid habitat is mainly nursery grade 2 and 3 in riffle and runs with some deeper areas of grade 3 nursery providing resting areas. There are several candidate grade 2 and 3 spawning areas in glide flow habitat with adjacent pools that would provide resting areas for adult trout and salmon. Salmonid habitat in this section would be considered moderate to good quality and thus potentially sensitive to the proposed Scheme such as the release of sediment and other pollutants, as well as potential habitat loss depending on the nature of proposed (if any) in-stream works**.**

Burnfoot River – Middle section (Located within the Burnfoot_SC_010 sub catchment)

Habitat surveys covered the lower and upper part of an area delineated for possible NWRM. A significant improvement in flows, and an increase in the coarseness of the rivebed substrate (cobble and boulder), saw a greater proportion of habitat classified as grade 2 nursery, with grade 2 and 3 spawning gravels also present. Fine sediment cover of the riverbed also was low and there was little evidence of livestock damage to the banks largely because sheep grazing appeared more prevalent than cattle grazing. There was evidence of extensive bank protection through stacking of boulders in several locations. Overall, the river in these areas would be potentially very productive for trout and salmon given the good quality nursery, identified spawning fords and pockets of gravel that were evident in may locations. Any NWRM options should be planned sympathetically with the good habitat quality present to minimise impacts on fisheries.

Burnfoot River – Upper section (Located within the Burnfoot_SC_010 sub catchment)

Habitat surveys covered the lower and upper part of the two upper areas identified for possible NWRM. The channel in these sections was similar to that in the middle section with good flows although there was a lower proportion of nursery habitat graded 2 while spawning gravels were grade 3. The channel in these sections had little meander suggestive of historical straightening while the greater proportion of grade 3 nursery may be a consequence of arterial drainage and channel deepening and widening; old embankments were present in several locations along the channel. Large areas of the riparian zone were thickly vegetated with Laurel, preventing access further upstream for survey. However, the habitat overall has good potential to support trout, and possibly salmon, spawning and recruitment and again any NWRM options should minimise habitat impacts.

5.3 Terrestrial Ecology

5.3.1 Policy and Legislation

5.3.1.1 Designated Sites

Natura 2000

In Ireland, the Natura 2000 network of European sites comprise Special Areas of Conservation (SACs), and Special Protection Areas (SPAs). SACs are selected for conservation under the Habitats Directive 92/43/EEC and include habitats listed on Annex I (including priority types which are in danger of disappearance) and

Annex II listed species. SPAs are selected for conservation under the EU Birds Directive protecting birds listed on Annex I and other regularly occurring migratory birds and their habitats.

The conservation objectives for European Sites are set out to ensure that the Qualifying Interests (QI) and/or Special Conservation Interests (SCI) for which an SAC or SPA has been designated are maintained or restored to a favourable conservation condition. Article 1 of the Habitats Directive states that for the purpose of the Directive "Conservation means a series of measures required to maintain or restore the natural habitats and the populations of species of wild fauna and flora at a favourable status."

Maintenance of favourable conservation condition of habitats and species at a site level in turn contributes to maintaining or restoring favourable conservation status of habitats and species at a national level and ultimately at the Natura 2000 Network level. In Ireland, 'generic' conservation objectives have been prepared for all European Sites, while 'site specific' conservation objectives have been prepared for a number of individual Sites to take account of the specific QIs/ SCIs of that Site. Both the generic and site specific conservation objectives aim to define the favourable conservation condition for habitats and species at the site level. The conservation objectives of European Sites within the Zone of Influence (ZoI) of the Burnfoot FRS are provided in **Table 5.1**.

Natural Heritage Areas

The Wildlife Amendment Act 2000 (as amended) provides the legal basis for the establishment of a national network of sites known as Natural Heritage Areas (NHAs). NHAs are also designated to conserve and protect nationally important landforms, geological or geomorphological features. Proposed Natural Heritage Areas (pNHAs) were published on a non-statutory basis in 1995, but have not since been statutorily proposed or designated, however they do have some protection under schemes such as Rural Environment Protection Scheme (REPS), Agri-Environmental Options Scheme (AEOS) and County Development Plans, and many pNHAs are also designated as SACs or SPAs.

5.3.1.2 The Wildlife Act (1976), the Wildlife (Amendment) Act, 2000

The Wildlife Act, 1976 and the Wildlife Amendment Act, 2000 are the principal statutory provisions providing for the protection of Wildlife (both Flora and Fauna) and the control of activities which may impact adversely on the conservation of wildlife.

Their purpose is to provide for the protection of wildlife (both flora and fauna) and the control of activities, which may impact adversely on the conservation of wildlife.

Under the Act, the Minister responsible for nature conservation may afford protection to all wild species of fauna and flora. However, the 1976 Act did not provide for the conservation of fish species nor of aquatic invertebrates in general, except insofar as species may be added in agreement with the Minister for Communications, Marine and Natural Resources.

The Wildlife Act, 1976 (Protection of Wild Animals) Regulations, 1990 (SI No. 112, 1990) conferred protected faunal species under the fifth schedule of the Wildlife Act (1976), and other subsequent protections under the Wildlife (Amendment) Act 2000. It is an offence to injure or wilfully interfere with or destroy the breeding place or resting place of a protected wild animal under Section 23 of the Wildlife Act as amended. Currently all bird species, 22 other animal species or groups of species and 86 species of flora are afforded protected status.

The 2000 Act gives statutory protection to areas designated by the Government as Natural Heritage Areas (NHAs), Nature Reserves, National Parks and Refuges.

5.3.2 Study Area

The study area for the terrestrial ecology focusses on a broader corridor and potential zone of influence to assist in the identification of direct and indirect impacts on mobile species and the potential for pathways and hydrological links to sensitive downstream conservation interests including designated sites. The preliminary field surveys that have been undertaken focus on the measures identified in the Flood Risk Management Plan for Burnfoot at this early stage of the scheme development. Should the option appraisal process require surveys over a greater extent, these will be undertaken to ensure that environmental issues which could either be impacted by the possible flood alleviation measures or constrain the feasibility of their design and implementation are defined.

5.3.3 Existing Environment

A desk study based on online resources and biological records that can be reasonably acquired or provided through consultation with the relevant statutory bodies will be undertaken over a broader corridor centred on the proposed Scheme. The following data sources were consulted and where relevant have been mapped in the biodiversity constraints map in *Volume II, Figures (Constraints – Biodiversity)*:

- Designated sites - National Parks and Wildlife Service website http://www.npws.ie/
- In addition to this the National Biodiversity Centre's Biodiversity Maps online viewer was queried for those datasets that have a restricted status.

5.3.3.1 Designated Sites

The Biodiversity constraints mapping in *Volume II, Figures* provides an indication of the designation within a 5km and 10km radius of the propose Flood Relief Scheme. **Table 5.1** lists the designated sites, their qualifying features and their conservation objectives.

5.3.3.2 National Biodiversity Centre

The National Biodiversity Data Centre (NBDC) is a national organisation that collates, manages, analyses and disseminates data on Ireland's biodiversity. It is funded by the Heritage Council and the Department of Culture, Heritage and the Gaeltacht. The NBDC provides access to all validated biodiversity data through Biodiversity Maps, the on-line biodiversity data portal.

Biodiversity records and full species accounts can be viewed and scrutinised through an interactive Biodiversity Maps portal. This is a tool that can be used to help make a preliminary assessment of biodiversity issues when considering site-specific developments. The chosen search area using the NBDC search tool was customised in order to capture all terrestrial biodiversity records within 10km^2 surrounding the Burnfoot Flood Relief Scheme. Online searches were undertaken in January 2021. The purpose of this task was to capture any records of protected species or species of natural heritage importance in proximity to the proposed site boundary. The zone of influence of the proposed Scheme on terrestrial biodiversity features does not extend further than this, as wider catchment pressures will dominate effects on terrestrial biodiversity features beyond the limits of this area. Records of the following protected species were found within a 10km grid square of Burnfoot based on the datasets outlined above or from the Biodiversity Ireland online mapping tool [3].

5.3.3.2.1 Flora Protection Order (FPO) & Rare Plant

A National Parks and Wildlife Service (NPWS) data set of Annex I habitats and Flora Protection Order (2015) plant species was reviewed to check for any records at the site of the proposed Scheme. The NBDC records search established that there are no species listed under the Flora Protection Order (2015) within the 10km^2 area.

[3] Available at https://maps.biodiversityireland.ie/Map

Table 5.1: Conservation Interests and objectives of designated sites with 10km of Burnfoot

Site Code	Site Name	Distance to the FRS	Qualifying Interests / Special Conservation Interests	Conservation Objectives
002287	Lough Swilly SAC	1.9km	Estuaries [1130] Coastal lagoons [1150] Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) [6410] Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0] Lutra (Otter) [1355]	19th July 2011 Version 1 • To maintain the favourable conservation condition of Estuaries in Lough Swilly SAC, as defined by 2 no. attributes and targets; • To restore the favourable conservation condition of Lagoons in Lough Swilly SAC, as defined by 11 no. attributes and targets; • To restore the favourable conservation condition of Atlantic salt meadows in Lough Swilly SAC, as defined by 10 attributes and targets; • To restore the favourable conservation condition of Otter in Lough Swilly SAC, as defined by 8 attributes and targets; • To restore the favourable conservation condition of Old oak woodland with Ilex and Blechnum in Lough Swilly SAC, as defined by 12 attributes and targets;
004075	Lough Swilly SPA	350m	Great Crested Grebe (Podiceps cristatus) [A005] Grey Heron (Ardea cinerea) [A028] Whooper Swan (Cygnus cygnus) [A038] Greylag Goose (Anser anser) [A043] Shelduck (Tadorna tadorna) [A048] Wigeon (Anas penelope) [A050] Teal (Anas crecca) [A052] Mallard (Anas platyrhynchos) [A053] Shoveler (Anas clypeata) [A056] Scaup (Aythya marila) [A062]	19th July 2011 Version 1 • To maintain the favourable conservation condition of wintering species in Lough Swilly SPA, as defined by 2 attributes and targets; • To maintain the favourable conservation condition of the breeding species in Lough Swilly SPA, as defined by 3 attributes and targets; • To maintain the favourable conservation condition of the wetland habitat in Lough Swilly SPA as a resource for the regularly-occurring migratory waterbirds that utilise it, as defined by one attribute and target.

Site Code	Site Name	Distance to the FRS	Qualifying Interests / Special Conservation Interests	Conservation Objectives
			Goldeneye (Bucephala clangula) [A067] Red-breasted Merganser (Mergus serrator) [A069] Coot (Fulica atra) [A125] Oystercatcher (Haematopus ostralegus) [A130] Knot (Calidris canutus) [A143] Dunlin (Calidris alpina) [A149] Curlew (Numenius arquata) [A160] Redshank (Tringa totanus) [A162] Greenshank (Tringa nebularia) [A164] Black-headed Gull (Chroicocephalus ridibundus) [A179] Common Gull (Larus canus) [A182] Sandwich Tern (Sterna sandvicensis) [A191] Common Tern (Sterna hirundo) [A193] Greenland White-fronted Goose (Anser albifrons flavirostris) [A395] Wetland and Waterbirds [A999]	
004087	Lough Foyle SPA	9.5km	Red-throated Diver (Gavia stellata) [A001] Great Crested Grebe (Podiceps cristatus) [A005] Bewick's Swan (Cygnus columbianus bewickii) [A037] Whooper Swan (Cygnus cygnus) [A038] Greylag Goose (Anser anser) [A043]	23rd September 2014 Version 1 NPWS • To maintain the favourable conservation condition of species in Lough Foyle SPA, as defined by 2 attributes and targets; • To maintain the favourable conservation condition of the wetland habitat in Lough Foyle SPA as a resource for the regularly-occurring waterbirds that utilise it, as defined by one attribute and target.

Site Code	Site Name	Distance to the FRS	Qualifying Interests / Special Conservation Interests	Conservation Objectives
			Light-bellied Brent Goose (Branta bernicla hrota) [A046] Shelduck (Tadorna tadorna) [A048] Wigeon (Anas penelope) [A050] Teal (Anas crecca) [A052] Mallard (Anas platyrhynchos) [A053] Eider (Somateria mollissima) [A063] Red-breasted Merganser (Mergus serrator) [A069] Oystercatcher (Haematopus ostralegus) [A130] Golden Plover (Pluvialis apricaria) [A140] Lapwing (Vanellus vanellus) [A142] Knot (Calidris canutus) [A143] Dunlin (Calidris alpina) [A149] Bar-tailed Godwit (Limosa lapponica) [A157] Curlew (Numenius arquata) [A160] Redshank (Tringa totanus) [A162] Black-headed Gull (Chroicocephalus ridibundus) [A179] Common Gull (Larus canus) [A182] Herring Gull (Larus argentatus) [A184] Wetland and Waterbirds [A999]	

Site Code	Site Name	Distance to the FRS	Qualifying Interests / Special Conservation Interests	Conservation Objectives
ASSI229	River Foyle and Tributaries NI ASSI	9.5km	Series of river types present with corresponding macrophyte assemblages, ranging from ultra-oligotrophic, mesotrophic to estuarine types Atlantic salmon Salmo salar • Otter Lutra	27th July 2017 Version 3 DAERA To maintain (or restore where appropriate) the Qualifying Interests to favourable condition, as defined by: Water courses of plain to montane levels i. Maintain and if possible enhance extent and composition of community. ii. Improve water quality iii. Improve channel substrate quality by reducing siltation. iv. Maintain and if feasible enhance the river morphology Atlantic Salmon i. Maintain and if possible expand existing population numbers and distribution (preferably through natural recruitment), and improve age structure of population. ii. Maintain and if possible enhance the extent and quality of suitable Salmon habitat - particularly the chemical and biological quality of the water and the condition of the river channel and substrate. Otter • Maintain and if possible increase population numbers and distribution. • Maintain the extent and quality of suitable Otter habitat, in particular the chemical and biological quality of the water and all associated wetland habitats

5.3.3.2.2 Mammals

Table 5.2 lists the protected mammals that have been listed on the NBDC database within 1km and 10km of the study area.

Table 5.2: NBDC Protected Mammal records from within 10km and 1km of the proposed

Species	Records within 10km	Records within 1km
Bottle-nosed Dolphin (Tursiops truncatus)	1	-
Common Dolphin (Delphinus delphis)	3	-
Common Seal (Phoca vitulina)	1	-
Grey Seal (Halichoerus grypus)	1	-
Phocidae	2	-
American Mink (Mustela vison)	3	1
Daubenton's Bat (Myotis daubentonii)	4	-
Eastern Grey Squirrel (Sciurus carolinensis)	2	-
Eurasian Badger (Meles meles)	22	-
Eurasian Pygmy Shrew (Sorex minutus)	1	-
Eurasian Red Squirrel (Sciurus vulgaris)	8	-
European Otter (Lutra lutra)	13	-
European Rabbit (Oryctolagus cuniculus)	1	-
Irish Hare (Lepus timidus subsp. hibernicus)	7	-
Irish Stoat (Mustela erminea subsp. hibernica)	6	-
Lesser Noctule (Nyctalus leisleri)	2	-
Pine Marten (Martes martes)	1	-
Pipistrelle (Pipistrellus sensu lato)	1	-
Red Fox (Vulpes vulpes)	6	-
Soprano Pipistrelle (Pipistrellus pygmaeus)	2	-
West European Hedgehog (Erinaceus europaeus)	4	1

5.3.3.2.3 Amphibians

The NBDC records search identified 3 records of Common Frog (Rana temporaria) and 1 Smooth Newt (Lissotriton vulgaris) from within 10km of the proposed Scheme.

5.3.3.2.4 Invertebrates

The NBDC records search identified no records of protected invertebrates within 10km of the proposed Scheme. However, the records identified a number of threatened invertebrate species within 10km range (Table 5.3).

Table 5.3: NBDC Threatened invertebrate records from within 10km and 1km of the proposed Scheme

Species name	Record within 10km	Records within 1km
Ash-black Slug (Limax cinereoniger)	1	-
Common Whorl Snail (Vertigo (Vertigo) pygmaea)	3	-
Heath Snail (Helicella itala)	5	-
Marsh Whorl Snail (Vertigo (Vertigo) antivertigo)	2	-
Moss Bladder Snail (Aplexa hypnorum)	1	-
Moss Chrysalis Snail (Pupilla (Pupilla) muscorum)	2	-
Smooth Ramshorn (Gyraulus (Torquis) laevis)	2	-
Striated Whorl Snail (Vertigo (Vertigo) substriata)	1	-

5.3.4 Field Survey

5.3.4.1 Flora and Habitat Survey

A terrestrial habitat survey was first conducted by the project team in September 2020. The survey was undertaken in accordance with the Heritage Council's Best Practice Guidance for Habitat Survey and Mapping (Smyth et al., 2011). All habitats were mapped and categorised in accordance with the Heritage Council's Guide to Habitats in Ireland (Fossitt, 2000). A search was undertaken for protected and invasive flora species. Georeferenced aerial photographs were used as an aid to mapping habitats.

Habitat mapping of the area surrounding the proposed Scheme has been undertaken. Table 5.4 below provides a breakdown of the different habitats encountered.

Table 5.4: Habitats Types encountered

Habitat	Habitat Code	Area (ha)	Percentage of Survey Area
Amenity Grassland	ga2	0.9526849	3.6%
Buildings and Artificial Surfaces	bl3	6.8488521	25.8%
Dry meadows and grassy verges	gs2	0.3660259	1.4%
Flower beds and borders	bc4	0.0246506	0.1%
Improved Grassland	ga1	14.2169945	53.6%
Recolonising Bare Ground	ed3	0.3422106	1.3%
Scrub	ws1	2.4481029	9.2%
Wet Grassland	gs4	1.3229257	5.0%
Total		26.5224472	100.0%

5.3.4.2 Protected Species

The habitat survey was also extended to include further information on the potential of the habitats present to support terrestrial species by law or of natural heritage importance. This aspect of the survey was conducted with regard to best practice guidelines, in particular the National Roads Authority guidance on Ecological surveying techniques for protected flora and fauna during the planning of National Road Schemes (NRA, 2008).

5.3.4.2.1 Mammals

All visible signs of mammals were recorded, and the site visually assessed, in particular for potential breeding or resting areas for protected mammal species. Notes were taken on tracks and signs of protected species during the surveys where or if these were encountered.

The suitability of habitats for protected species was also assessed using expert judgement in combination with the survey results and desktop assessment.

Based on the initial baseline surveys there are a number of trees identified with the potential for roosting bats in Burnfoot that will need to be considered further as the project progresses and option appraisal is undertaken.

5.3.4.2.2 Overwintering Birds

Wetland Bird Surveys (WeBs) were undertaken in November 2020, December 2020, January 2021 and February 2021 at Burnfoot. There is a further survey scheduled for March 2021 to complete the over-wintering period. The surveys covered a much larger area than the proposed Scheme but this is necessary to ensure that all the potential feeding areas are captured.

As expected, Burnfoot and Inch Levels held a large number of wildfowl and gulls, with >350 whooper swan, >400 black-headed gull and >1,100 greylag geese being recorded during each overwintering surveys conducted to date.

5.3.4.2.3 Specialist Surveys

Specialist detailed protected species or vegetation surveys cannot be prescribed, measured or quantified at this stage, nor is it required under the project brief. However, this preliminary work will inform the need for further protected species surveys or specialist vegetation surveys that might be required for option appraisal, EIAR preparation or Stage 2 of Appropriate Assessment as is required by the brief.

RPS will advise if further detailed specialist ecology surveys are required at the appropriate time of year (e.g., bats, birds, newts, otter holt monitoring, etc.).

5.3.4.3 Invasive Species

Invasive non-native species are defined as those that have been introduced, either intentionally or unintentionally, outside of their natural range and that present a threat to biodiversity. They can have a wide range of impacts on ecology, the environment and the economy. Once established they can be extremely difficult to control and costly to eradicate. It is also an offence to plant or otherwise cause to grow in the wild any plant listed on Part 1 of SI. No. 477 of 2011, European Communities (Birds and Natural Habitats) Regulations 2011.

Invasive species survey at Burnfoot was undertaken by RPS on 16th September 2020. Invasive species recorded within the site include Japanese knotweed and rhododendron.

Japanese knotweed was recorded in three separate stands within the Burnfoot survey area, including a large stand (c.30m^2) on rough ground on the eastern bank of a small tributary of the Burnfoot River; a large stand (c.50m^2), mostly on rough ground on the eastern bank of a small tributary of the Burnfoot River, although some was also located on the western bank outside the fence line of the improved field;

and a small stand (c.5m^2) on a bank to the rear of a house in Lios Na Greine on the southern side of the Burnfoot River.

Rhododendron was recorded in two locations including a single rhododendron plant on the northern bank of the Burnfoot River and a single rhododendron plant in a treeline east of the gate entrance to the farm-yard on southern side of R239.

An Invasive Species Management Plan (ISMP) has been prepared providing details of the location and nature of the invasive species in the study area and outlining the option available for treatment of invasive pre and post construction.

5.4 Key constraints

5.4.1 Lough Swilly (SAC)

- Lough Swilly is a designated Special Area of Conservation (SAC) under the Habitats Directive, and although distant downstream, is hydrologically connected.

The following qualifying features are relevant to fisheries and aquatic species (see NPWS, 2011);

- 1130 Estuaries – intertidal and subtidal habitat with polychaetes and bivalves.
- 1150 Coastal lagoons – This is a priority habitat under the Habitats Directive; the Lough contains important coastal lagoons that provide habitat for brackish water invertebrates. Inch lough/ lagoon is one of the largest low salinity lagoons in Ireland.
- 1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
- 1355 Otter (*Lutra lutra*) - Annex II listed European Otter have a broad diet within the Lough, feeding on salmonids, eels, and sticklebacks in freshwater, and brackish/ marine fish species in the lagoons and wider lough. Otters use all habitat types associated with the designated area including the lagoons and lower end of rivers.

Any proposed Scheme hydrologically connected to the river, must ensure that the conservation and protection of these habitats and species is considered.

5.4.2 Lough Swilly (SPA)

- Lough Swilly is a designated Special Protection Area (SPA) under the Birds Directive and although distant downstream, is hydrologically connected and there is also the potential for disturbance of the numerous protected birds for which it is designated.
- NPWS also noted breeding birds is an issue, particularly ground nesting birds around the periphery of the wildfowl reserve at Inch Lough. Previous significant flood events have resulted in the Inch Lough levels rising by 3-4ft resulting in the loss of an estimated 5000-6000 nests.
- Sandwich Tern colonies are one of national significance being one of the best populations in the country.
- It should be encouraged that the proposed Scheme look at a more radical way of thinking, e.g., provision of flood storage to reduce the impact on the levels at Inch Lough.

5.4.3 Annex II listed Atlantic salmon and other aquatic species

- The Atlantic salmon (*Salmo salar*) is an Annex II listed species and present within the river catchment; in general, salmon populations are in decline internationally.
- Brown trout, and migratory sea trout, are abundant in the river.
- Eel are present in the catchment while the silted areas of marginal habitat may be suitable nursery areas for Annex II listed lamprey spp. (e.g., Brook lamprey) if present.
- The main channel of the river also will be an important corridor for migration of adult salmonids (salmon and trout), salmonid smolts, eel (elvers and adults), and potentially lamprey spp.

Any proposed Scheme, adjacent or hydrologically connected to the river, must ensure that the conservation and protection of these species and their habitats is considered.

5.4.4 Invasive Species

- The key constraints from a terrestrial perspective include the significant number and intensity of invasive species. The nature of the works has the potential to spread invasive species which could be detrimental to the aquatic environment.
- An ISMP has been prepared and all works which have the potential to aid the spread of invasive species must implement a biosecurity protocol.

5.4.5 Culvert Design

- IFI will require additional information on any proposed culverting or temporary crossings that may be necessary.
- The proposed Scheme shall consult IFI's document entitled 'Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters (2016) for additional information on culvert design.
- Clear span bridging is the preferable option, causing no changes to bed or banks and no impact to fish migration.
- Culverts are likely to obstruct or delay upstream (and possibly downstream) fish passage unless the depths and velocities of flow in them are within the swimming capabilities of the species to be catered for. Entry and exit conditions are also critical for ease of fish passage. Where possible bottomless units should be used so that the natural stream bed can be retained.

5.4.6 Instream Works

No in stream works shall be carried out without the consent of IFI. A method statement must be agreed in advance of works and IFI should be given sufficient notice before any consented in stream works.

5.4.7 Timing of Works

- The proposed Scheme will consult the IFI's document entitled 'Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters (2016) for additional information on timing of works.
- In salmonid catchments, the guidelines required that all in-stream works should be carried out during the period July to September; any requirement for works to be conducted earlier should seek approval from IFI.
- Timing of works need to consider protected species; Atlantic salmon, migratory Sea Trout and resident Brown Trout, European Eel and Sea, Brook and River Lamprey.

5.4.8 Piling

Any proposed piling that may be necessary will require careful consideration as noise and vibration can impact on the development and behaviour of sensitive aquatic species and on their spawning and migration success.

5.4.9 Fuels / Oils and other pollutants

- Must be stored in bunded compounds well away from the watercourse and outside of the floodplain.
- Refuelling of machinery should be carried out in bunded areas.

5.4.10 Terrestrial Habitat

The habitat is largely buildings and artificial surfaces in the town where the proposed Scheme is predominantly located. Improved grasslands and amenity grasslands are also significant in the survey area. However, there are some areas of more natural habitats, such as wet grassland which represents over 8% of the habitat area surveyed with sand shores and rocky shores covering a combined total of over 5%. These more natural habitats will require due consideration during the development of the proposed Scheme, however these are not of national or international significance.

5.4.11 Protected Species

- There are a number of trees that have potential for roosting bats and will require furthermore detailed survey as the proposed Scheme progresses.
- Overwintering birds and the potential for disturbance also needs to be considered during option appraisal as outlined above in the context of the SPA but also under the Wildlife Acts.

5.5 Opportunities for Enhancement Measures

The brief requires the identification of possible biodiversity enhancement measures. In terms of aquatic ecology, fisheries enhancement measures will be considered when more specialist surveys have been undertaken. However, the habitat surveys that have been conducted to date indicate that there is potential to improve the fisheries habitat in Burnfoot River through habitat enhancement works and improvements for fish passage.

The potential for habitat improvements will also be considered including measures outlined in the All Ireland Pollinator Plan 2021 – 2025 such as management of grass, reduction of the use of herbicides, planting biodiversity-friendly trees, shrubs and flowers, management of existing native hedgerows including eradication of harmful invasive species.

There are significant issues with invasive species in the Burnfoot Study Area as indicated in Section 5.3.4.3. An ISMP has been prepared to co-ordinate the control measures and suppress the spread of invasive during the scheme development and implementation. The control measures included in the ISMP will help to reduce the extent of the invasive species encountered within the scheme area and will ensure that the risk of further spread due to the construction of the scheme will be adequately managed.

The National Biodiversity Action Plan 2017-2021 (Action 4.3.1) requires the consideration of catchment wide non-structural flood risk management measures. This action is being considered through Natural Water Retention Measures at a catchment scale to establish if there are feasible options for Nature Based Catchment Management Measures. The Constraints Study has considered a much wider area around Burnfoot to capture any environmental constraints that might influence the ability to effectively implement such nature based catchment measures for flood alleviation.

6 WATER QUALITY AND HYDROMORPHOLOGY

6.1 Overview

Water Framework Directive (WFD) compliance is a key consideration of the Constraints Study and will be a key constraint for the proposed Scheme development. The nature of the FRS could have direct and indirect impacts on ecological status and the contributing quality elements, i.e., biological elements and the supporting physico-chemical, hydromorphological and specific pollutants elements. Chemical status is less likely to be an issue given the nature of the proposed Scheme but it will also be necessary to ensure the achievement of the objectives of associated water dependent protected areas are not compromised by the proposed Scheme.

6.2 Study Area

Due to the significant interactions between water quality, hydromorphology WFD status and aquatic ecology the study area for these three disciplines will be the same. The river water bodies upstream and downstream of Burnfoot have therefore been included and incorporate the main channel of the Burnfoot River and relevant tributaries (*Volume II, Figures. Constraints – WFD Mapping*).

6.3 Desktop study

Water bodies that could potentially be affected by the proposed Scheme have been identified (both upstream and downstream). Available information on existing pressures, WFD risks, monitoring data and ecological status (including biological, physico-chemical and hydromorphological quality elements), have been collated in a geodatabase for the proposed Scheme. This allows spatial querying of the data and to inform WFD compliance of the scheme as it progresses through the different stages of the process.

Additional information through consultations with agencies outlined in the aquatic ecology section above will inform the baseline particularly in relation to water dependent protected areas including, bathing waters, nutrient sensitive water, drinking waters, economically significant waters (shellfish and salmonid waters), and SAC/SPAs.

The new Morphological Quality Index (MQI) system is currently under development by the Environmental Protection Agency (EPA). It is not yet available in Ireland for hydromorphological classification at a water body level. Should this become available, it will be explored with the EPA and the existing River Hydromorphological Assessments Technique (RHAT) surveys will be investigated. The project team has also undertaken RHAT surveys on the 13th of January 2021 to inform the constraints and the consideration of options.

6.4 Legislation and Policy

Directive 2000/60/EC established a framework for community action in the field of water policy (the Water Framework Directive), and it transposes regulations, establishes a legal framework for the protection, improvement and sustainable management of rivers, lakes, transitional waters (estuaries), coastal waters (to a distance of one nautical mile from the coastline) and groundwater.

The overall objective of the WFD is for all water bodies to achieve ‘good status’ where they are currently at less than good status and to prevent the deterioration in status. A water body must achieve both ‘good’ ‘ecological status’ and ‘good’ ‘chemical status’ before it can be considered to be at ‘good’ overall status. An assessment of the risks to the achievement of these objectives for water bodies has been undertaken by the EPA through the extensive characterisation of water bodies and the key pressures acting upon them. The characterisation process allows the development of a programme of measures to aid the achievement of the WFD objectives.

Member States are permitted to apply for an extended deadline in achieving ‘good’ status for water bodies where the necessary improvements in the status cannot reasonably be achieved within the required timescales. This may be for reasons such as technical feasibility, disproportionate cost or

natural conditions within the water body. It is evident from **Table 6.1** and **Table 6.2** (Section 6.5.2) that some of the water bodies associated with this proposed Scheme are subject to extended deadlines as they are not achieving their objectives.

Environmental Quality Standards (EQSs) for classifying surface water status are established for the Republic of Ireland in the European Communities Environmental Objectives (Surface Waters) Regulations, 2009 (SI No.272 of 2009), as amended and in Northern Ireland by the Water Framework Directive (Classification, Priority Substances and Shellfish Waters) Regulations (Northern Ireland) 2015, as amended.

These regulations set standards for biological quality elements, physico-chemical conditions supporting biological elements including general conditions and specific pollutants, priority substances and priority hazardous substances. As shown in Figure 6.1 the 'ecological status' of a water body is established according to compliance with the EQSs for biological quality elements, physico-chemical conditions supporting biological elements and relevant pollutants and hydromorphological quality elements. The 'chemical status' of a water body is established according to compliance with the EQSs for priority substances and priority hazardous substances.

Under Article 4(3) of the WFD Member States can designate surface water bodies as Heavily Modified Water Bodies (HMWB). HMWBs are considered as those which are physically altered by human activity. If the specified use of such a water body (e.g., navigation, hydropower, water supply, flood defence) or the "wider environment" would be significantly affected by the restoration measures required to achieve 'good' ecological status and if no other better, technically feasible and cost-effective, environmental options exist then the environmental objective is 'Good Ecological Potential' (GEP). A HMWB is inevitably associated with a profound alteration to the hydromorphological character of a water body.

In addition to achieving 'good' ecological and chemical status, a water body must achieve compliance with standards and objectives specified for protected areas, which include areas designated by the, Drinking Water Directive, Bathing Water Directive; the Urban Waste Water Treatment Directive; the Shellfish Waters Directive; the Habitats Directive and the Birds Directive. Water bodies that are compliant with WFD standards, but that contain protected areas that are non-compliant with protected area standards will not achieve their environmental objectives.

It will be a requirement that this proposed Scheme does not result in any deterioration of the current status of the relevant water bodies and does not prevent the improvement in status where this is required under the WFD or prevent the achievement of the protected area objectives for these water bodies.

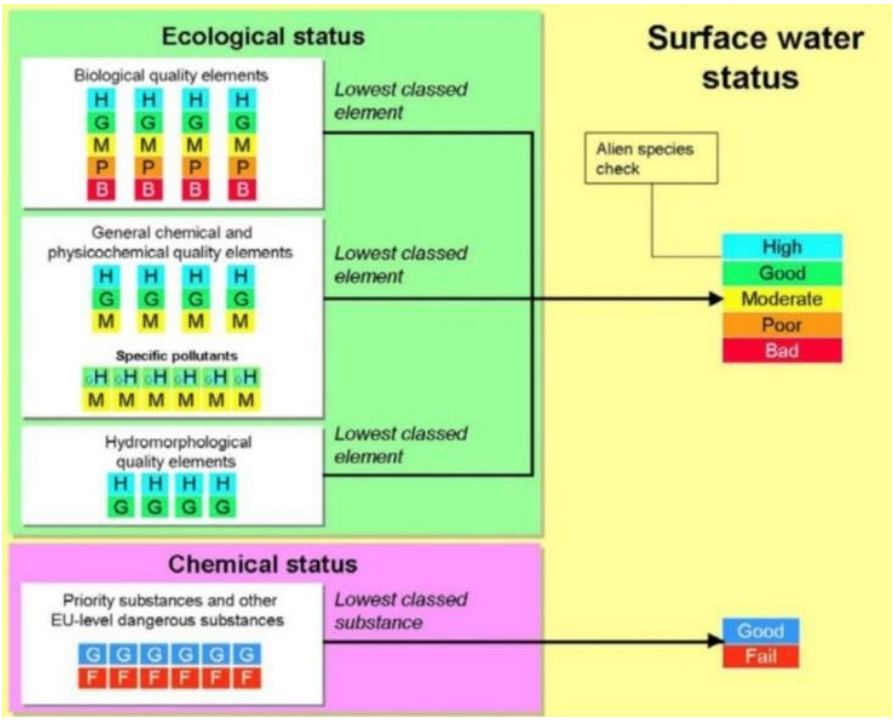


Figure 6.1: Elements of the Water Framework Directive Status

Based on monitoring information and data from 2013 to 2018, the current WFD status classification of water bodies potentially affected by the proposed Scheme is illustrated in the WFD mapping for the proposed Scheme included in *Volume II*, *Figures (Constraints – WFD Mapping)*. This is the latest status classification available, however, the 2019-2021 WFD Monitoring programme is active and may result in changes to the status of the water bodies affected due to changing trends resulting from the implementation of the Programme of Measures (PoMs) or additional pressures.

6.5 Existing Environment

For the purpose of characterisation, the WFD defines a catchment as the appropriate organising, landscape-based unit for water management by the nationally defined hydrometric units. These units encompass and connect water flowing from upland areas to the coast, with the exception of the Shannon catchment. These are then further divided into smaller units called sub-catchments.

The Burnfoot Flood Relief Scheme is located within the Burnfoot_SC_010 sub catchment of the Lough Swilly catchment. Each sub catchment contains several water bodies, which are the reporting unit for the WFD Ecological Status and Risk assessment. Section 6.5.3 contains further information regarding the WFD determinations of these water bodies.

Under the WFD, water bodies are assigned a risk status in addition to an ecological status (See Section 6.4). This risk status interprets trend information to predict the distance to the threshold of the next lowest ecological status class. This enables a conclusion to be formed as to whether a water body is likely to meet its environmental objectives by the end of the implementation period. This method highlights water bodies which require the implementation or adjustment of monitoring and measures to reach their objectives. There are three categories used to demonstrate risk; *Not at Risk, At Risk* and *Review*. Further information on the risk classification of the water bodies affected by the proposed Scheme is provided in the sections below.

A Water Status Assessment (WSA) will be undertaken when the preferred scheme has been determined. This will use the most up to date status reported by the EPA and will assess the potential for the FRS to impact on the water body's environmental objectives under the WFD. Where it is found that the FRS could impact on the achievement of these objectives, mitigation measures will be required.

6.5.1 Sub-catchment Burnfoot_SC_010

6.5.1.1 Preliminary risk review

The sub catchment comprises of seven river water bodies, which are located along the south western side of the Inishowen peninsula. The proposed Scheme has the potential to impact on the Burnfoot_020 and downstream Skeoge_010 waterbodies of the sub catchment.

The Burnfoot_020 water body deteriorated to 'poor' ecological status in the most recent 2013-2018 monitoring programme, while the 2010-2015 monitoring programme classified the water body at 'moderate' status. Historically, this water body has fluctuated between "Poor" and "Moderate" throughout the cycles. The waterbody is classified as "At Risk" in the most recent monitoring cycle. The Skeoge_010 has been classified at "Poor" ecological status for all cycles in the Republic of Ireland section. In Northern Ireland the Skeoge_10 is classified as a heavily modified water body due to the urban pressures associated with the portion of the water body within Derry City. For the remaining waterbodies within the sub catchment, one recorded "High" ecological status, one "Good" ecological status, one "Poor" ecological status and two unassigned, while all but three are considered to be "At Risk" of failing to achieve their environmental objectives under the WFD.

6.5.1.2 Catchment services and use

Within the sub catchment, the main urban agglomerations are Buncrana, Fahan and Burnfoot. The land use is variable and includes forests, peat bogs, moors and heaths along the upper and central areas, while the southern area is dominated by pasture lands and complex cultivation patterns.

There is a small section of the Burnfoot River listed as a drinking water, the area prior to merging with the Skeoge. There are two abstractions from the Burnfoot_020, one along the main channel and one on a tributary (Birdstown River). There is one IPPC[4] facility, four Section 4s[5] and a historic landfill. The sub catchment has a number of features on the Register of Protected Areas, with the Lough Swilly listed as an SPA (Lough Swilly SPA), pNHA, SAC (Lough Swilly SAC) and shellfish area. The catchment has one bathing water, Lisfannon. The north west of the catchment has green / open spaces within Buncrana and designated under the Buncrana and Environs Development Plan 2008-2024.

6.5.1.3 Sub catchment Conceptual Model

The topography of the sub catchment is comprised of mountainous areas, with gradients sloping towards the coastline along the western boundary.

Soils in the north east region of the sub catchment are predominantly poorly-drained podzols / gleys or peat soils, with underlying low permeability metamorphic tills. Well drained brown earth soils are present along low lying areas of the sub catchment.

Poorly productive aquifers that are generally unproductive except for local zones (Pl) underlie most of the sub catchment. Depth to bedrock is generally less than 3m, with groundwater vulnerability low. Susceptibility and pollution impact potential (PIP) of phosphates to surfaces waters are high here. In the vicinity of the proposed Scheme, near surface nitrate and phosphate susceptibility are ranked moderate and high respectively. While the PIP for phosphorus is rated high to mid risk (between 2 and 4) and Nitrate PIP is within the lower risk category of 6.

6.5.2 Water Framework Directive Surface Water Status

Baseline water quality within the receiving environment has been established through review of national monitoring data used to establish water quality status in the context of the EU WFD and supporting environmental standards.

Baseline data has been gathered from existing sources such as water quality monitoring stations included in the Northern Ireland Environmental Agency (NIEA) WFD monitoring programme and the EPA WFD App, as part of their River Basin Management Plan (RBMP) reporting.

For the purposes of monitoring and assessing the quality of surface waters, all rivers, lakes, coastal inter-basins, estuaries, and coastal waters (within 1 nautical mile of the shoreline) have been divided into management units called “water bodies”. The condition of each water body must be reported to the European Commission in the form of ecological status and chemical status. Ground water bodies are similarly delineated with status identified.

The study area for the proposed Scheme has the potential to impact on a number of water bodies within the Burnfoot_SC_010 sub catchment including rivers and ground water bodies:

- Burnfoot_010 (IE_NW_39B020200)
- Burnfoot_020 (IE_NW_39B020600)
- Skeoge_010 (UKGBNI1NW393901002)
- Lough Swilly ground waterbody (IEGBNI_NW_G_059)

The study area is located within the Burnfoot_SC_010 sub catchment, which is part of the Lough Swilly catchment. A desk study was undertaken to determine the current water quality status of each of the aforementioned water bodies in the context of WFD by querying the NIEA Water Information Request Viewer, submitting a request for available information from NIEA Water Management Unit and a review of data available on the EPA WFD App.

[4] Integrated Pollution Prevention Control facilities that are currently licensed by the EPA.

[5] Under the Water Pollution Acts are Local Authority licensed industries that discharge trade effluent into waters.

The river water bodies and most recent available WFD reporting data (2018) sourced from the NIEA River Basin Viewer and EPA WFD App is outlined in Table 6.1. The surface water status of the water bodies surrounding the study area are included in the WFD Mapping included in *Volume II, Figures (Constraints – WFD Mapping).*

Table 6.1: River Water body status classification

Sub catchment	Water body name	Water body code	WFD Status	Risk status
Burnfoot_SC_010	Burnfoot_010	IE_NW_39B020200	'Good'	'At risk'
	Burnfoot_020	IE_NW_39B020600	'Poor'	'At risk'
	Skeoge_010	UKGBNI1NW393901002	*Poor Ecological Potential*	'At risk'

Note: Italics indicates Northern Ireland classification.

A review of the baseline data suggests that the water bodies are not currently meeting their WFD objectives as they are not achieving 'good' status, with the exception of Burnfoot_010. **Table 6.2** below gives a further breakdown on the elements impacting on status, for those water bodies that are assigned a WFD status. The 2013-2018 status details have been used from the EPA WFD App for the Burnfoot_010 and Burnfoot_020, while 2010-2015 status details for the Skeoge River, a cross border water body, was extracted from the NIEA web viewer.

6.5.3 Indicative quality of chemistry data

6.5.3.1 Burnfoot_020

Trend analysis for 2013-2018 ammonia was available for three monitoring stations of the Burnfoot_010, RS39B020600, RS39B020570 and RS39B020610. All three stations recorded upwards trends, although none were statistically significant. Two stations recorded moderate indicative quality (RS39B020600 and RS39B020610), with baseline conditions of 0.153 mg/l and 0.115 mg/l respectively as an average of 2016-2018 data. While the remaining station (RS39B020570) recorded good indicative quality, with baseline conditions of 0.047 mg/l as an average of 2016-2018 data.

Trend analysis for 2013-2018 orthophosphate was available for one monitoring station of the Burnfoot_010, RS39B020600. The station recorded an upwards trend but this was not statistically significant. The station was representative of good indicative quality, with baseline conditions of 0.030 mg/l recorded as an average of 2016-2018 data.

Trend analysis for 2013-2018 total oxidised nitrogen was available for one monitoring station of the Burnfoot_010, RS39B020600. The station recorded downwards trends, although this was not statistically significant. The conditions were representative of good indicative quality, with baseline conditions of 0.0.641 mg/l recorded as an average of 2016-2018 data.

6.5.3.2 Skeoge_010

Trend analysis for 2013-2018 ammonia was available for two monitoring stations of the Skeoge_010, RS39S010120 and RS39S010220. Both stations recorded upwards trends, although none were statistically significant. Both stations recorded ammonia conditions consistent with moderate indicative quality, with baseline conditions of 0.240 mg/l and 0.296 mg/l respectively as an average of 2016-2018 data.

Table 6.2 displays how each water body is evaluated in terms of the elements which determine their overall status classification.

Table 6.2: River water status classification breakdown

	Water body		
	Skeoge_010	**Burnfoot_020**	**Burnfoot_010**
Biological elements:			
Benthic invertebrates (Q value)	*Poor ecological potential*	Poor	Good
Macrophytes	*Good*	-	
Phytobenthos	*High*	-	-
Fish	*Poor*	Moderate	-
Physicochemical elements:			
Biochemical oxygen demand	*High*	-	-
Temperature	*High*	-	-
Dissolved oxygen	*Moderate*	Pass	-
pH	*High*	Pass	-
Soluble reactive phosphorus	*High*	-	-
Nutrient Conditions	-	High	
Overall specific pollutants	*Good / High*	Pass	-
Overall priority substances	*Good*	-	-
Chemical surface water status	-	Failing to achieve 'good' due to Benzo(a)pyrene	
Hydromorphological elements		-	-
Hydrological regime	*High*	-	-
Morphological conditions	*Good*	-	-
Overall WFD status	*'Poor'*	'Poor'	'Good'

Note: Italics indicates Northern Ireland classification.

6.5.4 Pressures and Threats

Table 6.3 illustrates the pressures that are acting on the water bodies within the study area and those that are considered significant. None of the water bodies are currently meeting their WFD objectives. The risk classification of the waterbodies are 'at risk' of not meeting their WFD objectives.

It is important to ensure that the proposed Scheme does not introduce new pressures to these water bodies, which would be contrary to the objectives of the WFD.

Table 6.3: Pressures acting upon the water bodies within the vicinity of the proposed Scheme

Name	Pressures	Sub category	Significant	Pressure Details
Burnfoot_010	Extractive Industry	Quarries	Yes	Nutrient pollution and altered habitat due to hydrological changes. Very poorly maintained sand quarry. Drop in quarry activity but still significant pressure.
	Agriculture	Pasture	Yes	Nutrient, sediment and organic pollution
Burnfoot_020	Urban Waste Water	Agglomeration PE of 500 to 1,000 - Burnfoot	Yes	Nutrient and organic pollution. Discharge to be relocated in 2024.
	Agriculture	Pasture	Yes	Nutrient pollution.
	Domestic Waste Water	Communal System Discharge	Yes	Nutrient and organic pollution.
Skeoge_010	Urban Waste Water	Agglomeration PE of 500 to 1,001	Yes	Nutrient and organic pollution
	Agriculture	Pasture	Yes	Nutrient pollution

6.5.5 Water Dependant Protected Areas

The proposed Scheme has the potential to impact upon waters that are protected under existing European Union (EU) legislation requiring special protection due to their sensitivity to pollution or their particular economic, social or environmental importance. The WFD requires competent authorities to establish a register of these protected areas and ensure that they are adequately protected. A water body which otherwise meets the requirements of the WFD, may not achieve its environmental objectives if it does not meet its water dependant protected area objectives. All of the areas requiring special protection in the North Western RBD have been identified by the NIEA and the EPA, mapped and listed in a Register of Protected Areas (required under Article 6 of the WFD). The Register of Protected Areas includes:

- Nutrient sensitive areas, including areas identified as Nitrate Vulnerable Zones under the Nitrates Directive or areas designated as sensitive under the Urban Waste Water Treatment Directive;
- Areas designated for the protection of habitats or species where the maintenance or improvement of the status of water is an important factor in their protection including relevant Natura 2000 sites; Special Protection Areas (SPAs) and Special areas of Conservation (SACs);
- Areas designated for special scientific interest, wetlands of international importance and natural beauty. Those include Areas of Special Scientific Interest (ASSIs), RAMSAR sites and Areas of Outstanding Natural Beauty (AONB);
- Areas designated for the protection of economically significant aquatic species i.e., freshwater fish and shellfish;
- Bodies of water designated as recreational waters, including areas designated as bathing waters;

- Areas designated for the abstraction of water for human consumption (Drinking Water Protected Areas);

These protected areas have their own monitoring and assessment requirements to determine their condition. They are often assessed for additional pollutants or requirements relevant to their designation. Water dependent protected areas are listed in Table 6.4 below.

Table 6.4: Protected areas within 10km of the site.

Designation	Site	Distance
Nutrient Sensitive Waters	-	-
Drinking Water Protected Areas	A small section of the Burnfoot_020 prior to merging with the Skeoge_010	0km
Areas of Special Scientific Interest (ASSIs)	Lough Foyle ASSI	9.5 km
Special Areas of Protection (SPAs)	Lough Swilly SPA	350m
	Lough Foyle SPA	9.5km
Special Areas of Conservation (SACs)	Lough Swilly SAC	2.0km
Designated Shellfish Waters	Lough Swilly	3.2km
Salmonid River Waters	-	-
Natural Heritage Areas (NHAs)	Lough Swilly including Big Isle, Blanket Nook and Inch Lake pNHA (000166)	240m
	Port Lough (000180)	8.0km
Ramsar sites	Lough Foyle Ramsar site	9.5km
Area of Natural Beauty	-	-
Designated Bathing Waters	Lisfannon	6.5km
	Rathmullan	9.0km
	Lady's Bay, Buncrana	9.0km

6.5.5.1 Nutrient Sensitive Waters

The Urban Waste Water Treatment Regulations 2001, as amended, list nutrient sensitive waters in the Third Schedule. The UWWDT (91/271/EEC) is transposed into Northern Irish Law by the Urban Waste Water Treatment Regulations (Northern Ireland) 2007.

The proposed Scheme is not located within nutrient sensitive waters.

6.5.5.2 Natura 2000 Protected Areas

Natura 2000 is a European network of important ecological sites. The EU Habitats Directive (92/43/EEC) places an obligation on Member States of the EU to establish the Natura 2000 network. The network is

made up of Special Protection Areas (SPAs), established under the EU Birds Directive (79/409/EEC), and SACs, established under the Habitats Directive itself.

The proposed Scheme activities and the footprint will be within waterbodies that subsequently flow into to Natura 2000 sites (i.e., SPA or SAC). The proposed Scheme will, therefore, have an indirect impact on Natura 2000 sites. There is the potential for water dependent protected areas downstream of the proposed development to be affected in the event of water pollution, in the absence of mitigation.

It will be necessary to ensure that the development will not significantly impact on the ecological status of the water bodies affected and to ensure the achievement of the environmental objectives for the water bodies, including those for nutrient sensitive waters, and the Natura 2000 network, are not compromised by the proposed Scheme.

6.5.5.3 Areas of Special Scientific Interest (ASSIs)

The Environmental (Northern Ireland) Order 2002 (as amended) designates areas as ASSIs due to their flora, fauna, geographical, physiographical or other selection features. The following ASSIs are within 10km of the site; Lough Foyle ASSI (*Volume II, Figures. Constraints – Biodiversity*).

6.5.5.4 Designated Shellfish Waters

Shellfish waters are designated under the WFD and all shellfish protected waters will be assigned an objective under this directive. The directive is transposed into Irish law under the European Communities (Quality of Shellfish Water) Regulations 2006 (SI No 268 of 2006), which was further amended in 2009. It is essential that 'good' water quality is maintained within these areas to ensure the production of high quality shellfish.

The proposed Scheme is within 10km of Lough Swilly designated shellfish waters.

6.5.5.5 Designated Bathing Waters

The Bathing Water Directive (2006/7/EC) came into force in March 2006 and was transposed into Northern Irish law by The Quality of Bathing Water Regulations (Northern Ireland), 2008, as amended and into law in the Republic of Ireland in Bathing Water Quality Regulations 2008 (S.I 79 of 2008). Since 2014, the annual water quality classification (rating) of a beach or lake has been based on water quality results covering a four-year period rather than a single previous season's data. Water quality at beaches and lakes is classified as excellent; good, sufficient or poor. This approach is common across all EU Member States and there is a requirement to ensure that bathing waters are of 'Sufficient' standard or better. Any 'Poor' bathing water requires a programme of adequate management measures to be implemented. A minimum of 16 samples are required for formal annual assessment.

Table 6.5: Annual Assessment Criteria for Bathing Waters

E. coli (Freshwater)	500*	1000*	900**
E. coli (Coastal)	250*	500*	500**
Intestinal enterococci (freshwater)	200*	400*	330**
Intestinal enterococci (Coastal)	100*	200*	185**

*based on 95-percentile value **based on 90-percentile value

The bathing areas within a 10.0 km range of the proposed Scheme are Lisfannon, Rathmullan and Lady's Bay. All three have been classified as having 'good' bathing water quality in the most recent monitoring programme.

6.5.5.6 Drinking Water Protected Areas

These are the Drinking water surface water bodies in accordance with European Communities (Drinking Water) (No. 2) Regulations 2007 (SI no. 278/2007). The proposed Scheme is within 10km of designated drinking water protected areas. A small section of the Burnfoot_020 waterbody, prior to merging with the Skeoge_010 is designated.

6.6 Field Survey

No physico-chemical water quality monitoring was undertaken for the Constraints Study. Fish and macroinvertebrate monitoring at sampling points along the Burnfoot River will be undertaken as part of the baseline survey programme. The data captured will inform the current assessment of the WFD ecological status and the Environmental and Natura Impact Assessments of the proposed Scheme.

RHAT surveys (full (500 m) and spot checks) based on the NIEA Training Manual (NIEA. 2014) have been conducted on water bodies that could be potentially affected by the proposed scheme to allow an understanding of the existing hydromorphological conditions at a site level. Full 500 metre survey reaches were conducted immediately upstream and downstream of the proposed Scheme and spot checks (from bridges or other vantage points) were conducted further downstream of the study area to gain an appreciation of hydromorphological condition of the water body in the wider areas.

The MQI system provides the water body level assessment. The availability of this tool at a water body level to inform the assessment of the impact of the proposed Scheme will be explored with the EPA.

6.6.1 River Hydromorphological Assessment Technique (RHAT) Survey

It is assumed that natural systems support ecology better than modified systems. Hence the RHAT survey method classifies river hydromorphology based on a departure from naturalness. It assigns a morphological classification directly related to that of the WFD: High, Good, Moderate, Poor and Bad, based on semi-qualitative and quantitative criteria.

An objective for all water bodies, regardless of current status is to prevent deterioration. Hydromorphology is now a contributing factor under the WFD in determining High Ecological Status. Therefore, morphological assessment, including (RHAT) should be part of determining baseline conditions of a river so that measures can be taken to prevent a downgrade in status or to ensure the hydromorphological conditions are adequate to support the ecological status.

Under the WFD, a water body can only be classified as High Ecological Status if biology, chemistry and hydromorphology are all of high status. If all other quality elements are at high status but hydromorphological status is not high, then that water body is classified as Good Ecological Status (GES). This is the key role of hydromorphology under WFD classification.

As stated above, the RHAT score is based on a deviation from naturalness and assigns a morphological classification directly related to that of the WFD. The eight criteria that are scored are:

- Channel morphology and flow types (Scored out of 4)
- Channel vegetation (Scored out of 4)
- Substrate Condition (Scored out of 4)
- Barriers to Continuity (Scored out of 4)
- Bank and bank top stability (Scored out of 4, 2 for each bank)
- Bank and bank top vegetation (Scored out of 4, 2 for each bank)
- Riparian land use (Scored out of 4, 2 for each bank)
- Floodplain connectivity (Scored out of 4, 2 for each bank)

The hydromorphological score is calculated by summing the scores attributed to the individual criteria above and dividing by the maximum score available of 32 (typical of natural conditions).

RHAT scores which correlate to WFD status classes as follows:

>0.8 = High

>0.6 – 0.8 = Good

>0.4 – 0.6 = Moderate

>0.2 – 0.4 = Poor

<0.2 = Bad

It is designed to be a rapid visual assessment based on supporting information from desktop studies, using GIS data, aerial photography, historical data and data obtained from previous field surveys together with the field RHAT survey itself.

Whilst WFD hydro-morphology monitoring at a national level by the EPA is currently focused on classifying high status candidates, RHAT should also be used to determine baseline conditions at sites where engineering modifications are taking place, such as the proposed Flood Relief Scheme at Burnfoot. It can assist in identifying why a water body might be failing to achieve GES as it is based on the observed impact in the field. For example, construction works in or adjacent to a watercourse can cause substrate and/or bank damage and heavy siltation which are known to have a direct negative impact on species such as macro-invertebrates or sensitive species such as Fresh Water Pearl Mussel.

In such a case the waterbody is likely to be classified as less than GES based on these biological elements and hydromorphology. The departure from natural bank conditions caused by any works as recorded in a post-completion RHAT survey can help identify objectives and measures to maintain or improve status in order to prevent further deterioration. This is important for the works associated with the Flood Relief Scheme as it will be necessary to mitigate and minimise any likely negative impact on the hydro-morphological conditions which may arise from both the construction and operational phases of the proposed Scheme, and which in turn could impact other biological elements and therefore prevent the watercourse from achieving the objectives of the WFD i.e., the hydromorphological conditions must be consistent with the achievement of the values specified for good status of the biological quality elements.

The RHAT survey was undertaken on the 13th January 2021. The survey was focussed along the main channel of the Burnfoot River and associated tributaries in the vicinity of Burnfoot Bridge. The recommended survey reach length for RHAT survey is 500m. Therefore the Burnfoot River section requiring survey was split into two survey reaches both approximately 500m in length either side of the main bridge.

In summary each of the stretches surveyed scored within from ‘Moderate’ to ‘Good’ WFD score range, with all showing some degree of deviation from naturalness due to human influence. These alterations often have knock on effects and continue to impact the rivers morphological and hydrological regime. The removal of natural bank and riparian vegetation for example paves the way for shallow rooted vegetation (majority of the surveyed reaches are dominated by shallow rooted vegetation) to dominate the banks which affects the integrity of natural bank structure and stability increasing the likelihood for bank erosion, and does not provide diverse range of natural habitat. In addition, channel modifications including straightening and artificial reinforcements dictates the hydrological regime increasing velocity and hydraulic stress on the compromised banks downstream.

Hydromorphological conditions are indicative of less than high morphological status and therefore any works associated with the proposed Scheme are unlikely to cause a deterioration in overall status from a morphological perspective. The driving factor in determining the ecological status of these waterbodies currently are the biological elements which are less than good status. However, the potential impact on the hydromorphology supporting conditions could affect the biological elements further and result in a deterioration of the ecological status or prevent the achievement of Good Ecological Status for these water bodies. In conclusion, the water bodies need to be protected to ensure that the current hydromorphological supporting conditions are maintained and there is not a significant risk to the biological elements that are driving the status classification.

Table 6.6: RHAT Assessment description and scores for water body sections

Waterbody Section	Description and Score
Burnfoot main channel upstream 	**Score: 22 "Good"** This section of the waterbody scored good for channel morphology and flow type. Evidence of alteration to a small part of the stretch >10 years ago with good recovery. Variations in velocity/depth combinations are present where expected. Channel vegetation scored moderate for this section. There was evidence of some vegetation management, limited range of vegetation types and vegetation growth dense on up to 35% of the reach. Substrate diversity and condition scored moderate. Barriers to migration (longitudinal continuity) scored high. Short areas of river straightening and no artificial structures impeding flow. Bank structure and stability scored good along both banks, evidence of bank alterations or protection is minimal. Bank and bank-top vegetation scored good along the left bank and high along the right bank. One vegetation type not dominating. Range of canopy layers along the right bank. Riparian land use scored moderate on both banks. Vegetation cover is predominantly rough pasture along the stretch. Floodplain interactions scored moderate along the left bank and good on the right bank. Embankment works present along the left bank, while the natural bank form over most of reach along the right bank.
Burnfoot main channel downstream 	**Score: 13 "Moderate"** This section of the waterbody scored poor for channel morphology and flow type. Clear evidence of alteration of the course, significant length straightened. Minimal variation in flow depths and velocities. Channel vegetation scored poor for this section. There is clear evidence of vegetation management and increased fine sediment. Substrate diversity and condition scored moderate. Barriers to migration (longitudinal continuity) scored moderate. Presence of bridge abutments. River straightened with no fish resting places >15% to 35% of the reach. Bank structure and stability scored moderate along the left bank and good along the right bank. Evidence of bank alterations or protection is minimal along the right bank and minor poaching evident. Evidence of instability in sections along the left bank by livestock poaching. Bank and bank-top vegetation scored moderate along both banks. Simple native vegetation but isolated trees. Japanese knotweed present in a small section. Riparian land use scored poor on both banks. Land use is a mix of improved grassland, urban and rough pasture. Floodplain interactions scored poor along the left bank and moderate on the right bank. Significant embankment works present along the left bank, while the right bank has a lesser extent of works.

Waterbody Section	Description and Score
	
Burnfoot tributary upstream section 	**Score: 15 "Moderate"** This section of the waterbody scored good for channel morphology and flow type. This is due to the channel form having evidence of alteration to a small part over of the stretch 10 years ago but with good recovery. Channel vegetation scored moderate for this section. There was evidence of some vegetation management, limited range of vegetation types and vegetation growth dense on up to 35% of the reach. Substrate diversity and condition scored high. Good diversity in substrate. Barriers to migration (longitudinal continuity) scored poor. Weir and culvert present. Bank structure and stability scored good along the left bank and poor along the right bank. Evidence of bank alterations or protection is minimal along the left bank. The right bank has sections of wall reinforcing. Bank and bank-top vegetation scored poor along the left bank and bad along the right bank. Very little vegetation along right bank as wall reinforcement in place, while the left has simple vegetation and is managed by mowing. Riparian land use scored poor on both banks. Land use is predominantly improved grassland from residential lawns. Floodplain interactions scored poor along the left bank and moderate on the right bank.

6.7 Key Constraints

The Flood Relief Scheme will need to ensure that it does not introduce impediments to the achievement of the environmental objectives of the water bodies within the study area, including those downstream of those water bodies immediately adjacent to the proposed Scheme.

At present the water bodies are at less than GES and are therefore failing to achieve their environmental objectives under the WFD. There are a number of significant pressures acting on the water bodies as listed in **Table 6.2** including urban wastewater, pasture and domestic waste water. Site surveys have also noted that the Burnfoot_020 water body is physically modified and the supporting hydromorphological conditions are not suitable for the achievement of HES. Therefore, the best this water body can achieve is GES.

The Scheme has the potential to impact the supporting hydromorphological conditions of the water bodies which could affect their ecological status classification. This will require detailed consideration in the assessment of any proposed Scheme.

Construction impacts will also be a key consideration as pollutants can impact on the biological and physico chemical elements of WFD status.

The objectives for water dependent protected areas also need to be carefully considered in the assessment of the proposed Scheme and in particular the qualifying features of the Lough Swilly SAC/SPA, shellfish waters and bathing waters.

7 LAND GEOLOGY, HYDROGEOLOGY AND SOILS

7.1 Study Area

The desk based study area is based upon a 5km and 10km buffer, as illustrated in *Volume II, Figures*. The study area for the field assessments will extend 250 metres from the centreline of the proposed Scheme, i.e., a 500 metre corridor. Desk based data collection will be reviewed and professional judgement will be used to establish if the study area for field based assessments needs to be extended to capture potential impacts on features a greater distance away, e.g., groundwater dependent terrestrial ecosystems (GWDTE).

7.2 Desk Study

At this stage of the proposed Scheme desk based assessments only have been undertaken for the purposes of the Constraint Study. Although CFRAM proposals are in place from the FRMP, this project level assessment will reconsider all potential options and ultimately the Constraints Study will inform early optioneering as well as engineering design.

The following datasets have been consulted from the Geological Survey of Ireland (GSI), unless otherwise stated:

1. Corine Land Use 2018
2. Bedrock Geology
3. Bedrock Aquifers
4. Soils Map - Teagasc/EPA
5. Subsoils map - Teagasc/EPA
6. Geological heritage
7. Mineral localities
8. Active Quarries

7.3 Landuse

Land use within the study area has been calculated based on the Corine Land Cover 2018 update and is presented in Table 7.1.

Table 7.1: Land use within the study area

Landuse	5 km radius (ha)	Percentage	10 km radius (ha)	Percentage
111 Continuous urban fabric	0	0.00%	195	0.033%
112 Discontinuous Urban Fabric	1,364	0.61%	3,125	0.52%
121 Industrial or commercial units	175	0.08%	684	0.11%
131 Mineral extraction sites	0	0.00%	43	0.01%
141 Green Urban Areas	0	0.00%	154	0.03%
142 Sport and Leisure Facilities	78	0.03%	284	0.05%
211 Non-irrigated arable land	1,400	0.63%	4,671	0.78%
231 Pasture	212,979	95.65%	559,498	93.82%
242 Complex cultivation patterns	37	0.02%	769	0.13%
243 Land principally occupied by agriculture	189	0.08%	1,034	0.17%
311 Broadleaf forest	55	0.02%	463	0.08%
312 Coniferous Forest	583	0.26%	1801	0.30%
313 Mixed Forest	124	0.06%	185	0.03%

Landuse	5 km radius (ha)	Percentage	10 km radius (ha)	Percentage
321 Natural Grasslands	163	0.07%	191	0.03%
322 Moors and Heathland	1,366	0.61%	4,259	0.71%
324 Transitional Woodland Scrub	928	0.42%	1,150	0.19%
331 Beaches, dunes, sands	0	0.00%	93	0.02%
412 Peat Bogs	2,755	1.24%	15,381	2.58%
421 Salt marshes	39	0.02%	39	0.01%
423 Intertidal flats	430	0.19%	886	0.15%
511 Watercourses	0	0.00%	896	0.15%
512 Water bodies	0	0.00%	29	0.00%
522 Estuaries	0	0.00%	536	0.09%
Total	222,663	100%	596,367	100%

The CORINE 2018 land cover for the study area (5km radius) is dominated by pasture with smaller distributions of non-irrigated arable land, discontinuous urban fabric and peat bogs. This reflects the intensive nature of the catchment where agriculture dominates the land use.

7.4 Sub soils

Subsoils in the study area include alluvium along the Burnfoot River and floodplain, however the majority of the study area is characterised by metamorphic till.

Sub-soil types are shown in sub soils constraints map in *Volume II, Figures (Constraints – Subsoils)*.

7.5 Soils

The most dominant soils in the study area are surface and groundwater water gleys derived from non-calcareous parent materials. Blanket peats, acid brown earths and brown podzolics, are also present to the north of the study areas. Details of the main soil types at a sub catchment scale within the Burnfoot sub catchment are provided in Section 6.5.1.

Alluvium is the dominant soil type present along surrounding the waterbody and along the lowlands to the west of the study area.

Soil types are shown in soils constraints map in *Volume II, Figures (Constraints – Soils).*

7.6 Bedrock Geology

The bedrock geology constraints map in *Volume II, Figures (Constraints – Bedrock Geology)* provides an overview of the geology in the Burnfoot and wider area with 5km and 10km buffers illustrated.

Lithologies generally comprise metamorphic rock. Review of the karst database of the GSI shows no recorded karst features in the study areas, which is to be expected given the metamorphic geology of the region.

The area is predominantly underlain by Precambrian rocks. The dominant rock units underlying the overall study area is the Lough Foyle Succession Formation which comprises of schist and grit with thin marble units.

Bedrock lithology in the general vicinity also consists of:

- Fahan Slate Formation – dark politic & psammitic schist.
- Culdaff Limestone Formation – grey graphic marble & politic schist.

- Culmore Formation – sandstone with quartz pebbles, mudstone.
- Fahan Grit Formation – pale grey grit with psammitic schist.
- Upper Crana Quartzite Formation – psammite schist with pebbly grit beds

7.7 Hydrogeology

7.7.1 Bedrock Aquifer

The study area is predominantly underlain with an aquifer classified as a “Poor” Aquifer (Pl), or bedrock which is generally unproductive except for local zones. The remainder of the study area is partially underlain with a “Locally Important” Aquifer (Ll), classified as moderately productive only in local zones and “Poor” Aquifer (Pu), classified as generally unproductive.

The study area is underlain by one groundwater bodies; the Lough Swilly Groundwater Body.

The details of these waterbodies and their status are displayed in **Table 7.2**. The following information was obtained from the EPA online mapping resource.

There is no reliance on groundwater as a public or group water supply within the study area. The study area is within the Pollan Dam public water supply zone, the source of which is located approximately 12km to the north east.

Information from the GSI Groundwater Body (GWB) descriptions[6] was also reviewed to ascertain any particular constraints. The description for the Lough Swilly GWBs corroborates that the region is composed primarily of likely low transmissivity rocks with possibly higher values achieved in faulted zones, with shallow groundwater flow paths. Groundwater will discharge locally to streams and rivers crossing the aquifer and also to small springs and seeps and seepages developing on coastal cliff faces. Owing to the poor productivity of the aquifers in this body it is unlikely that any major groundwater - surface water interactions occur.

Table 7.2: Groundwater body status 2013-2015

Contributing Status Element	Lough Swilly (IEGBNI_NW_G_059)
Overall Groundwater Status	**Good**
Quantitative Groundwater Status	Good
Saline (or Other) Intrusions Test	Good
Impact of Groundwater on Surface Water Ecological/Quantitative Status Test	Good
Groundwater Dependent Ecosystems (GWDTE) - Quantitative Assessment Test	Good
Water Balance Test	

[6] https://www.gsi.ie/en-ie/programmes-and-projects/groundwater/activities/understanding-ireland-groundwater/Pages/Groundwater-bodies.aspx

Contributing Status Element	Lough Swilly (IEGBNI_NW_G_059)
Chemical Groundwater Status	**Good**
Saline (or Other) Intrusions Test	Good
Impact of Groundwater on Surface Water Ecological/Chemical Status Test	Good
Groundwater Dependent Ecosystems (GWDTE) - Chemical Assessment Test	Good
Drinking Water Protected Area Test	Good
General Chemical Assessment Test	Good

7.7.2 Groundwater Vulnerability

Groundwater Vulnerability is a term used to represent the natural ground characteristics that determine the ease with which groundwater may be contaminated by human activities. A groundwater vulnerability classification ranges from extreme to low. The classification 'high to low' for the Republic of Ireland applies to areas where an interim study only was undertaken by GSI. The majority of the groundwater bodies are considered to have moderate to high vulnerability, with the higher zones related mostly to where significant permeable superficial deposits overlie the bedrock. An assessment of groundwater vulnerability data indicates the area underlying the study is primarily within the high vulnerability category, although there are areas of moderate and extreme vulnerability.

The groundwater vulnerability does not take into account the nature of the underlying 'receiving' aquifer with respect to resource value or the significance of pollution occurring. As outlined above the bedrock aquifers within the study area are classified "Poor" Aquifer (Pl), or "Poor" Aquifer (Pu).

The groundwater vulnerability mapping is included in *Volume II, Figures (Constraints – Groundwater Vulnerability)*.

7.8 Geohazard

A review of the GSI Geohazard database indicated that there is no past evidence or record of landslides in any of the study areas.

In terms of the landslide susceptibility risk mapping the study area is predominantly displaying a D or low risk landslide vulnerability, however there is an area north of the study area that has been identified as an area of moderate to high susceptibility however this will not be impacted by the proposed Scheme.

7.9 Geological Heritage

The GSI and the Irish Geological Heritage programme (IGH) are in partnership with the NPWS of the Department of Culture, Heritage and the Gaeltacht (DCHG) to identify and select important geological and geomorphological sites throughout the country for designation as NHAs (Natural Heritage Areas). The GSI database for the Constraints Study area was searched for evidence of geological heritage sites. There are two sites of Geological Heritage within the study area, the closest site being the Burnfoot Spread (approximately 2.6km north east), followed by the Lough Swilly which is the only fjord on

Ireland's north coast (approximately 3.2km west). The Burnfoot Spread is a flat-topped sand and gravel feature and is interpreted as a large delta deposited into a bay at the head of a fjord.

7.10 Active Quarries and Mineral Localities

Gransha Quarry in Upper Gransha is the only active quarry in the study area. This is situated over 6 km North West of the study area. There are eight mineral site locations within the 5km buffer zone or in close proximity with a further 14 mineral site locations within the 10km buffer zone.

Mineral site locations are outlined in **Table 7.3** and shown in Material Assets and Infrastructure constraints map in *Volume II, Figures (Constraints – Material Assets & Infrastructure)*.

Table 7.3: Mineral Site Locations within the Constraints Study Areas

Section	Location No.	Mineral	Townland	Notes
5 km	196	clay, brick	Inch Level	Site of brick clay although no exposure and now inactive.
	197	Sand and gravel	Moress	Sand and gravel pit 200m X 120m X 4m of fluvioglacial origin. Worked out when visited in 1974.
	198	Sand and gravel	Magherabeg	Sand and gravel pit 130m X 100m X 5m of fluvioglacial origin. Worked out when visited in 1974.
	199	Sand and gravel	Gortinaskea	Two opencast pits in mound of gravel of fluvioglacial origin. Pit no.1 60m X 40m X8m is active at present (1973) and production is at a rate of 800-1000 tons/day.
	2505	clay, brick	Inch Level	Brickfield noted on old GSI 6in. map.
	2861	gold	Muff	Gold panned here during 1985 by Tara prospecting Ltd. Underlain by basal conglomerate of Upper Paleozoic age.
	2865	gold	Carrowreagh	Visible gold panned from stream sediment here by Tara
	2904	Sand and gravel	Birdstown	Sand and gravel pit producing aggregate, concrete blocks bricks, ready-mix, pipes and hydraulically pressed road kerbs.
10 km	175	gravel	Ballymacarry Lr	Boulder clay (boulders up to 1m x .5m x .5m) with gravel patches locally. Covering of dune sand, generally .3m thick but up to 2m thick. Now inactive though was of local importance.

Section	Location No.	Mineral	Townland	Notes
	176	Sand and gravel	Gransha	Sand and gravel pit 300m X 300m X 8m is a well sorted fluvioglacial deposit with alternating lensoid beds and some thicker bands of sands & gravels.
	178	gravel	Trillick	Active opencast pit 150m X 60m X 10m in fluvioglacial deposits. These consist of gravel with a little sand mostly at the top of the deposit.
	2994	Sandstone (in general)	Gransha	Active quarry (Gransha No.2) producing shale, sandstone and whinstone.
	2994	Whinstone	Gransha	Active quarry (Gransha No.2) producing shale, sandstone and whinstone.
	2994	Shale	Gransha	Active quarry (Gransha No.2) producing shale, sandstone and whinstone.
	5292	slate	Carrowmullin	Shallow quarries here produced poor quality dark grey slates with high pyrite content. Noted by Kinahan (1886).
	169	greenstone	Tirmonin	Infilled quarry though once large (200m X 60m X 3m), in dolerite intrusions into Dalradian metasediments.
	225	greenstone	Rathmullan	Inactive quarry in rock known locally as Ballyboe green granite and described by Kinahan as a porphyritic lamprophyre. It was used locally for cut stone purposes and as a building stone.
	245	gravel	Castleforward	Infilled gravel pit. Deposit essentially a sandy boulder clay rather than gravel - according to a local farmer. Used for construction of the main road to the south.
	3242	limestone (in general)	Carnaghan	Quarry in fine-grained, crysatlline limestone. CaCO3 content 72%.
	230	Sand and gravel	Ardmore	Pit (150m X 120m X 2m) in sand and gravel of fluvioglacial origin. Well sorted and bedded but variable gravels with some very fine sand bands.
	3250	Clay, brick	Drumskellan	Brickfield noted on old GSI 6in. map.

Section	Location No.	Mineral	Townland	Notes
	6819	Slate	Aught	Disused slate quarry noted here; material used locally for roofing. Slates small, heavy and with an uneven cleavage.
	163	Quartizite / schist	Upper Gransha	Gransha Quarry. Active. General stone materials supplied to farms/private housing/roadmaking. Aggregate produced for concrete and block-making material

7.11 Key Constraints

The land use within the study area is dominated by pasture with over 90% of the study area. The main land uses around the proposed Scheme is discontinuous urban fabric and agriculture (pasture) reflecting the intensive agriculture land use surrounding the village of Burnfoot.

The nature of the soils and subsoils in the immediate vicinity of the proposed Scheme are a mixture of surface water gleys, acid brown earths and podzols with some alluvium along the channel.

The nature of the soils and subsoils (predominantly wet soils) in the wider study area mean that there is limited groundwater surface water interactions and the dominant pathways are surface water or near surface pathways. This means that overland flow or drainage ditches will be the main pathway for contaminants to enter the water environment, however given the extensive outcropping in the area and limited depth to groundwater there are areas of extreme groundwater vulnerability.

The groundwater vulnerability is considered to be high across the study area and therefore needs to be considered in the development of the proposed scheme to ensure that contamination of the groundwater does not occur. Cognisance must be given to avoiding impact to groundwater aquifers during the option selection process. Poor aquifers of bedrock are generally the main class of aquifer in close proximity to the scheme, therefore there will be limited impact on groundwater resource.

The groundwater body underlying the Scheme area is at Good quality status and has been identified as being “Not at risk” for negative impacts in their current state. Due consideration is to be given to any design and option selection process to avoid any negative adverse impacts to these receptors.

The mineral sites within the study area are extensive and comprise mainly sands and gravels with shale, slate, gold and quartz. These are all relatively minor mineral occurrences and are not considered to be a constraint.

8 NOISE, VIBRATION, AIR QUALITY & CLIMATE

8.1 Noise

8.1.1 Overview

The specific objective of the noise input to the Constraints Study is to identify any receptors that may be deemed to be particularly sensitive to noise and/or vibration. The NRA Guidelines list examples as including schools, hospitals, places of worship, heritage buildings, special habitats, amenity areas in common use and designated quiet areas. However, residential properties must not be overlooked. Potential for ecological receptors to be impacted will also be assessed at the environmental assessment stage, particularly the presence of overwintering birds identified in the terrestrial ecology section.

The Environmental Noise Directive, EC 2002/49/EC, was transposed into Irish Law as Statutory Instrument, S.I. No. 140/2006 - Environmental Noise Regulations 2006. However, the European Communities (Environmental Noise) Regulations 2018 (S.I. No. 549) both revise and revoke the Environmental Noise Regulations 2006.The Environmental Noise Directive (END), requires Member States to prepare and publish, every 5 years, strategic noise maps and noise management action plans. The aim of the END is to provide a common framework to avoid, prevent or reduce, on a prioritised basis, the harmful effects of exposure to environmental noise through the preparation of strategic noise maps and the development and implementation of action plans.

The directive mandates that Member States must prepare and publish, noise maps and noise management action plans for:

- Agglomerations with more than 100,000 inhabitants;
- Major roads (more than 3 million vehicles a year);
- Major railways (more than 30,000 trains a year); and
- Major airports (more than 50,000 movements a year, including small aircrafts and helicopters).

8.1.2 Existing Environment

Environmental noise is unwanted or harmful outdoor sound created by human activities, including noise emitted by means of transport, road traffic, rail traffic, air traffic and noise in agglomerations over a specified size. Types of noise not included in the Regulations are noise that is caused by the exposed person, noise from domestic activities, noise created by neighbours, noise at workplaces or noise inside means of transport or due to military activities in military areas.

Based on a desktop review of available mapping depicting the study area with regard to potential constraints, along with the EPA noise mapping tool and Donegal County Council Draft Noise Action Plan 2018-2023, it was established that none of the thresholds as set out in the directive and listed above are exceeded and therefore strategic noise maps nor a noise management plan are required to be prepared for the study area.

Environmental noise is therefore limited to the rural nature of the area but will be dominated by road traffic noise. Other noise sources that supplement the noise from road traffic include general noise from human activities, bird calls and the occasional aeroplane noise which are unlikely to represent a nuisance or annoyance to the local population.

8.2 Air Quality and Climate

8.2.1 Overview

The constraints of the proposed Scheme in relation to air quality and/or those which impose on the viability or design of measures proposed within the study area is discussed in this section.

8.2.2 Existing Environment

EU Member States must designate "Zones" for the purpose of managing air quality, under the Clean Air for Europe Directive (2008/50/EC). For Ireland, four zones were defined in the Air Quality Standards Regulations (2011), namely: A, B, C and D taking into account population counts from the 2011 CSO Census and categorised as follows:

- Zone A: Dublin
- Zone B: Cork
- Zone C: Other cities and large towns comprising Limerick, Galway, Waterford, Drogheda, Dundalk, Bray, Navan, Ennis, Tralee, Kilkenny, Carlow, Nass, Sligo, Newbridge, Mullingar, Wexford, Letterkenny, Athlone, Celbridge, Clonmel, Balbriggan, Greystones, Leixlip and Portlaoise.
- Zone D: Rural Ireland; i.e., the remainder of the State excluding Zones A, B and C.

The air quality monitoring station within closest proximity to the study area is located in Letterkenny, Co. Donegal; this is categorised as Zone C. The air quality at this location is assigned as “Good”, which is calculated on measurements of ozone, nitrogen dioxide, and particulate matter of 10 µm (PM_{10})[7]. There is limited data available from the national air quality monitoring database for air quality specifically in Donegal with collated data from Letterkenny available from May 2008 to July 2009.

Table 8.1 illustrates the monthly rainfall amount that occurred in Carrigans (closest weather station) during the calendar year 2019. The total annual rainfall during the calendar year for was 1102 mm. Generally, the higher the rate of rainfall that occurs the cleaner the ambient air quality becomes as rain precipitates out the airborne particulate matter (PM).

Table 8.1: Monthly Rainfall (mm) in Carrigans in 2019 [8]

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Carrigans (Kildrum)	67.8	72.6	166.7	54.8	63.7	71.1	72	191.7	100.8	63.9	69.5	108.1

Air quality at the closest ambient air monitoring station, Letterkenny, during the period 2008/2009 is summarised in **Table 8.2**. Between the monitoring period 2008/2009 the maximum PM_{10} concentration of 160 µg/m^3 exceeded the 24-hour limit value of 50 µg/m^3.

A new air quality monitoring station was commissioned in Letterkenny in May 2019 providing measurements for PM_{10}, $PM_{2.5}$ and sulphur dioxide. The latest information available is presented in **Figure 8.1** for February/March 2021. The daily limit for PM10 exceed the 50 µg/m^3 limit on the 28th February but generally the air quality for human health (AQIH) is consistently within index 1 or 2 which is indicative of good air quality.

Recent ambient air quality is available in Northern Ireland and has also been reviewed at the nearest location to the study area, i.e., Rosemount, Derry City (65km away). Derry City ambient air monitoring station, Rosemount, is located north east of the Constraints Study area. Analysis of PM10 from this ambient monitoring, show an annual mean measurement of 14µg/m^3 which is below the annual mean limit of PM10 in 2020. There was no exceedance recorded of the daily mean limit of 50 µg/m^3 during this period. **Table 8.2** shows the limit values for pollutants in air quality for further clarity.

Given the location of these ambient air quality monitoring stations in more built up locations in larger towns it is reasonable to assume that the same good air quality conditions exist in the Burnfoot study extents. The sensitive receptors (pertaining to air and human health) identified in the Constraints Study area involve the amenities and residential receptors within Burnfoot and wider environs, particularly those that could potentially be affected by any proposed Scheme.

[7] PM10 refers to particulate matter which is 10 microns or less in diameter.

[8] https://www.met.ie/climate/available-data/historical-data

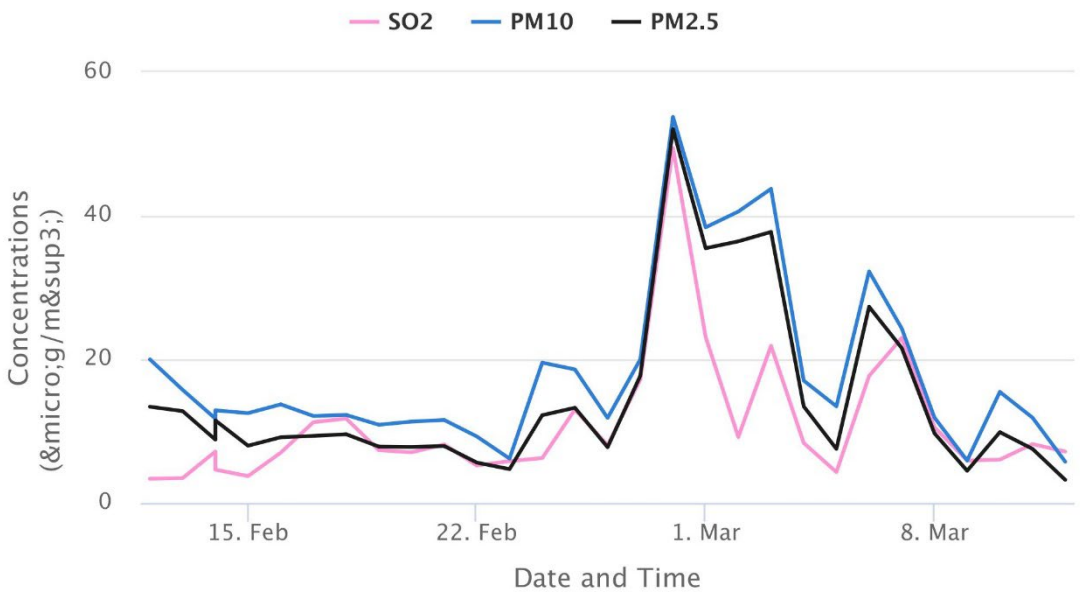


Figure 8.1: Air quality levels at Letterkenny, during Feb/Mar 2021

Table 8.2: Air Quality Data for Letterkenny Station Co. Donegal (EPA, 2009).

Pollutant	Criteria	Limit Value[a]	Letterkenny Station 2009
Nitrogen Dioxide	Hourly limit for protection of human health –not to be exceeded more than 18 times/year	200 µg/m³ NO2	76.6 µg/m³ NO2 (99.7 percentile) 13.1 µg/m³ NO2 (mean hourly value) 111.9 µg/m³ (maximum hourly value)
	Annual limit for protection of human health	40 µg/m³ NO2	-
	Annual limit for protection of vegetation	30 µg/m³ NO +NO2	22.1 µg/m³ NOX (mean hourly value)
Sulphur Dioxide	Hourly limit for protection of human health –not to be exceeded more than 24 times/year	350 µg/m³	25.5 µg/m³ (98 percentile) 6.3 µg/m³ (mean hourly value) 131.9 µg/m³ (maximum hourly value)
	Daily limit for protection of human health –not to be exceeded more than 3 times/year	125 µg/m³	17.9 µg/m³ (mean hourly value) 33.9 µg/m³ (maximum 24-hour value)
	Annual limit for protection of vegetation	20 µg/m³	-
Particulate Matter (PM_{10})	24-hour limit for protection of human health	50 µg/m³ PM10	18.0 µg/m³ (mean daily value) 160 µg/m³ (maximum daily value)

Pollutant	Criteria	Limit Value[a]	Letterkenny Station 2009
	- not to be exceeded more than 35 times/year		
	Annual limit for protection of human health	40 µg/m^3	-
Particulate Matter ($PM_{2.5}$)	Annual target value for the protection of human health	25 µg/m^3 PM2.5	Not measured
Ozone	Maximum daily 8 hour mean for theprotection of human health – not to be exceeded more than 25 days per calendar year averaged over 3 years	120 µg/m^3	Not measured
	AOT40 calculated from 1-hour values from May to July for protection of vegetation (2020 objective)	6,000 µg/m^3-h	Not measured

8.3 Key Constraints

There will be airborne emissions associated with the Scheme during construction phase, however after the Scheme becomes operational there will be limited impact on air quality. Particulate matter and other gases are produced by internal combustion engines and these could contribute to a reduction in the overall air quality in the vicinity of any works over the short term. Vehicle emissions also contribute to greenhouse gas emissions and as such will have an impact on climate in terms of the macro scale.

There are three potential impacts to atmosphere from the construction stage of the proposed Scheme:

- Generation and dispersion of construction dusts during the proposed works (minor earthworks and general construction);
- Emissions associated with construction traffic; and,
- Greenhouse gas emissions from the construction phase of the proposed Scheme.

Residential developments are present throughout the Study Area. The Study Area also includes one primary school.

It is not envisaged that the Scheme will have long term detrimental effect on the noise environment within the Study Area, however noise during the construction phase of the Scheme may have a temporary local adverse impact on the environment.

9 MATERIAL ASSETS

9.1 Overview

Material assets can be defined as economic assets of natural and human origin, or cultural assets of a physical and social type. This section identifies the constraints aspects of the proposed Scheme in relation to material assets and identifies possible issues which have the potential to constrain the Scheme design.

9.2 Existing Environment

9.2.1 Buildings and Structures

Buildings of architectural and cultural heritage significance are discussed in Section 10. Other buildings or structures of significance include those that have been identified to be at risk of flooding from the NWNB CFRAM Study. This assessment will be updated as part of this project (see Figure 9.1).

9.2.2 Rail Network

There is a dismantled rail line within the study area. No live railway network exists in Donegal.

9.2.3 Water and Wastewater Treatment

9.2.3.1 Water

There is no reliance on groundwater as a public or group water supply within the study area. The study area is within the Pollan Dam public water supply zone, the source of which is located approximately 12km to the north east.

As is illustrated in the Material Assets and Infrastructure mapping in *Volume II, Figures (Constraints – Material Assets & Infrastructure)*, the area is well serviced by public supply with extensive water mains located within the national, regional and county road network. There is one service reservoir and a number of pumping stations (4 no.) on the water supply network within the 5km buffer zone.

9.2.3.2 Wastewater

The Burnfoot agglomeration is serviced by a wastewater gravity main and recently upgraded wastewater treatment plant (WWTP) which provides secondary treatment and has a capacity of 180PE (Annual Environmental Report 2020, Burnfoot D0531)[9].

The Burnfoot agglomeration is currently organically overloaded but is operating within hydraulic capacity. The plant has a design hydraulic capacity of 135 m^3/day and a 2020 average collected hydraulic loading of 87 m^3/day. Organically, the plant is overloaded by -142 PE, with a design capacity of 180 PE and a 2020 collected load of 322 PE (Annual Environmental Report 2020, Burnfoot D0531).

Burnfoot agglomeration has been consistently non-compliant, with frequent breaches of its Emission Limit Values (ELVs) set out in the Waste Water Discharge Licence (WWDA) licence for several parameters in 2016- 2017. There is an Irish Water (IW) capital project planned to combine Burnfoot and Bridgend agglomerations into one WWTP at a new site in Burnfoot and to then relocate the primary discharge. These improvement works are noted in the 2020 AER[9] but are not funded under Regulatory Control Period (RC3), therefore the planned improvement works will be post 2024.

There is one wastewater pumping station on the network and no known storm water overflows. The location of the pumping station is shown in *Volume II, Figures (Constraints - Material Assets & Infrastructure)*.

[9] https://www.water.ie/__uuid/7b04322f-5a72-4f71-a7e4-018b435d9211/d0531-01_2020_aer-(1).pdf

There are wastewater treatment package plants adjacent to the Burnfoot River at Líos Na Greíne on the left bank and at Monreagh Park Housing estate on the right bank. There is a large package plant upstream on the right bank, marked by the rectangular raised land. It was suggested that Monreagh Park Housing estate may discharge from here. Further investigation to confirm this is required.

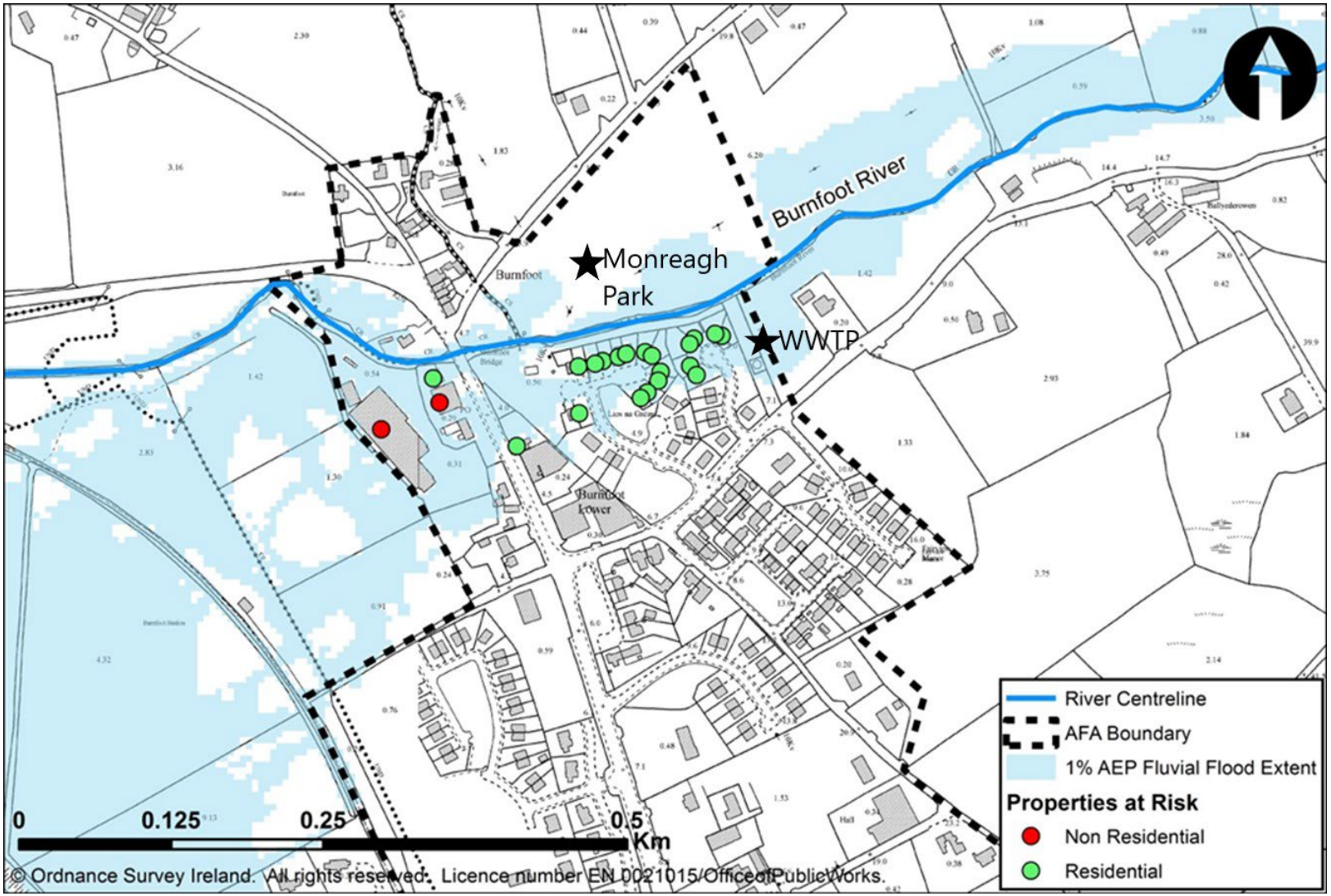


Figure 9.1: Flooding risk in Burnfoot AFA within a 1% AEP Fluvial Flood Extent (Based on the NWNB CFRAM Study UoM01 Preliminary Options Report). (Note: The location of Monreagh Park is not illustrated on the base mapping but its location along with that of the WWTP is indicated on Figure 9.1).

All package plants and the WWTP are in the 1% AEP flood extent and should be considered in the flood risk assessment. Should they be flooded, the infrastructure would recover after a few days, however this would pose a risk to human health and pollution of downstream water bodies and protected areas. The impact of surface water flooding of these assets and the potential impact to the sensitive receptors will be considered as part of the Flood Relief Scheme.

There is a possible flow path through the plant to the houses they service. A survey of the plant is required to assess this and determine what modifications would be required to prevent this while ensuring no reduction in operational efficiency. The plant at Líos Na Greíne has had operational issues in the past which would need to be considered in any modifications.

There are five other agglomerations within the study area - Bridgend, Muff, Newtowncunningham, Buncrana and Ramelton, none of which have the potential to be impacted by the proposed Scheme.

9.2.4 Waste Management

There will be a requirement to handle, store, remove and dispose of waste material in accordance with the relevant waste management legislation. Waste material will be generated from two sources:

- Wastes resulting from general construction on-site; i.e., waste fuels, oils from machinery, cement and concrete from required masonry works and wastewater from sanitary facilities.
- Excess excavated materials generated from general site clearance and earthwork excavations, as well as construction and demolition waste from proposed flood defences and other construction activities.

The nature of the wastes generated from site clearance and earthworks will generally be vegetation, topsoil, subsoil and stone. Where this material is to be stored on-site and reused it is important that it is not stored close to any watercourses or lakes. Any excavated material which is deemed unacceptable for re-use in the works will have to be removed off-site for disposal or for processing and as such may be required to be removed or disposed of under a waste permit or certificate of registration from the local authority.

There are currently no active waste management facilities within the study area.

9.2.5 Licensed Facilities

There are no EPA, IED or IPPC licensed facilities in the study area. There is an industry licensed by Donegal County Council to discharge to the Burnfoot_010 river water body under Section 4 of the Water Pollution Acts, as outlined in the WFD mapping in *Volume II, Figures (Constraints – WFD Mapping)*.

9.2.6 Telecommunications

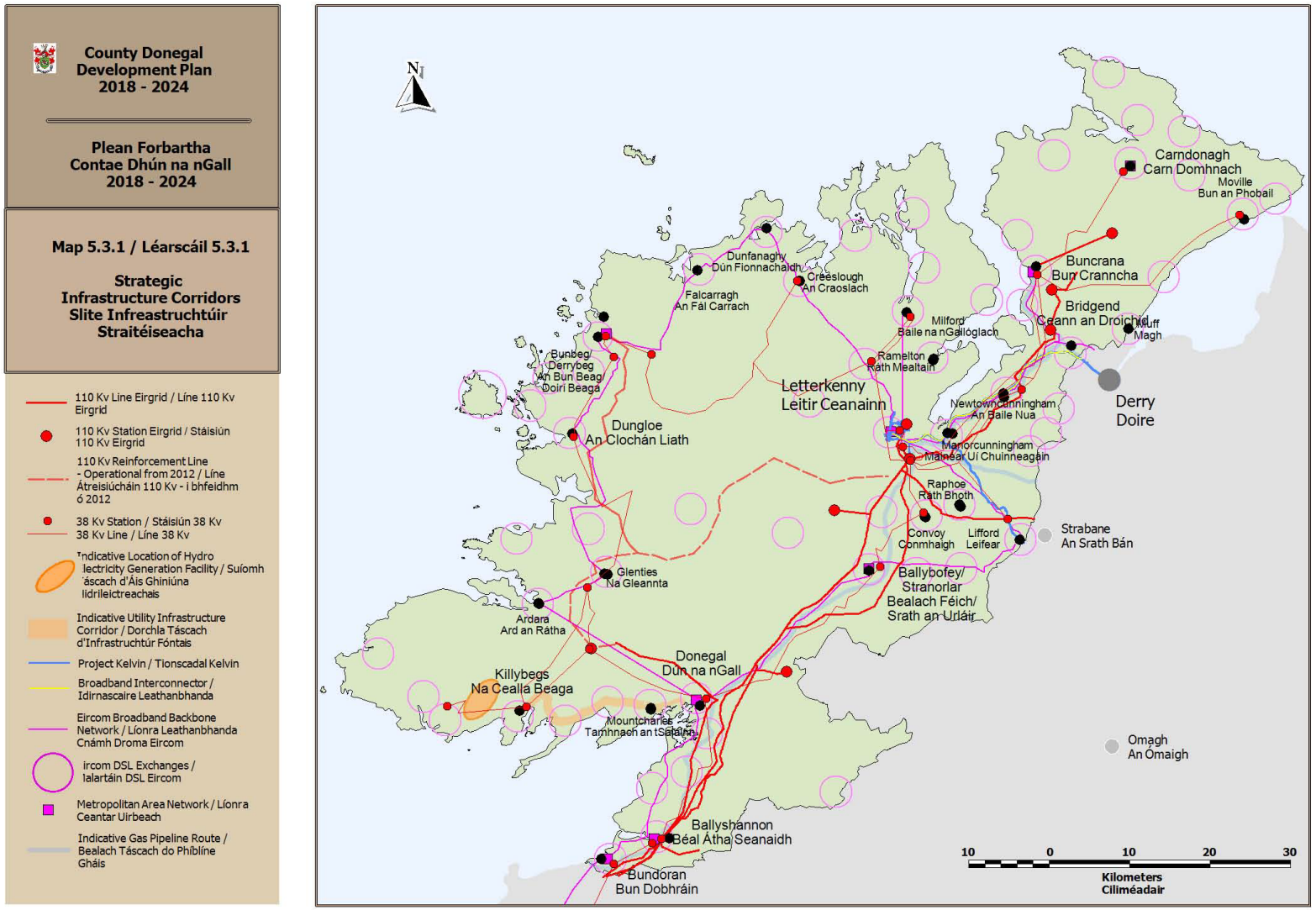
The County Donegal Development Plan 2018-2024 includes two principal objectives related to telecommunications:

a. TC-O-1: To facilitate the development and delivery of a sustainable telecommunications network across the County through a range of telecommunication systems, developed with due regard to natural and built heritage and to environmental considerations,"

b. TC-O-2: "To support and facilitate the deployment of the National Broadband Plan the National subvention plan to deliver High Speed Broadband to every rural household outside the commercially served areas as defined on the National Broadband Plan Map and similar projects, subject to the proper planning and sustainable development of the area".

Figure 9.2 illustrates the telecommunication and electrical network structure as sourced from Map 5.3.1 from the County Donegal Development Plan 2018-2024.

The Material Assets and Infrastructure constraints map in *Volume II, Figures (Constraints – Material Assets & Infrastructure)* identifies an Eircom DSL exchange in the village of Bridgend and the R238 between Bridgend and Buncrana represents the Eircom broadband backbone network for this area.



Source - Donegal County Council
Foinse - Comhairle Chontae Dhún na nGall

Ordnance Survey Ireland data reproduced under OSi Licence Number 2018/02/CCMA/Donegal County Council. Unauthorised reproduction infringes Ordnance Survey Ireland and Government of Ireland copyright. Ordnance Survey Ireland, 2018. Donegal County Council, 2018.
Sonraí de chuid Shuirbhéireacht Ordnáis Éireann arna atáirgeadh faoi Uimhir Cheadúnais SOÉ 2018/02/CCMA Comhairle Contae Dhún na nGall. Má dhéantar é seo a atáirgeadh gan údarás, sáródh sé cóipcheart Shuirbhéireacht Ordnáis Éireann agus Rialtas na hÉireann. Shuirbhéireacht Ordnáis Éireann, 2018. Comhairle Contae Dhún na nGall, 2018

To be read in conjunction with relevant accompanying text contained in the front section of this appendix as well as other relevant objectives & policies of the CDP.
Le Léamh i gcomhar leis an téacs ábhartha tionlacain atá chun tosaigh sa chuid seo den aguisín chomh maith le cuspóirí agus beartais ábhartha eile sa PFC.

Figure 9.2: Telecommunications and Electrical Networks in Donegal County (Donegal County Council, 2018)

9.2.7 Road Networks

As Burnfoot is a Layer 3 settlement, transport links to larger urban hubs are vital for the community. Burnfoot is serviced by the R238 regional road and several local roads. The R238 road bridge is a historic masonry structure that facilitates heavy road traffic towards the western side of Inishowen including the town of Buncrana. Cracks are evident in the parapet walls of the bridge on both the upstream and downstream sides of the bridge. The bridge is believed to have been subject to significant lateral loading from flood flows in the channel and on the banks of the Burnfoot River in August 2017. This was an extreme flood event with an approximate frequency of 0.5% Annual Exceedance Probability (equivalent of 1 in 200 year event). Flood risk management measures which funnel more flow onto the upstream face of the bridge will result in increased lateral loading on the front (upstream) face of the bridge and will increase the risk of structural failure.

9.3 Key constraints

The primary constraints within the study area are the utilities and existing wastewater, water and transport infrastructure.

Buildings or structures of significance include those that have been identified to be at risk of flooding and the R238 regional road which is within the study area.

The waste water treatment plant is a key constraint due to its proximity to the proposed Scheme. The surface water flooding of the WWTP and small package plants serving individual housing estates and the potential impact to the sensitive receptors is a key constraint that will be considered as part of the Flood Relief Scheme.

Early consideration of how options can integrate with the existing material assets in the area is essential and will require engagement with service providers to ensure that utilities can be avoided and/ or modified to mitigate impacts.

The ability of the existing R238 road bridge to withstand extra lateral loading at the upstream face should flood risk management measures increase flows through the structure needs to be considered. The R238 bridge is therefore a key constraint given its importance as only main road link to Inishowen.

10 ARCHAEOLOGY, ARCHITECTURAL AND CULTURAL HERITAGE

10.1 Overview

Detailed assessment of the recorded archaeological and architectural heritage resource shall require provision of best practice guidance in terms of avoidance and mitigation of any likely significant impacts that the proposed Scheme may have from earliest stages of viable option assessment through to detailed design and construction stages.

The archaeological and architectural heritage constraints identified in this section will assist in the assessment of the options appraisal will seek to avoid and, where possible, reduce negative impacts.

10.2 Study Area

Given the large number of features of archaeological and architectural heritage in the area only those within 1km of the proposed Scheme have been considered, focussing on the proposed Scheme as a centre point. All archaeological and architectural heritage features from the datasets listed in Section 10.3 have been identified.

10.3 Existing Environment

The desktop assessment identified all recorded archaeological monuments and architectural heritage structures within the study area including the legal status of these features. Sources of background information that was drawn upon include:

- Record of Monuments and Places (RMP)
- Sites and Monuments Record (SMR)
- Register of Historic Monuments
- National Inventory of Architectural Heritage (NIAH)
- County Development Plans
- Irish Antiquities Division, National Museum of Ireland Topographical Files
- Urban Archaeological Surveys
- Ordnance Survey first and subsequent editions
- Ordnance Survey Namebooks/Letters/ Memoirs

A desktop survey of cultural heritage sites within the study area was carried out in order to assess volume and location of cultural heritage constraints pertaining to the proposed Scheme. The Record of Monuments and Places (RMP) of County Donegal was the principal source for identifying archaeological constraints. Other sources consulted included SMR records, NIAH (preliminary) survey records, County Development Plan (Record of Protected Structures), historic OS mapping, aerial photographs and excavations bulletins.

10.4 Archaeology

10.4.1 Policy and Legislation

The *National Monuments Acts 1930 to 2004*, the *Heritage Act 1995* and relevant provisions of the *National Cultural Institutions Act 1997* are the primary means of ensuring the satisfactory protection of archaeological remains, which are deemed to include all man-made structures, of whatever form or date, except buildings habitually used for ecclesiastical purposes. A National Monument is described as 'a monument or the remains of a monument the preservation of which is a matter of national importance by reason of the historical, architectural, traditional, artistic or archaeological interest attaching thereto' (Section 2, National Monument Act, 1930).

There are a number of mechanisms under the National Monuments Act that are applied to secure the protection of archaeological monuments. These include the Register of Historic Monuments, the Record

of Monuments and Places (formerly the Sites and Monuments Record) (RMP), and the placing of Preservation Orders and Temporary Preservation Orders on endangered sites. The administration of national policy in relation to archaeological heritage management is undertaken by the Department of Arts, Heritage and the Gaeltacht.

The State may acquire or assume guardianship of national monuments by agreement with site owners or under compulsory order. Once the site is in ownership or guardianship of the State it may not be interfered without the written consent of the Minister. There are no national monuments located within 200m of the proposed Scheme extents.

Sites deemed to be in danger of injury or destruction can be allocated Preservation Orders under the 1930 Act. Preservation Orders make any interference to the site illegal. Temporary Preservation Orders can be attached under the 1954 Act. These perform the same function as a Preservation Order but have a time limit of six months, after which the situation surrounding the site must be reviewed. Work may only be undertaken on or in the vicinity of sites under Preservation Orders by the written consent, and at the discretion, of the Minister. There are no sites subject to preservation orders located within 200m of the proposed Scheme.

10.4.2 Record of Monuments and Places

Section 12 (1) of the National Monuments (Amendment) Act, 1994 made provision for the establishment and maintenance of a Record of Monuments and Places (RMP) deemed to have cultural heritage potential. Superseding the Register of Historic Monuments, which was established under the 1987 Amendment to the Act, the RMP comprises of a list and maps of monuments and relevant places in respect of each county in the State. All sites recorded on the RMP receive statutory protection under the National Monuments Act 1994 and any work undertaken at these sites must be done so under licence (Section 12 (3)).

There are six RMP sites recorded within 1km of the edge of the proposed Scheme (see Table 10.1). The location of the RMP sites surrounding the study area is illustrated in *Volume II, Figures (Constraints – Cultural, Archaeological & Architectural Heritage)*. Sites from the prehistoric period through to the monastic period are among those recorded. Most of these sites are prehistoric (including a cairn) and monastic in date (souterrain). None of these sites will be directly affected by the Scheme.

Table 10.1: RMP sites located within c. 1km of the proposed Scheme

Reference No.	Legal Status	Townland	Monument Type	NGR	Distance from edge of road corridor	Information Source
DG038-025001	Recorded Monument	Crislaghmore	Hilltop enclosure	237295 424922	1km	RMP (www.archaeology.ie) No further info available.
DG038-025002	Recorded Monument	Crislaghmore	Hut site	237295 424922	1km	RMP (www.archaeology.ie) No further info available.
DG038-028	Recorded Monument	Monreagh or Barr of Kilmackilvenny	Cairn - unclassified	238226 425164	1km	RMP (www.archaeology.ie) No further info available.
DG038-029	Recorded Monument	Kilmackilvenny	Souterrain	238451 424737	720m	RMP (www.archaeology.ie) No further info available.
DG038-039	Recorded Monument	Garvary (Birdstown)	Hut site	239490 424430	1km	RMP (www.archaeology.ie) No further info available.
DG038-025003	Recorded Monument	Crislaghmore	Field boundary	237295 424922	1km	RMP (www.archaeology.ie) No further info available.

10.4.3 Excavations Database

A review of the Excavations database (1970 – 2007) (www.excavations.ie) has shown that two archaeological excavations have taken place in the townlands associated with the Scheme (within 1km). These are shown in Table 10.2.

Table 10.2: Information from the excavation database of the study area

Townland	SMR No	Licence No	Description
Inch Level /Ballyederowen	N/A	05E0252	Predevelopment testing was undertaken at a site on the 5th and 6th of April 2005. The site is located south of Burnfoot Village. No archaeological significance was noted during the excavation of six trenches.

10.4.4 Topographical Files, National Museum of Ireland (NMI)

A review of the topographical files in the National Museum of Ireland revealed that a small number of finds have been previously discovered in the townlands of Tievebane (see Table 10.3).

Table 10.3: List of finds from the topographical files of the National Museum of Ireland

Townland	NMI No.	Notes
Tievebane	N/A	SMR DG038-041 Licence number E1055 Discovery of a cist grave in 1969 reported a complete vase located within, although it had been removed and broken prior to being acquired by the NMI in 1971.

10.5 Architectural Heritage

Protection of architectural or built heritage is provided for through a range of legal instruments that include the Heritage Act, 1995, the Architectural Heritage (National Inventory) and National Monuments (Misc. Provisions) Act, 1999, and the Local Government (Planning and Development) Act 2000. Part IV of 2000 Act deals with architectural heritage and incorporates the provisions of the Local Government (Planning and Development) Act, 1999.

Section 2.1 of the Heritage Act, 1995, describes architectural heritage as 'all structures, buildings, traditional and designed, and groups of buildings including streetscapes and urban vistas, which are of historical, archaeological, artistic, engineering, scientific, social or technical interest, together with their setting, attendant grounds, fixtures, fittings and contents, and, without prejudice to the generality of the foregoing, includes railways and related buildings and structures and any place comprising the remains or traces of any such railway, building or structure'.

Under the Local Government (Planning and Development) Act, 2000, all Planning Authorities are obliged to keep a 'Record of Protected Structures' of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest. As of the 1st January 2000, all structures listed for protection in current Development Plans, have become 'protected structures'.

Since the introduction of this legislation, planning permission is required for any works to a protected structure that would affect its character. If a protected structure is endangered, planning authorities may issue a notice to the owner or occupier requiring works to be carried out. The Act contains comprehensive powers for local authorities to require the owners and occupiers to do works on a protected structure if it is endangered, or a protected structure or a townscape of special character that ought to be restored.

There are no protected structures within 1km of the proposed Scheme.

10.5.1 National Inventory of Architectural Heritage

The Architectural Heritage Act, 1999, requires the Minister to establish a survey to identify, record and evaluate the architectural heritage of the country. The function of the National Inventory of Architectural Heritage (NIAH) is to record all built heritage structures within the Republic of Ireland. Inclusion in an NIAH inventory does not provide statutory protection; the document is used to advise local authorities on compilation of a Record of Protected Structures as required by the Local Government (Planning and Development) Act, 2000.

A total of one site located close to the proposed Scheme were surveyed during the preliminary 1996 NIAH Survey (see Table 10.4 below and in *Volume II, Figures (Constraints – Cultural, Archaeological & Architectural Heritage)* - subsequent surveys carried out have not yet been published and details are unknown at time of writing). The structure is located within the urban environs in the town of Burnfoot. No works are proposed on or adjacent to this and it shall not be affected by the proposed Scheme.

Table 10.4: NIAH sites (preliminary) located within 1km of the proposed Scheme

Reg. No.	Structure	Address	Composition
40903827	Farm house	Ballyederowen	1870-1910

10.6 Key Constraints

The town of Burnfoot is located in the largely rural study area. It is located in the parish of Burt, in the barony of Inishowen West.

Much of the older buildings in the surrounding towns and lands date to the middle of the 19th century or later, for example Fahan Catholic Church in 1820-1870 and Lisfannon Presbyterian Manse in 1850 to 1890. There is a souterrain (DG038-029) and a Cairn (DG038-028) located in the townlands of Kilmackilvenny and Monreagh to the north of Burnfoot.

There are six RMP sites recorded within 1km of the edge of the current proposed Scheme (see Table 10.1). Sites from the prehistoric period (cairn) right through to the monastic (souterrain) period are among those recorded. A majority of the sites in the surrounding area are prehistoric in date, including ringforts and cists. None of these sites will be directly affected by the proposed Scheme.

Records of monuments that are scheduled for inclusion in the next issue of the statutory “Record of Monuments and Places” are surrounded by a zone. The zones do not define the exact extent of the monuments but rather are intended to identify them for the purposes of notification under Section 12 of the National Monuments Act (1930-2004): each is referred to as a “zone of notification”. The zone of notification is included in the Cultural, Archaeological & Architectural Heritage constraints map included in *Volume II, Figures.*

The proposed Scheme could impinge on the zone of notification (*Volume II, Figures. Constraints – Cultural, Archaeological & Architectural Heritage*) for Burnfoot, therefore, the National Monuments Service will need to be kept informed and this will be confirmed during walkover surveys. Any site investigations or ground investigations that involve intrusive works around the town need to be planned so that they can first be assessed by an archaeologist to check for potential impacts.

NMS will also be kept informed of any in-channel or coastal works so as to provide an adequate archaeological assessment as there have been historical boats found over the years that have been lost and washed ashore during flood.

Given the heritage significance as outlined above a more detailed archaeological evaluation process and subsequent environmental impact assessment, which will involve a desk study and field inspection, will ensure that known and standing monuments, architectural and cultural heritage sites and features are identified and any potential likely impacts measured as appropriate. It will be difficult to identify previously unrecorded sites by simply field-walking proposed corridors at option selection stage. Many sites, due to low visibility factors or lack of definition, may now have been extinguished as surface features 'gone under' completely as a result of agricultural development. Specific mitigation requirements to address potential 'unknowns' can only be identified as items for review once the location of any chosen preferred option is defined. The judicious use of Light Detection and Ranging (LiDAR) survey, geophysical survey and topographic survey techniques may be advised if an area of significant potential is identified. In some locations, exploratory test excavation may be considered, as cultivated soils can be extremely deep, masking the presence of below-ground remains, even to geophysical survey.

11 LANDSCAPE & VISUAL

11.1 Overview

This section identifies the Landscape constraints for the proposed Scheme. It does so in relation to the assessment of landscape and visual impacts which comprises both natural and built elements including: landform, vegetation and historical and cultural components. Landform relates in general to topography and geology (see Section 7 Land, Geology, Hydrogeology and Soils). Historical and cultural components include historic landscapes, listed buildings, conservation areas and historic designed landscapes (see Section 10 Archaeology, Architectural and Cultural Heritage).

A desktop study was undertaken using the following sources of information:

- Ordnance Survey mapping accessed online February 2021 (www.osi.ie);
- Aerial photography; and
- Donegal County Development Plan (2018 - 2024).

11.2 Existing Environment

11.2.1 Landscape Character Assessment

The landscape character is assigned through a desktop examination of various layers of spatial data on the physical attributes of the county, in combination with historical mapping, photography surveys, 3D photography and aerial photography. Landscape Character Types (LCT) were identified in the Landscape Character Assessment of County Donegal (2016) [10]

There are 23 different LCTs throughout County Donegal (Figure 11.1). Four of these LCTs are located within the study areas assessed as part of this report (listed below), reflecting the agricultural nature of the study area:

1. Agriculture Riverine
2. Agricultural Coastal
3. Agricultural Arable and Pasture
4. Agricultural Foothills

Donegal is further divided into 44 Landscape Character Assessment (LCAs) areas. The LCAs in which the study area sections are situated are described in detail in **Table 11.1**.

[10] Landscape Character Assessment of County Donegal

http://www.donegalcoco.ie/media/donegalcountyc/planning/pdfs/viewdevelopmentplans/landscapecharacterassessmentofcountydonegal/landscapecharacterassessmentofcountydonegal/Landscape%20Character%20Assessment%20Part%201.pdf

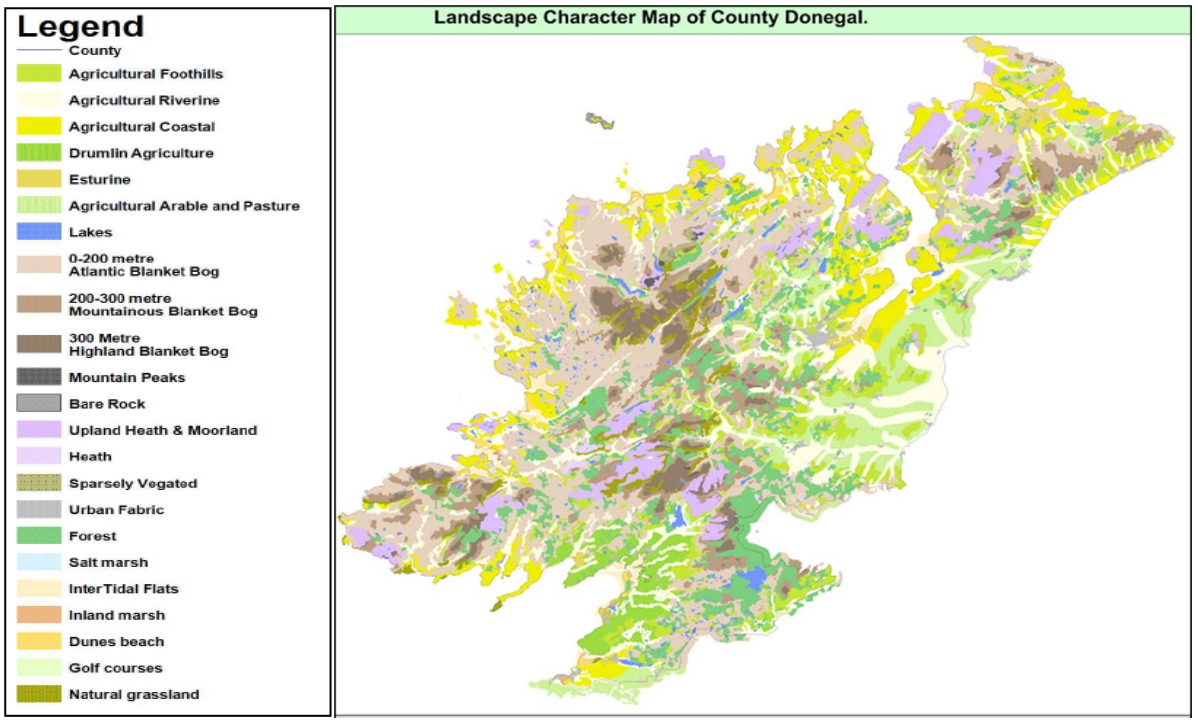


Figure 11.1: Landscape Character Type Map of County Donegal

Table 11.1: Landscape Character Assessments of Study Areas (Landscape Character Assessment of County Donegal (2016) [11]

Area	Landscape Character Assessment Area	Description
5km	South Inishowen Farmland LCA 10	South Inishowen farmland LCA spans the bottom of the Inishowen peninsula from Lough Swilly to Lough Foyle. It is characterized by good quality agricultural land in a pattern of medium to large sized fields separated by hedgerow and deciduous trees against the backdrop of Scalp Mountain to the north and the suburbs of Derry City (Northern Ireland) to the south-east. Inch Island is connected to the mainland by 2 embankments created to hold water drained from the adjoining flat agricultural re-claimed land that has, in turn, created Inch Lake. One of these causeways constitutes the only vehicular access into the island from the mainland. The area is well connected to adjoining areas by a Regional road that cuts right through the length of the LCA and a network of county roads that provide permeability throughout the area and linkages between the settlements. This area has been settled for millennia, and there are many remaining national monuments evident in the landscape.

[11] Landscape Character Assessment of County Donegal

http://www.donegalcoco.ie/media/donegalcountyc/planning/pdfs/viewdevelopmentplans/landscapecharacterassessmentofcountydonegal/landscapecharacterassessmentofcountydonegal/Landscape%20Character%20Assessment%20Part%201.pdf

Area	Landscape Character Assessment Area	Description
	Grianan Slopes & lowlands LCA 11	Grianan Slopes and Lowlands LCA is a fertile green agricultural landscape of great environmental, historical and archaeological importance, with an extensive boundary along the border with Northern Ireland to the east and along the shores of Lough Swilly to the west. The topography is such that higher lands within the centre east of this area slope downwards on all sides to an undulating lower agricultural landform affording extensive and panoramic views out over the surrounding landscape and Lough Swilly, and conversely this area is highly visible from a wide area of Donegal and adjoining County Derry in Northern Ireland. A large swathe of low lying lands on the edge of Lough Swilly in the northwest of this area are of especially high ornithological value and these feeding and wintering grounds form part of Inch Wildlife reserve, an area designated as SPA. The range of landscape assets and the location along the Wild Atlantic Way with good transport connections by air and road make this landscape area a popular area for tourists to visit and stay. Similarly these same assets have fuelled recent rural and urban population expansion within this LCA.
10km	Scalp Mountain LCA 9	Scalp Mountain LCA is characterised by widespread upland blanket bog and dominated by the imposing Scalp and Iskaheen mountains. Substantial areas of commercial forestry extend throughout the area and 22 wind turbines are located in 2 groupings of 10 and 12 in the west of this LCA. There are pockets of agricultural land and dispersed rural dwellings on the periphery of this area and alongside the Owenkillew and Barnahone Rivers.
	Buncrana Coast LCA 8	Buncrana Coast LCA is located on the west of the Inishowen peninsula and is defined by Buncrana Town, a long stretch of sandy coastline along the Swilly and the surrounding mountains that encircle this fertile agricultural landscape. This is a historic landscape intrinsically associated with Lough Swilly as evident from the plethora of recorded monuments and protected structures in the landscape including enclosures, middens, cairns, promontory forts, Napoleonic forts, a castle and seaside Victorian architecture. Buncrana LCA is an interesting and active landscape with a synergy of land uses that contribute to the unique character of this area.

11.3 Landscape Amenity

The County Donegal Development Plan 2018-2024 provides a policy context to build on the evidential approach of the LCA. The landscape of the County has been categorised into three layers of value and are illustrated in the Landscape Amenity Map in *Volume II, Figures (Constraints – Landscape Scenic Amenity)* which will be considered during the Option Development Process.

The County Donegal Development Plan 2018 – 2024 provides descriptions for the scenic amenity areas which should be considered when assessing sensitive areas during the Option Development Process. The definitions for relevant areas considered within this report are follows:

Especially High Scenic Amenity Areas (EHSA): are sublime natural landscapes of the highest quality that are synonymous with the identity of County Donegal. These areas have extremely limited capacity to assimilate additional development. They include the high-cliffed coastal zone, and upland mountain areas."

High Scenic Amenity Areas (HSA): are landscapes of significant aesthetic, cultural, heritage and environmental quality that are unique to their locality and are a fundamental element of the landscape and identity of County Donegal. These areas have the capacity to absorb sensitively located development of scale, design and use that will enable assimilation into the receiving landscape and which does not detract from the quality of the landscape, subject to compliance with all other objectives and policies of the plan.

Moderate Scenic Amenity Areas (MSA): are primarily landscapes outside Local Area Plan Boundaries and Settlement framework boundaries that have a unique, rural and generally agricultural quality. These areas have the capacity to absorb additional development that is suitably located, sited and designed subject to compliance with all other objectives and policies of the plan.

None of the landscapes of County Donegal have been classified as Low Value. The definitions for each of the areas of landscape value range from moderate to especially high scenic amenity.

Burnfoot lies within an area of high scenic amenity, however areas of especially high scenic amenity are located north at Scalp Mountain, west at Inch Levels and south at Greenan Mountain.

The study area does overlap with areas of Especially High Scenic Amenity but the FRS does not impact on any of these however the area can be viewed from the views and prospects of special amenity value and interest at An Grianan and Inch Wildfowl reserve identified in the County Development Plan (as illustrated in Map 7.1.1 of the plan).

11.4 Settlement Character Assessment

A Settlement Character Assessment [12] was carried out for County Donegal. Within the Settlement Character Assessment, settlements were classified within four tiers included in the assessment:

1. Gateway
2. Strategic Support Towns
3. Strong Towns and Villages
4. Small Villages

The Donegal County Development Plan 2018-2024 [13] also provides classification guidelines for towns and villages marked for renewal and regeneration. The strategy for renewal and regeneration of towns is provided across the following categories:

1. Gateway' town(s) that make up the primary centre(s) for economic growth and population settlement in the county as Layer 1.
2. 23 towns described as the County's 'Strategic Towns' that perform a 'Special Economic Function' identified in the settlement structure of the Core Strategy as Layer 2 (A & B).
3. 7 towns/rural areas of smaller scale (included in Layer 3 in the settlement structure) for which a focus on regeneration and renewal, primarily through enhancement schemes, will strengthen communities.

The towns identified as 'Gateway Towns', 'Strategic Towns' and 'Rural Areas' are represented visually in Figure 11.2.

Burnfoot is classified under 'Layer 3: Rural Towns and Open Countryside'. The Donegal County Development Plan defines 'Layer 3: Rural Towns and Open Countryside' as follows:

[12] http://www.donegalcoco.ie/media/donegalcountyc/planning/pdfs/viewdevelopmentplans/landscapecharacterassessmentofcountydonegal/settlementcharacterassessmentofcountydonegal/Settlement%20Character%20Assessment.pdf

[13] http://www.donegalcoco.ie/media/donegalcountyc/planning/pdfs/viewdevelopmentplans/countydonegaldevelopmentplan2018-2024/partaandb/Document.pdf

"Layer 3 comprises the County's network of smaller rural towns together with their surrounding rural hinterlands. Generally, Layer 3 provides for small scale clusters of urban development in rural towns and one-off rural housing supported by specific water services provided in the main as individual and private systems. The core strategy recognises that Layer 3 is a critical component of the social, community and cultural identity of the County and that strengthening of rural communities is essential in order to ensure the survival of the unique character of the county. The rural areas of Layer 3 provide an important and diverse resource for the county as a place to live; to express cultural identify; to establish and strengthen rural communities; to provide a unique quality of life; to provide a natural tourism product; for health, recreation and wellbeing; for its natural resource potential and; for providing economic opportunities directly related to rural areas."

The settlement structure and the inclusion of Burnfoot within Layer 3 will need to be considered in the landscape assessment to ensure the quality of life, natural tourism recreational and wellbeing is not unduly impacted.

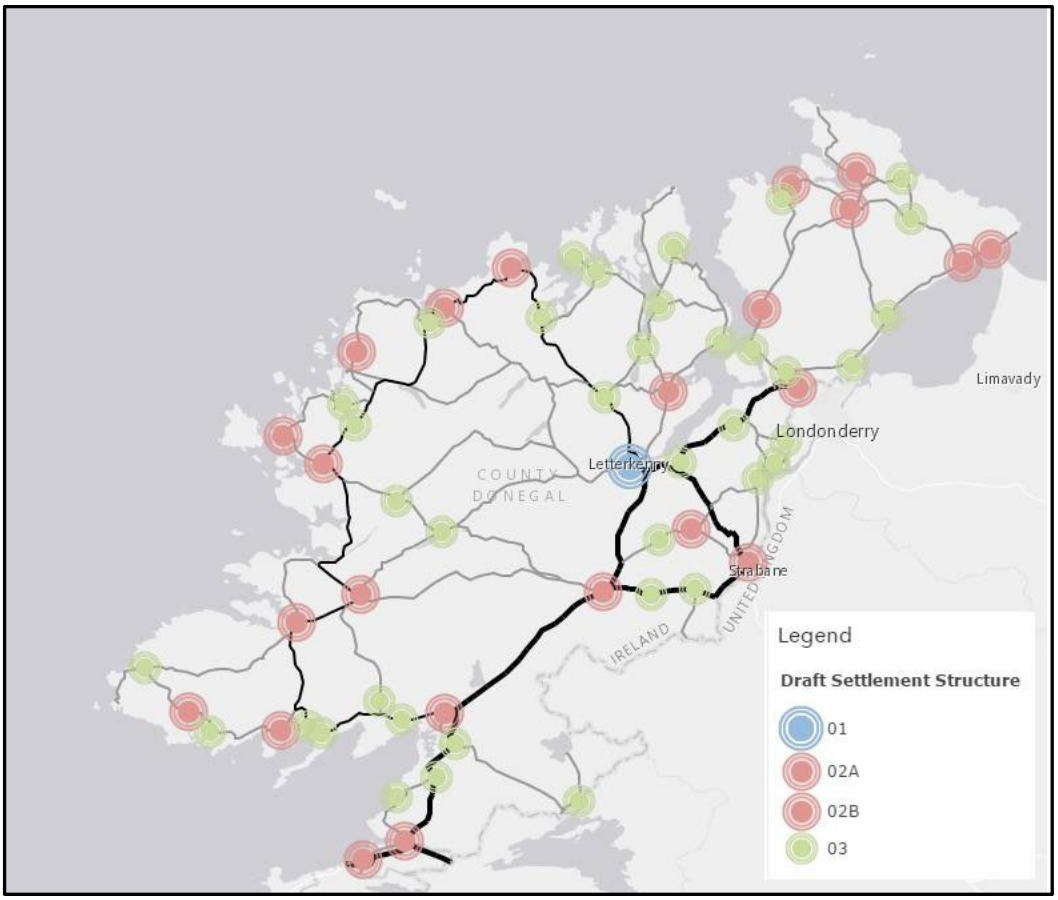


Figure 11.2: Settlement Structure

11.5 Key Constraints

The landscape will be appraised in the environmental assessment to describe the landscape character areas which enable the categorisation of landscape sensitivity.

It is a policy of the Council to protect, conserve and manage landscapes having regard to the nature of the proposed Scheme and the degree to which it can be accommodated into the receiving landscape. In this regard the proposal must be considered in the context of the landscape classifications, and views and prospects contained within this Plan and as illustrated on Map 7.1.1: 'Scenic Amenity' (*Volume II, Figures*).

It will be important to ensure that the FRS is consistent with policy NH-P-17 of the County Development plan which seeks to preserve the views and prospects of special amenity value and interest, in particular, views between public roads and the sea, lakes and rivers. In this regard, development proposals situated on lands between the road and the sea, lakes or rivers shall be considered on the basis of the following criteria:

- Importance value of the view in question.
- Whether the integrity of the view has been affected to date by existing development.
- Whether the proposed Scheme would intrude significantly on the view.
- Whether the proposed Scheme would materially alter the view.

The Development Plan states “In operating the policy, a reasonable and balanced approach shall be implemented so as to ensure that the policy does not act as a blanket ban on developments between the road and the sea, lakes and rivers.”

Given the location of the proposed Scheme in the South Inishowen Farmland LCA 10, and the views and prospects from Grianan Slopes & lowlands LCA 11, the scenic amenity is classified as high to extremely high means that the landscape character is very sensitive and the scenic amenity will require careful consideration in the further environmental assessment of the options and emerging proposed Scheme.

12 REFERENCES

Atlantic Salmon Management Strategy for Northern Ireland and the Cross-Border Foyle and Carlingford catchments to meet the objectives of NASCO resolutions and agreements, Department Culture, Arts and Leisure, 2008-2012

British Ecological Society., (2007) UK Biodiversity Action Plan - Report 2007. Available at https://www.britishecologicalsociety.org/uk-biodiversity-action-plan-report-2007/

Department for Environment, Food and Rural Affairs., (2010). Eel Management plans for the United Kingdom. North Western International River Basin District. Available at https://www.daera-ni.gov.uk/sites/default/files/publications/dcal/eel-management-plans-for-the-uk-north-western-international-river-basin-district.pdf

Department of Culture, Heritage and the Gaeltacht., (2017). National Biodiversity Action Plan 2017-2021. Available at https://www.npws.ie/sites/default/files/publications/pdf/National%20Biodiversity%20Action%20Plan%20English.pdf

Department of Housing, Planning and Local Government, (2018). Project Ireland 2040 The National Planning Framework. Available at https://npf.ie/wp-content/uploads/Project-Ireland-2040-NPF.pdf

Donegal County Council, (2018). County Donegal Development Plan 2018-2024. Available at https://www.donegalcoco.ie//media/donegalcountyc/planning/pdfs/viewdevelopmentplans/countydonegaldevelopmentplan2018-2024/partaandb/Document.pdf

Donegal County Council., (2013). Donegal Local Authorities Noise Action Plan 2013-2018. Lifford. Donegal County Council.

EPA, (2017). Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR). Available at https://www.epa.ie/publications/monitoring--assessment/assessment/draft-guidelines-on-the-information-to-be-contained-in-environmental-impact-asse.php

European Commission (2000) EU Water Framework Directive 2000/60/EC, Offical Journal of the European Communities. Available at https://eur-lex.europa.eu/resource.html?uri=cellar:5c835afb-2ec6-4577-bdf8-756d3d694eeb.0004.02/DOC_1&format=PDF

European Commission (2000) Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg

European Commission, (2017). EIA Directive within the European Commission's guidance on the preparation of the Environmental Impact Assessment Report. Available at https://ec.europa.eu/environment/eia/pdf/EIA_guidance_EIA_report_final.pdf

European Commission., (1991) The Nitrates Directive 91/676/EEC. Available at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:01991L0676-20081211&from=EN

European Commission., (1991) The Urban Waste Water Directive 91/271/EEC. Available at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ:L:1991:135:TOC

European Commission., (2002). Environmental Noise Directive 2002/49/EEC. Official Journal of the European Communities, L 189, Vol 45.

European Commission., (2020). EU Biodiversity Strategy for 2030 Bringing nature back into our lives. Office for Official Publications of the European Communities, Brussels

European Communities (Drinking Water) (No. 2) Regulations 2007. Available at http://www.irishstatutebook.ie/eli/2007/si/278/made/en/print

European Environment Agency., (1975). Bathing Water Directive (76/160/EEC)

European Environment Agency., (2008). Directive 2008/50/EC Ambient air quality and cleaner air for Europe.

Fáilte Ireland (2021). Tourism Facts 2019 Final March 2021. Available at: https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3_Research_Insights/4_Visitor_Insights/KeyTourismFacts_2019.pdf?ext=.pdf.

Flora (Protection), 2015. Available at http://www.irishstatutebook.ie/eli/2015/si/356/made/en/print

Fossit., J. A (2000). Heritage Council's Guide to Habitats in Ireland. Dublin. The Heritage Council.

Foyle Area (Control of Fishing) Regulations., (2010). Available at https://www.legislation.gov.uk/nisr/2010/199/introduction/made

Foyle Fisheries Act (Northern Ireland), 1952. Available at https://www.legislation.gov.uk/apni/1952/5/section/1

Heritage Act., (1995). Available at http://www.irishstatutebook.ie/eli/1995/act/4/enacted/en/html

National Cultural Institutions Act., (1997). Available at http://www.irishstatutebook.ie/eli/1997/act/11/enacted/en/pdf#:~:text=AN%20ACT%20TO%20PROVIDE%20FOR,STATE%20AGAINST%20THE%20LOSS%20OF%2C

National Monuments Act, (1930) as Amended., (2004).

National Roads Authority., (2008). Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes. Available at https://www.tii.ie/technical-services/environment/planning/Ecological-Surveying-Techniques-for-Protected-Flora-and-Fauna-during-the-Planning-of-National-Road-Schemes.pdf

National Roads Authority., (2011). Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes. Revision 1. Available at https://www.tii.ie/technical-services/environment/planning/Guidelines-for-the-Treatment-of-Air-Quality-during-the-Planning-and-Construction-of-National-Road-Schemes.pdf

Niven, A. and Clarkin, J. (2018). Foyle Area and Tributaries Catchment Status Report 2017. Derry. Accessed https://loughs-agency.zestydev.com/app/uploads/2019/06/2017-Foyle-Area-Status-Report.pdf

Ross, A. & Chang, M., 2012. Reuniting Health with Planning - Healthier Homes, Healthier Communities. https://www.tcpa.org.uk/Handlers/Download.ashx?IDMF=90dfdb6c-e68e-42ce-955f-fd5b15f69ba0

Smyth et al., (2011). Heritage Council's Best Practice Guidance for Habitat Survey and Mapping. Dublin. The Heritage Council.

The Border Regional Authority, (2010). Regional Planning Guidelines (2010-2022). Available at https://www.nwra.ie/wp-content/uploads/Planning-Guidelines-for-the-Border-Region.pdf

The Environment (Northern Ireland) Order 2002. Available at https://www.legislation.gov.uk/nisi/2002/3153/contents

The Wildlife (Amendment) Act 2000., (2000). Available at http://www.irishstatutebook.ie/eli/2000/act/38/enacted/en/print.html

Wildlife Act, 1976 (Protection of Wild Animals) Regulations, 1990. Available at http://www.irishstatutebook.ie/eli/1990/si/112/made/en/print

WMPHO, (2007). A Crititcal Guide to HIA. https://web.archive.org/web/20170301012334/http://www.apho.org.uk/resource/view.aspx?RID=44422

Appendix A

Opening Public Questionnaire

Comhairle Contae Dhún na nGall
Donegal County Council

OPW Oifig na nOibreacha Poiblí Office of Public Works

BURNFOOT FLOOD RELIEF SCHEME

OPENING PUBLIC CONSULTATION QUESTIONNAIRE

Please complete this questionnaire and return using the stamped addressed envelope provided, alternatively this questionnaire can be completed online at https://countydonegalfrs.ie/burnfootfrs/. Please return by Monday 21st December 2020.

1. **Name *(optional)*:** _____

   Address: _____

   _____

   Phone *(optional)*: _____

   Email *(optional)*: _____

2. **Do you own, rent or occupy a property within the study area being considered?** Yes ☐ No ☐

3. **Address of property (if different from home address)**

   _____

4. **Have you had any personal experience of flooding?** Yes ☐ No ☐

5. **If yes, please give date(s):** _____

6. **Type of property flooded:** _____

7. **Approximate maximum depth of flooding:** _____

8. **Source of Flooding**:

   Directly from River/ Stream ☐

   From Drains ☐

   Overground flow (surface water) ☐

   Other (please state below) ☐

   Other: _____

9. **Do you have photographs of flooding?** Yes ☐ No ☐

10. **Do Donegal County Council and the OPW have permission to use them?** Yes ☐ No ☐

    Note: We will contact you to collect photos at a later date

11. **Have you put in place measures to prevent or reduce the impact of flooding?** Yes ☐ No ☐

    If yes, please describe overleaf:

12. How do you think the issue of flooding in the area can be resolved?

13. In your opinion, how important are the following environmental constraints to the development of a Flood Relief Scheme for the Burnfoot area: *(please tick appropriate boxes)*

Issue	Very Important	Important	Moderately Important	Of Little Importance	Unimportant
Biodiversity, Flora and Fauna	☐	☐	☐	☐	☐
Land Use and Agriculture	☐	☐	☐	☐	☐
Water Quality	☐	☐	☐	☐	☐
Architectural and Cultural Heritage	☐	☐	☐	☐	☐
Landscape and Visual Amenity	☐	☐	☐	☐	☐
Angling, Tourism & Recreation	☐	☐	☐	☐	☐

14. If you have any comments in relation to the proposed scheme or the constraints, please record them here:

Comment:

GDPR Compliance

Your contact details have been collected to aid the development of the flood relief scheme for Burnfoot. The details will only be used for the purposes of contacting you in relation to the scheme, which may include some or all of the following:

- Notifying you of future consultation opportunities
- Arranging access to your lands for the purposes of data collection by project staff and approved third party surveyors
- Clarifying information, you have already provided to the project team and obtaining further inputs

Your details will be securely kept on file for the duration of the project

Signature:	I agree to the above use and retention of my contact details