



Comhairle Chontae Liatroma
Leitrim County Council



OPW Oifig na
nOibreacha Poiblí
Office of Public Works

Leitrim Village Flood Relief Scheme

Constraints Study Report

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EXECUTIVE SUMMARY

This report sets out the key environmental issues relating to the Study Area for the Leitrim Village Flood Relief Scheme (FRS) which may be impacted upon by potential Flood Risk Management (FRM) measures and/ or which may impose constraints on the viability and/ or design of these measures. Information has been gathered on engineering, socio-economic, environmental, archaeological, and geotechnical constraints.

Environmental constraints have been investigated under the following headings:

- Human Beings;
- Ecology;
- Water;
- Soils & Geology;
- Archaeology & Cultural Heritage;
- Landscape;
- Air & Climate; and
- Material Assets.

Under each heading, the assessment methodology is first outlined followed by a description of the defined Study Area or 'receiving environment' and Scheme Area. Finally, a summary of the key constraints and implications for the proposed Scheme are noted.

In addition to the assessments carried out, a public consultation process was undertaken to present the Study Area and Scheme Area to the public and consultees and invite feedback regarding the proposed Scheme. Information gathered during this public consultation process has been assessed and included in this report.

This report is the first stage in the Environmental Assessment process, which will be ongoing throughout the planning and design stages of the project. Information gathered or alternative proposals arising from public consultation, meetings with consultees/ stakeholders and written representations will be considered on the grounds of engineering feasibility, environmental viability, existing constraints and economics.

1 INTRODUCTION

1.1 OVERVIEW OF SCHEME

Ryan Hanley Ltd. was appointed by Leitrim County Council (LCC) in January 2021 to undertake a Flood Relief Scheme (FRS) for Leitrim Village, County Leitrim. Notable flooding took place in Leitrim Village and environs during events in October 1954, November 1968, February 1990, December/January 1999/2000, February 2002, January 2005, December 2006, November 2009, December/January 2015 and February 2020. Historically, the worst flood event in the Upper River Shannon, including at Leitrim Village, occurred in November 2009..

In 2012, the National Preliminary Flood Risk Assessment (PFRA) project reports and maps were produced, which provided the initial estimation of flood extents for Leitrim Village. This highlighted Leitrim Village as an Area for Further Assessment (AFA) and as a Community at Risk (CAR) area for the Catchment Flood Risk Assessment Management (CFRAM) study. Leitrim Village AFA was included in Unit of Management (UoM) 25/26 Shannon Upper and Lower River Basin in the Shannon CFRAM study. Jacobs Engineering Group completed the works for the CFRAM study for Leitrim Village.

The purpose of the Leitrim Village FRS is to identify the most technically, socially, economically and environmentally acceptable solution to the flood risk in Leitrim Village and environs.

1.2 STUDY AREA & SCHEME AREAS

Leitrim Village in County Leitrim is located 400m northeast of the River Shannon and approximately 5km northeast of Carrick on Shannon. Leitrim Village is an important tourist base for surrounding attractions and amenities with a significant proportion of employment generated from tourism and associated services industries. The main roads serving Leitrim Village are the R280 linking Bundoran in County Donegal with Carrick on Shannon in County Leitrim and the R284 linking Sligo to Leitrim Village. The village has a population of approximately 594 (CSO, 2016).

The Ballinamore and Ballyconnell Canal flows through Leitrim Village, which is a canalised tributary watercourse that flows into the River Shannon approximately 400m to the southwest of the village and has a catchment area of approximately 31km². There are a number of other local minor tributaries that flow into the Canal at Leitrim Village, including the Tawnycurry, Kilmaghera and Carrickevy. A small drain in the vicinity of the Keadue Road also flows into the River Shannon. The upstream River Shannon catchment comprises two sub-catchments. The first being a steeper northerly sub-catchment that includes Lough Allen and extends northwards close to the border with County Fermanagh. The other main sub-catchment is the Boyle River, which includes many lakes and is generally of a gentler topography.

The River Shannon is a significant ecological resource with important fisheries and high biodiversity value. There are no hydrologically connected European Sites (Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) within the Study Area. The closest designated sites linked to the Study Area are the Cuilcagh-Anierin Uplands SAC and Boleybrack Mt SAC to the north and the Lough Arrow SPA to the south. The Lough Drumharlow proposed Natural Heritage Area (pNHA) is located 850m west of the Scheme Area. Features of local and regional importance within the general Scheme Area and environs include the Shannon itself; with riparian reedbed, marsh, wetland grassland and wet woodland. The other watercourses which drain into the village (e.g. Kilmaghera, Ballinamore and Ballyconnell Canal, Tawnycurry, Carrickevy) with locally important habitats of hedgerows, treelines and grasslands. The village has a number of historical features and monuments representing a rich historical heritage.

The Study Area covers approximately 831.3km² and the Scheme Area covers approximately 0.71km².

The Study Area, shown in Figure 1-1, is the area that contains the:

- Lengths of river channel / watercourse that have an influence on the area intended to benefit from and be protected by any feasible Scheme;
- Catchment areas draining to those river channels / watercourses; and
- Areas that require environmental assessments as part of the development of any such Scheme – SACs, SPAs, NHAs and pNHAs connected hydrologically to the Scheme Area (Zone of Influence).

The Scheme Area, shown in Figure 1-2, is defined as:

- Areas within which physical works are proposed to be constructed, accessed and maintained as part of any feasible Scheme;
- Areas that are intended to benefit from, and be protected by, any feasible Scheme; and
- Lengths of river channel upstream and downstream that are likely to be impacted hydraulically/ environmentally by any feasible Scheme.
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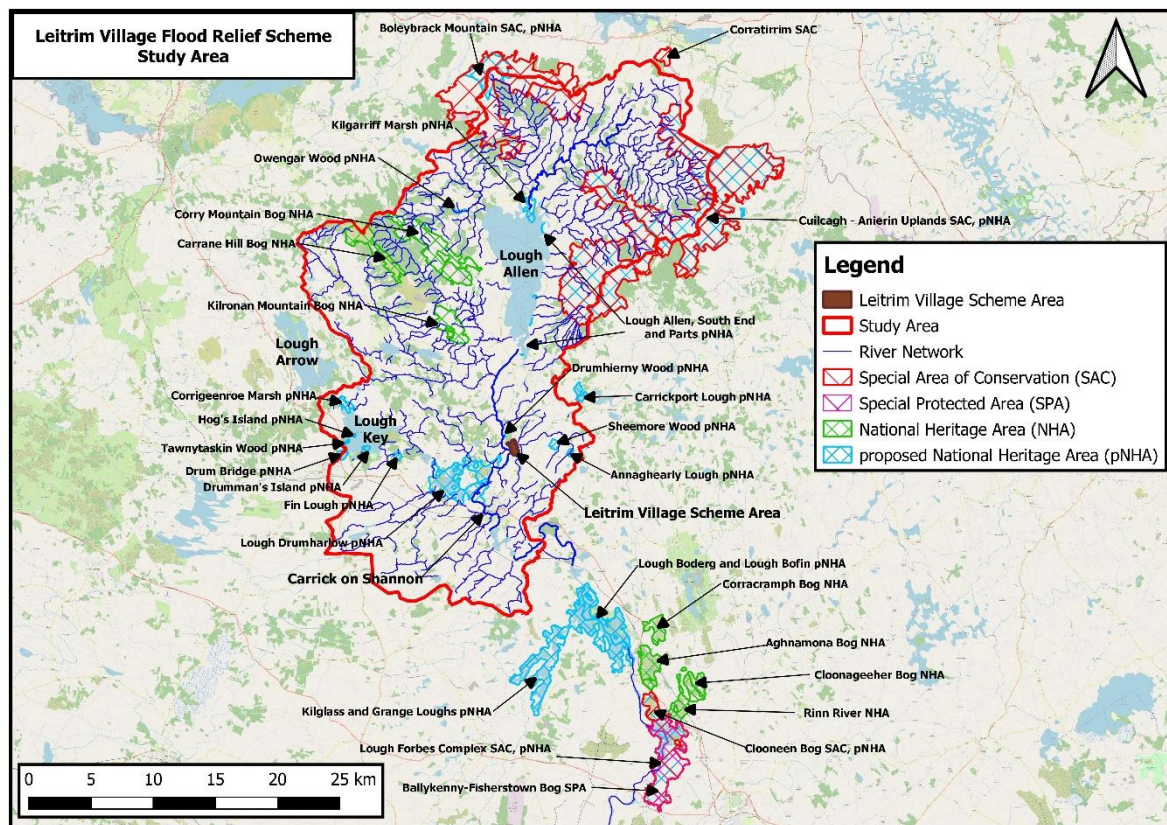


Figure 1-1: Leitrim Village FRS Study Area

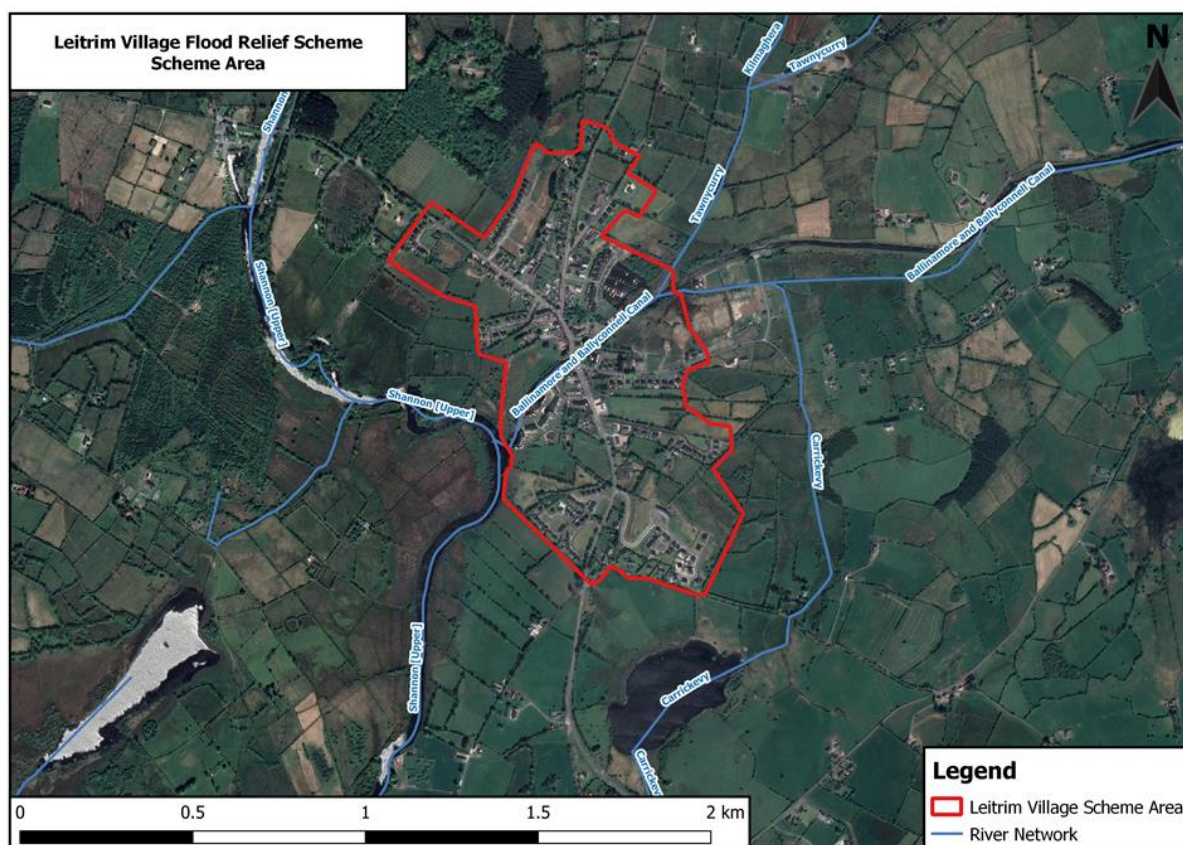


Figure 1-2: Leitrim Village FRS Scheme Area

1.3 STAGE OF PROCESS

The Environmental Constraints Study is the first stage in the Environmental Impact Assessment for the Leitrim Village FRS and is being advanced in parallel with the Engineering Study for the Leitrim Village FRS. The project will be delivered in the following stages:

Table 1-1: Stages in the Planning of the FRS

Stage		Environmental Impact Assessment	Engineering Study
Stage I	Part 1	Environmental Constraints Study Baseline Environmental Surveys Invasive Species Management Plan	Review of Existing Data Hydrology Study/ Hydraulic Modelling/ Flood Mapping Additional Surveys and Site Investigation
	Part 2	Screening for Appropriate Assessment Screening for EIAR	Assessment of Flood Risk Management Options Selection of Preferred Option Identify and record all landowners that may be affected by the FRS
	Part 3	Appropriate Assessment and EIAR (if required) Preliminary CEMP	Preliminary Buildability and Operation/ Maintenance Report
Stage II		Planning/ Development Consent Process	
Stage III		Environmental Impact Statement Developed CEMP	Detailed Design Developed Buildability and Operation/ Maintenance Report Tender Drawings, Specifications, Bills of Quantities Construction Contract Documents Tender Reports
Stage IV		Construction Supervision and Project Management Services	

1.4 SCOPE OF STUDY

Information has been gathered under the relevant headings prescribed in the Environmental Protection Agency (EPA) guidelines “Advice Notes on Current Practice in the Preparation of Environmental Impact Statements, 2003” and “Guidelines on the Information to be Contained in Environmental Impact Assessment Reports” (Draft, August 2017).

1.5 CONSULTATION

Consultation has taken place with statutory and non-statutory consultees as part of the initial scoping process. Comments, observations and information were sought from the following list of consultees:

Table 1-2: Statutory EIA Consultees

STATUTORY EIA CONSULTEES	
An Bord Pleanála	Department of Rural and Community Development
An Comhairle Ealaíon (The Arts Council)	Environmental Protection Agency (EPA)
An Taisce - The National Trust for Ireland	Failte Ireland
Commission for Electricity Regulation	Health and Safety Authority
Department of Agriculture, Food and the Marine	Transport Infrastructure Ireland (TII)
Department of Housing, Local Government & Heritage	Leitrim County Council (LCC)
Department of Communications, Energy & Natural Resources	Office of Public Works (OPW)
Department of Environment, Climate and Communications	The Heritage Council
Department of Justice	
Department of Enterprise, Trade and Employment	

Table 1-3: Other Consultees

OTHER CONSULTEES	
Badgerwatch	Tree Council of Ireland
Bat Conservation Ireland	Waterways Ireland
BirdWatch Ireland	Carrick on Shannon Flood Action Group Committee (Brian Kenny)
Bus Éireann	Councillor Finola Armstrong-McGuire
Chambers Ireland	Councillor Enda Stenson
Coarse Angling Federation of Ireland	Councillor Des Guckian
Coillte	Councillor Paddy Farrell
Eir	Councillor Seán McGowan
Electricity Supply Board (ESB)	Councillor Thomas Mulligan
Environmental Pillar & Irish Environment Network	Earthwatch (Friends of the Earth Ireland)
Federation of Irish Salmon and Sea Trout Anglers	Enet
Forfás	Environmental Sciences Association of Ireland
Geological Survey of Ireland (GSI)	Irish Creamery Milk Suppliers Association
Inland Fisheries Ireland (IFI)	The International Association of Hydrogeologists (IAH) Irish Group
Inland Waterways Association of Ireland	Irish Heritage Trust
Irish Angling Development Alliance	Irish Planning Institute

Irish Farmers Association	National Association of Regional Game Councils
Irish Natural Forestry Foundation	National Federation of Group Water Schemes
Irish Peatland Conservation Council	National Monuments Service
Irish Small and Medium Enterprises Association (ISME)	Development Applications Unit (DAU)
Irish Water (IW)	Salmon Growers Association
Irish Wildlife Trust	The Mining Heritage Trust of Ireland
Landscape Alliance Ireland	Tourism Ireland
Leitrim Farm Relief Group	Voice of Irish Concern for the Environment
Met Eireann	Shannon River Basin District Office
National Anglers Representative Association	Shannon Flood Risk State Agency Co-ordination Working Group
National Organisation of Regional Game Councils	Leitrim Observer Newspaper
National Parks and Wildlife Service (NPWS)	Local Authority Waters Programme
Native Woodland Trust	The National Water Forum
Recreational Angling Ireland	Water Policy Advisory Committee
Royal Society of Antiquaries of Ireland	Climate Action Regional Office
Sustainable Energy Authority of Ireland (SEAI)	Save Leitrim
Sustainable Water Network (SWAN)	Leitrim Village Tidy Towns-Leitrim Village Development
Teagasc	Keadue Road Residents Association

A copy of the letter and attachments issued to Consultees is included in Appendix A. Copies of any written correspondence received are also provided in Appendix A.

Relevant observations, comments and information received from the consultation process are provided in Appendix A.

2 SCHEME CONTEXT AND BACKGROUND

2.1 HISTORY OF FLOODING

There have been ten recorded flood events in Leitrim Village with the historical worst flood in the Upper River Shannon occurring in November 2009. The main events that occurred in Leitrim Village are as follows:

- November 2009;
- December/January 2015; and
- February 2020.

Notable past flooding events in the River Shannon catchment are presented below:

- January 1925
- October 1954;
- November 1968;
- February 1990;
- December/Jan 1999/2000;
- February 2002;
- January 2005; and
- December 2006.

2.1.1 January 1925

There is little available information on the January 1925 flood event. Floodinfo.ie offers no information specific to Leitrim Village for this event. The CFRAM Hydrology Report notes that flooding occurred.

2.1.2 October 1954

There is little available information on the October 1954 flood event. Floodinfo.ie offers no information specific to Leitrim Village for this event. The CFRAM Hydrology Report notes that flooding occurred.

2.1.3 November 1968

There is little available information on the November 1968 flood event. Floodinfo.ie offers no information specific to Leitrim Village for this event. The CFRAM Hydrology Report notes that flooding occurred.

2.1.4 February 1990

Extensive flooding throughout the Shannon Catchment. There is little available information on the February 1990 flood event. Floodinfo.ie offers no information specific to Leitrim Village for this event. The CFRAM Hydrology Report notes that flooding occurred.

2.1.5 December/Jan 1999/2000

Major flooding to roads leading to and from Carrick on Shannon, including N4 and N5 National roads. This event produced flood peaks over the 24th to 26th December throughout the whole of the Shannon catchment, including Leitrim Village. Heavy rainfall occurred from late November to mid-December, which resulted in widespread flooding.

2.1.6 February 2002

There is little available information on the February 2002 flood event. Floodinfo.ie offers no information specific to Leitrim Village for this event. The CFRAM Hydrology Report notes that flooding occurred.

2.1.7 January 2005

There is little available information on the January 2005 flood event. Floodinfo.ie offers no information specific to Leitrim Village for this event. The CFRAM Hydrology Report notes that flooding occurred.

2.1.8 December 2006

There is little available information on the December 2006 flood event. Floodinfo.ie offers no information specific to Leitrim Village for this event. The CFRAM Hydrology Report notes that flooding occurred.

2.1.9 November 2009

This is widely understood to have been the worst flood event since major flooding in 1954 and 1925; and may possibly have exceeded these events in terms of overall impact. Like most winter floods on the Shannon, the peak developed over a period of weeks following the onset of wet weather in October and affected more parts of the river system than other major floods – ie. December 2006-January 2007 flood event.

Floodinfo.ie offers no information specific to Leitrim Village for this event. The CFRAM Hydrology Report notes that flooding occurred.

2.1.10 December 2015

Storm Desmond and Storm Frank occurred in December 2015 with associated heavy rainfall. Flooding occurred due to overtopping of riverbanks and backing-up of drainage including pipes, culverts and manholes.

Floodinfo.ie offers no information specific to Leitrim Village for this event. Photographs of flooding during this event were recorded by LCC.

2.1.11 February/March 2020

Floodinfo.ie offers no information specific to Leitrim Village for this event. There are videos and photographs of flooded farmland during this event.

2.2 FUTURE CHANGES

The risk of flooding may increase with time. Future changes, which have the potential to affect the risk of flooding include:

- Climate Change potentially resulting in higher rainfall;
- Geomorphological processes, such as (i) sedimentation transport which affects the area of conveyance of the river channel and (ii) erosion.
- Development within the catchment and upstream of Leitrim Village, which depending on the type of development, may have the potential to adversely affect the response of the catchment to rainfall;
- Changes in land use, including forestation and land drainage.

2.3 POTENTIAL FLOOD RISK MANAGEMENT MEASURES

An Engineering Study is being advanced in parallel with the Environmental Assessment of the proposed FRS. The Constraints identified in this report will inform the selection of FRM measures as part of the Engineering Study.

The range of engineering measures typically considered for FRSs include, but are not limited to, the following:

- a) Do Nothing (i.e., implement no new flood alleviation measures);
- b) Non-Structural Measures (e.g. flood warning system or individual property protection);
- c) Relocation of Properties and/or infrastructure;
- d) Reconstruction of Properties and/or infrastructure to a higher level;
- e) Flow Diversion (e.g. stream diversion or flood flow bypass channel);
- f) Flow Reduction (e.g. upstream catchment management or flood storage);
- g) Flood Containment through Construction of Flood Defences;
- h) Increase Conveyance of Channel (upstream and/or through and/or downstream of the town);
- i) Sediment Deposition and Possible Sediment Traps;
- j) Pump storm waters from behind flood defences; and
- k) Measures Specific to the Study Location.

It is not possible at this stage to define the number of Scheme options that will require study. However, a typical Engineering Study of this nature will identify between three and five viable Scheme options including the do nothing and the do minimum scenarios.

2.4 TOPOGRAPHY AND MAPPING

The following section presents information on the topography of the FRS Study Area and the mapping used in the preparation of this Constraints Study Report.

2.4.1 Topography

The Study Area contains Leitrim Village, which generally comprises urban/developed land, residential and commercial properties, with some areas of natural vegetation and lands principally occupied by agriculture, woodland and marsh lands.

The main flood risk in Leitrim Village is associated with the River Shannon, which has a number of minor tributaries at Leitrim Village including the Carrickey watercourse, Tawnycurry watercourse, Ballinamore and Ballyconnell Canal and the Kilmaghera watercourse. The Study Area extends upstream and downstream of Leitrim Village to Jamestown and includes areas that are hydraulically connected to the Study Area (see Figure 3-2).

2.4.2 Mapping

The following mapping was used in order to prepare this Constraints Study Report:

- Ordnance Survey Discovery Series Mapping at 1:50,000 scale;
- Old Raster 6" Mapping;
- Old Raster 25" Mapping;
- 1:10,560 OS Mapping;
- Aerial photography of the Study and Scheme Areas; and
- Any other relevant maps and previous surveys.

3 ENVIRONMENTAL CONSTRAINTS

The purpose of this section of the report is to describe the key environmental issues relating to the Leitrim Village FRS, which may be impacted upon by potentially viable FRS measures and/or which may impose constraints on the viability and/or design of these measures.

3.1 METHODOLOGY AND GUIDELINES

This Constraints Study Report is the first stage in the Environmental Impact Assessment for the Leitrim Village FRS and is being carried out in accordance with the Environmental Protection Agency's "Guidelines on the Information to be Contained in Environmental Impact Assessment Reports" (Draft, August 2017). Information has been gathered under relevant headings prescribed in these EPA Guidelines and legislation for what is to be contained in an EIAR – i.e. Schedule 6 of the Planning and Development Regulations.

The following sections outline the findings of the Constraints Study and identify potential environmental constraints associated with the proposed FRS.

3.2 POPULATION AND HUMAN HEALTH

This section outlines the socio-economic features of the Study Area, with emphasis on the Scheme Area, that may impact the selection of flood alleviation measures for the proposed FRS.

3.2.1 Settlements and Planning Policy

The following sources of information were utilised in the preparation of this section: (These have been determined as the most up to date documents at time of writing) :

- Leitrim County Development Plan (2015-2021);
- Census of Ireland 2016 (www.cso.ie);
- Leitrim County Council Website;
- Shannon River Basin Management Plan;
- National Planning Framework; and
- Regional Spatial Economic Strategy (2020 – 2032) [Northern and Western Regional Assembly].

The major settlement within the Scheme Area is Leitrim Village, which is a small village on the River Shannon near the border with County Roscommon. The village acts as a tourism base for surrounding attractions including the Lough Key Forest Park, the Shannon-Erne Blueway, Arigna Mining Experience, Lough Rynn and the nearby County Town of Carrick on Shannon.

3.2.2 Population and Housing

County Leitrim has the lowest population of the six Border Region counties. Whilst the region has experienced population decline over most of the nineteenth and twentieth century, the County population has increased in recent years. In the period 2011-2016 the Leitrim Village Electoral area went from 1,123 to 1,224 which represents a steady recorded increase.

The Leitrim County Development Plan states that the nearby town of Carrick on Shannon is identified as a main driver for economic development in the county and the council will also seek to ensure to reinforce commercial viability and attractiveness of all the other towns and villages in the county.

The Leitrim County Development Plan details the following policies in relation to population and housing, relevant to Leitrim Village:

Policy 34 *It is the policy of the Council to enable every household to have an available and affordable dwelling of good quality, suited to its needs, in a good environment and, as far as possible, at the tenure of its choice;*

Policy 36 *It is the Council's policy to encourage the distribution of social and affordable dwellings so as to meet the locational preferences of housing applicants, build on and strengthen existing social networks and provide for the growth of towns and villages within the county;*

Policy 37 *The Council will continue to work with the Voluntary Housing Sector;*

Policy 38 *It is the Council's Policy to assist in the provision of houses or sites on lands acquired as part of the overall housing programme or under the provision of the Planning & Development Act 2000-2014, or as amended;*

Policy 40 *It is the Council's Policy to examine and bring under review the adequacy of lands zoned for residential purposes in the context of meeting the demands for housing generally, including social and affordable housing.*

3.2.3 Industry and Business

In 2016, the population of Leitrim Village was 594 (CSO, 2016). Leitrim Village is an important tourist base for the surrounding attractions such as the Arigna Mining Experience, Lough Rynn, Lough Key Forest Park, the Shannon-Erne Blueway and the nearby County Town of Carrick on Shannon. Therefore, a significant proportion of employment is generated from the tourist and services industry.

LCC have the following policies to ensure the continued success of the town:

Policy 65 *It is the Council's policy to actively promote and develop Enterprise and Employment throughout the County. The Council will support the development of transport, energy, telecommunications, water and drainage infrastructure to facilitate such development;*

Objective 45 *It is an objective of the Council to actively support all efforts to have further Government Offices decentralised to County Leitrim and to seek to maximise the amount of Government Services to be delivered from the County;*

Objective 46 *It is an objective of the Council to actively engage with the Department of Environment, Community and Local Government and other Government Departments, for the expedient delivery of infrastructural projects; and*

Objective 48 *It is an objective of the Council to encourage the expansion of service sector employment and to recognise the opportunities it presents to the retention of population in both urban and rural areas".*

3.2.4 Tourism

Tourism is one of the major contributors to the national economy and is a significant source of full-time and seasonal employment. Covid-19 has had a negative effect on tourism in Ireland in 2020 and 2021.

Expenditure by tourists visiting Ireland (excluding receipts paid to Irish carriers by foreign visitors) was estimated to be worth €5.6 billion in 2018, which represents growth of 6% on 2017. Combining spending by international tourists with the money spent by Irish residents taking trips here and receipts paid to Irish carriers by foreign visitors; total tourism expenditure in 2018 was estimated to be €9.4 billion.

Table 3-1 provides *Faillte Ireland* figures indicating the types of activities that overseas tourists engaged in together with a breakdown of the number of participants that undertook each activity. From these figures, it can be seen that Hiking/Cross-country walking visits form the majority of all activities enjoyed in Ireland.

Table 3-1: Activities undertaken by overseas visitors whilst visiting Ireland

Holiday - Activities Engaged in (Overseas Participants (000s))	2018	2016	2015	2014	2013	2012
Hiking/cross country walking	2,679	2,077	1,674	1,193	742	578
Cycling	504	399	355	286	241	171
Golf	221	193	198	172	204	118
Angling	146	131	163	157	127	149
Equestrian	126	98	75	79	99	66

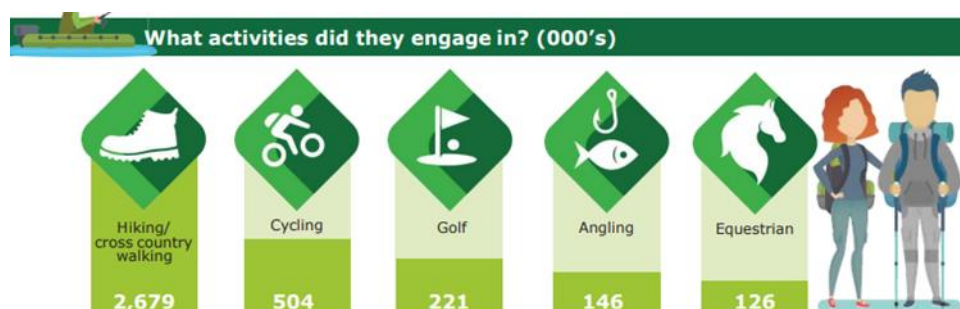


Figure 3-1: Activities engaged within Ireland

Ireland is divided into eight tourism regions. Leitrim Village is in the North West which is considered to have rugged scenery; catering for walking & hiking on coastlines of lakes and national parks.

According to Leitrim's tourism strategy (A growth strategy for tourism in Leitrim 2015-2021), Leitrim has a yearly average of 144,000 tourists who generate €34m of tourism revenue. The figures are divided into:

- Overseas – 39,000 with €14m;
- Domestic – 70,000 with €13.5m; and
- Northern Ireland – 35,000 with €6.7m.

3.2.5 Local Amenities and Attractions

Leitrim Village has several surrounding attractions including the Lough Key Forest Park, the Shannon-Erne Blueway, Arigna Mining Experience, Lough Rynn and the nearby County Town of Carrick on Shannon. The village has a number of facilities including a nearby golf club, GAA grounds, church, quay facilities, berthing and fishing areas, shooting and archery centre, pubs and restaurants. The Ballinamore and Ballyconnell Canal, which runs through Leitrim village and flows into the River Shannon and is used to access Leitrim Marina, Leitrim Quay and moorings at the Leitrim Village waterfront.

3.2.6 Community Facilities

The following sections give an overview of some of the main community facilities for Leitrim Village.

3.2.6.1 Education

There is one primary school in Leitrim Village, the Leitrim Village National School (mixed). One full pre-school day care facility operates in the village. The nearest secondary school is located in Carrick on Shannon.

3.2.6.2 Sports and Recreation

The Leitrim Gaels football club is located in Leitrim Village.

An large number of clubs and recreational facilities including a rowing club, tennis club, GAA and football clubs, athletics and several smaller clubs and organisations are available in nearby Carrick on Shannon.

3.2.7 Key Constraints

- In designing the proposed Scheme, the value (both cultural and economic) of any buildings (residential, retail, etc.), which are likely to be adversely affected by the Scheme should be taken into account. In addition, adverse impacts on buildings or structures of historical interest should be minimised or avoided where possible;
- The design of the Scheme should ensure that the public amenity value of the Scheme Area is not diminished. Impacts on public amenity areas and tourism should be considered and avoided where practicable, minimised or mitigated as may be necessary;
- Impacts on especially sensitive receptors e.g. schools, crèches, nursing homes; should be considered in the flood risk assessment;
- The proposed scheme should take consideration of the proposed zoning objectives set out in the Leitrim County Development Plan; and
- The proposed scheme should take consideration of impacts on the Ballinamore and Ballyconnell Canal as a tourist attraction and access route to Leitrim Marina, Leitrim Quay and moorings at the Leitrim Village waterfront from the River Shannon.

3.3 ECOLOGY

This Constraints Study Report has been carried out to provide decision makers with clear and concise information on the international, national, regional and local issues that must be considered when planning and designing the Leitrim Village FRS. It will also feed into scoping of the project by identifying potential significant effects.

This section provides the main ecological issues and constraints that could significantly affect the design of the Scheme, delay progress or influence the costs.

The findings of this section will feed into further stages of the proposed scheme such as Environmental Impact Assessment and Screening for Appropriate Assessment.

3.3.1 Methodology

The methodology followed in completing this section of the report consists of a desktop study, consultation with governmental and non-governmental bodies and a site visit with walkover survey of the Scheme Area.

The following sources were also used in the compilation of this section of the constraints report:

- Ordnance Survey Discovery Series Mapping at 1:50,000 scale;
- Old Raster 6" Mapping;
- Old Raster 25" Mapping;
- 1:10,560 OS Maps of the Study Area;
- Aerial photography of the Study Area;
- NPWS site synopses and database of information on designated sites and records of protected species;
- New Atlas of the British & Irish Flora (Preston et al., 2002);
- The Atlas of Breeding Birds in Britain and Ireland' (Sharrock, 1976), 'The New Atlas of Breeding Birds in Britain and Ireland: 1988-1991' (Gibbons et al., 1993) and 'The Atlas of Wintering Birds in Britain and Ireland' (Lack, 1986);
- Biodiversity Ireland Database www.biodiversityireland.ie;
- The Environmental Protection Agency website www.epa.ie/rivermap/data;
- The Water Framework Directive website www.WFD.ie;
- Map of Irish Wetlands <https://www.wetlandssurveysireland.com/wetlands/map-of-irish-wetlands--/map-of-irish-wetlands---map/index.html>;
- NPWS Publications (Wildlife Manuals, Red Lists, other reports) www.npws.ie/publications;
- IWEBS Data www.birdwatchireland.ie;
- Any relevant previous surveys; and
- NPWS data request for 10km square G90.

3.3.2 Desktop Study

The following outlines the results of the desktop study carried out for Leitrim Village FRS.

3.3.2.1 Designated Areas

With the introduction of the EU Habitats Directive (92/43/EEC) which was transposed into Irish law as the Natural Habitats Regulations, 1997, the European Union formally recognised the significance of protecting rare and endangered species of flora and fauna, and also, more importantly, their habitats. Member states were directed to provide lists of sites for designation.

Natural Heritage Areas

Natural Heritage Areas (NHAs) are heritage sites that were designated for the protection of flora, fauna, habitats and geological sites of national importance. Management of NHAs is guided by planning policy and the Wildlife (Amendment) Act 2000. It was from these NHAs that the most important sites were selected for international designation as Special Areas of Conservation (SACs) and Special Protection Areas (SPAs).

SACs and SPAs

There are two types of EU site designation, the Special SAC and the Special SPA. SACs are designated for the conservation of flora, fauna and habitats of European importance and SPAs are designated for the conservation of bird species and habitats of European importance. These sites form part of “Natura 2000” a network of protected areas throughout the European Union.

Annex I of the Habitats Directive lists certain habitats that must be given protection. Certain habitats are deemed ‘priority’ and have greater protection. Irish habitats include raised bogs, active blanket bogs, turloughs, heaths, lakes and rivers. Annex II of the Directive lists species whose habitats must be protected and includes Lesser Horseshoe Bat, Otter, Salmon and White-clawed Crayfish.

The Birds Directive aims to protect all wild bird species naturally occurring within the European Union. Emphasis is placed on the protection of habitats for migratory and endangered species. Endangered species within the European Union are listed under Annex I of the Birds Directive. Member states must designate SPAs for the survival of Annex I species and for all migratory birds.

3.3.2.2 Designated Sites within the Study Area

The NPWS publish synopses of the information regarding areas designated for conservation in the Republic of Ireland.

European (Natura 2000) sites

There are 5 European sites (SACs or SPAs) within the Study Area (Table 3-2 and Figure 3-2. The Study Area has been extended downstream, as far as and including Lough Forbes, to include the SACs and SPAs that are hydrologically connected to the River Shannon.

Table 3-2: SACs and SPAs surrounding and/or connected to Study Area.

SPA/SAC	Distance from Leitrim Village
Cuilcagh - Anierin Uplands SAC (000584)	10.5km northeast
Clooneen Bog SAC (002348)	21.5km southeast
Boleybrack Mountain SAC (002032)	22.5km north
Lough Forbes Complex SAC (001818)	24km southeast
Ballykenny-Fisherstown Bog SPA (004101)	24.km southeast

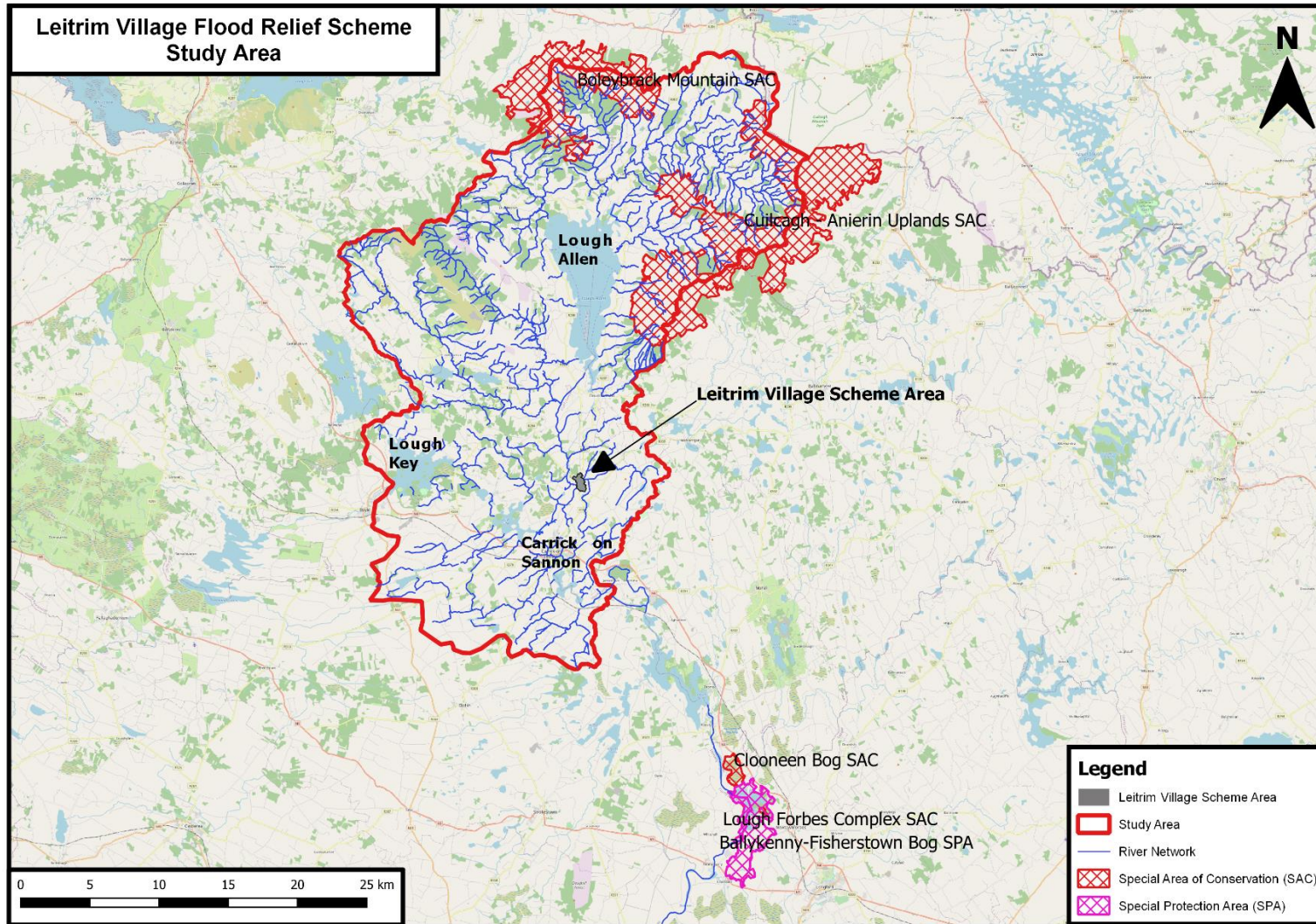


Figure 3-2: Overview of the Leitrim Village FRS Study Area (including downstream connected areas)

The Scheme Area is not directly adjacent to any European site and is at least 10km from the nearest SAC or SPA. The likelihood of interaction and significant adverse effects on these European sites and their conservation objectives will be assessed through the Screening for Appropriate Assessment and Natura Impact Statement (where necessary) processes. Each SAC and its qualifying interests are listed in Appendix G of this report.

Other Designated Sites

Where a nationally designated site overlaps with the boundary of a European designated site, the potential for impacts is considered under the European designation. Designated and proposed NHAs (where they are not SACs or SPAs) within the Study Area and including those directly connected via the River Shannon, as far as and including, Lough Forbes are listed below (8 NHAs and 15 pNHAs) with their main conservation interest (based on NPWS site synopses and where unavailable, aerial imagery).

Table 3-3: NHAs within Study Area

NHA	Site Code	Conservation Interest
Corry Mountain Bog NHA	002321	Peatlands
Kilronan Mountain Bog NHA	000617	Peatlands
Carrane Hill Bog NHA	002415	Peatlands
Cashel Bog (Leitrim NHA)	001405	Peatlands
Corracramph Bog NHA	001420	Peatlands
Aghnamona Bog NHA	000422	Peatlands
Cloonageeher Bog NHA	001423	Peatlands
Rinn River NHA	000691	Peatlands

Table 3-4: pNHAs within Study Area

pNHA	Site Code	Conservation Interest
Owengar Wood	001419	-
Kilgariff Marsh	000426	-
Lough Allen, South End and Parts	000427	-
Corrigeenroe Marsh	000596	-
Sheemore Wood	001421	-
Hog's Island (Lough Key)	001638	-
Drumhierny Wood	001412	-
Tawnytaskin Wood (Lough Key)	001651	-
Drumman's Island (Lough Key)	001633	-
Drum Bridge (Lough Key)	001631	-
Fin Lough (Roscommon)	001636	-
Annaghealy Lough	001402	-
Lough Drumharlow	001643	-
Lough Boderg and Lough Bofin	001642	-
Kilglass and Grand Loughs	001642	-

Non-Designated Features of Ecological Interest

Within the Study Area all semi-natural habitats are likely to be of some ecological value. The network of designated sites includes semi-natural habitats (e.g. turloughs, wetlands, grassland, fen, other peatlands and woodland habitats), which may be of high biodiversity value. Linear habitats such as old stone walls, treelines, hedgerows and watercourses are also of biodiversity value and where they connect small areas of semi-natural habitat, their value is enhanced further. These habitats are of importance in themselves and as foraging, shelter, rest and nesting sites for birds and mammals. Open grassland habitats which can include improved pasture may be important for wintering waterbirds including swans and geese which use these habitats for feeding. This study includes a range of habitats which are likely to be of local and regional biodiversity value.

The following data on habitats and species outside of the designated sites was reviewed:

NPWS Data

Data provided by NPWS for the relevant 10km square (G90), shown in Figure 3-3 - derived from grassland, woodland, limestone pavement and degraded raised bog surveys - shows the following habitats to present outside of and within designated sites:

- Wet grassland (including Annex habitat 6410 – Molinia meadows);
- Improved agricultural grassland;
- Swamps; and
- Dry calcareous grassland.

Rare and Protected species data provided by NPWS for the relevant 10km square (G90), shown in Figure 3-3 deriving from various surveys and Conservation Ranger records, shows a number of species listed for this square. Records include waterbirds and mammals, the following of which are of note:

- Papilose Bog – Moss;
- Red Bog-Moss;
- Otter;
- Badger;
- Frog;
- Curlew;
- Greenland white-fronted goose;
- Whooper Swan;
- Lapwing; and
- Freshwater Crayfish.

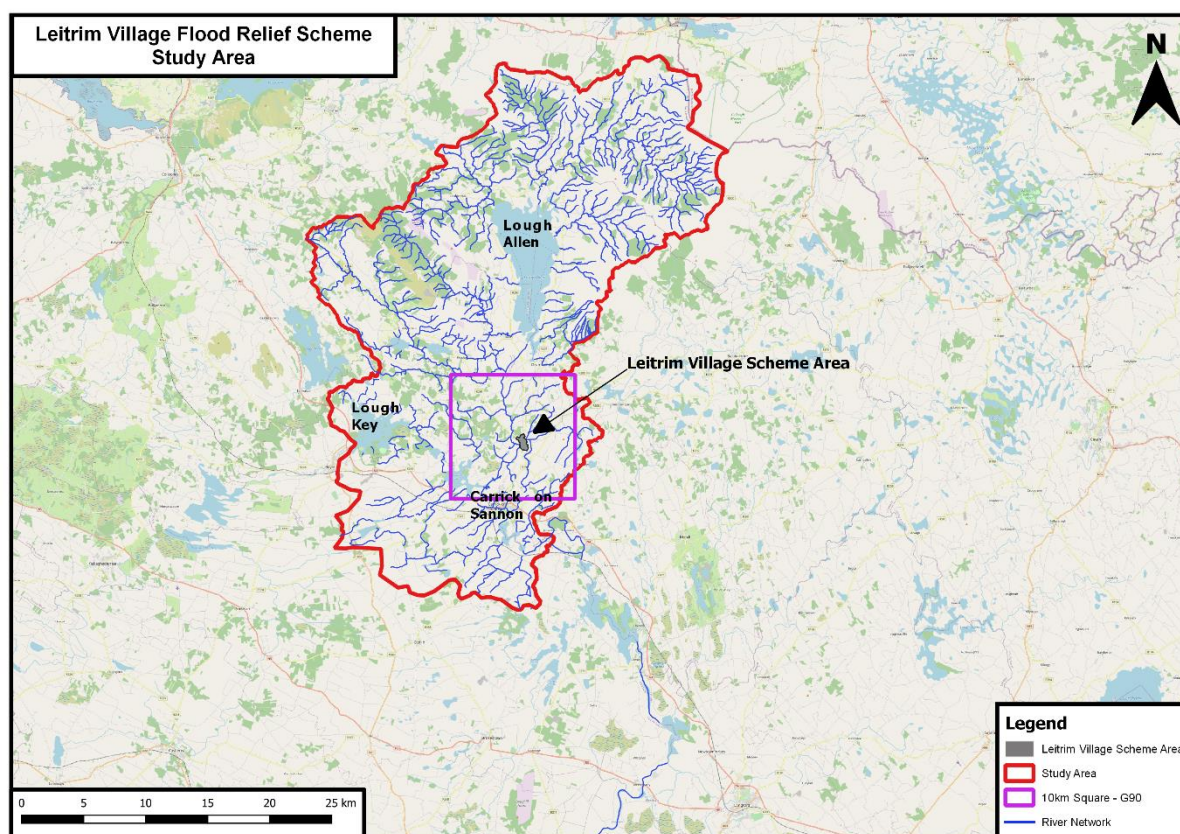


Figure 3-3: 10km Grid Square (NPWS: G90) for Leitrim Village FRS Study Area

I-WeBS Data

A number of wetlands sites are counted as part of the annual Irish Wetland Bird Survey (I-WeBS). Sites include Lough Allen, Lough Key, Lough Corry, Lough Eiden, Lough Bofin, Lough Forbes and a great number of smaller wetlands. These sites are important for wintering waterbirds (migratory ducks, geese, swans & waders) and are likely to be important for a range of breeding waterbirds (duck & grebes). The presence of breeding waders on associated wet grassland, the numbers of which have declined dramatically all over Ireland, is also possible. Breeding gulls and terns may also be present at other lakes with suitable habitat.

3.3.3 The Scheme Area

Detailed data was collated during the desktop study review process for the Scheme Area. Walkover surveys of this area were also completed.

The National Biodiversity Data was checked for records of species to find which rare or unusual species have been recorded within the Scheme Area (using the G90 10km Square).

3.3.3.1 Flora

Yew (*Taxus baccata*) a native conifer which has a limited distribution in Ireland is recorded for the 10km Square. A considerable number of ferns, flowering plants, liverworts and mosses are listed for the G90 10km Square. Records are from the Botanical Survey of Britain and Ireland tetrad data and from Bryophytes of Ireland. A number of mosses and liverworts are listed as threatened but classified as Least Concern. No Flora Protection Order (2015) species were reported within the Scheme Area.

3.3.3.2 Insects

A considerable number of insects are listed for the G90 10km grid square. They include harvestmen, butterflies, caddis fly, dragonfly, damselfly, bees, shield bugs. Of note is the presence of several species of bee and of dragonfly; and the record of Marsh Fritillary butterfly, an Annex II species of the Habitats Directive and listed as a Threatened species of Vulnerable status in Ireland (Regan *et al.* 2010) [Ref1].

3.3.3.3 Molluscs

Several mollusc species are listed for the G90 10km Square included the Common Whorl Snail (*Vertigo pygmaea*), a Threatened species with Near Threatened Status (Byrne *et al.*, 2009) [Ref2].

3.3.3.4 Other

Common Frog is listed as a species of Least Concern (King *et al.*, 2010). It is protected under the Wildlife and Wildlife (Amendment Act) and is an Annex V species under the Habitats Directive. Pine Marten (*Martes martes*) is listed and is protected under the Wildlife and Wildlife (Amendment Act) and is an Annex V species under the Habitats Directive. The European Otter (*Lutra lutra*) is listed and is protected under the Wildlife Act 1976 and the Wildlife Amendment Act 2000 and is an Annex II species under the Habitats Directive.

3.3.3.5 Bird Atlases

The following publications were consulted for information regarding the distribution of birds in Ireland:

- 'The Atlas of Breeding Birds in Britain and Ireland' Sharrock, 1976;
- 'The New Atlas of Breeding Birds in Britain and Ireland: 1988-1991' Gibbons *et al.*, 1993;
- 'The Atlas of Wintering Birds in Britain and Ireland' Lack, 1986; and
- 'Bird Atlas 2007-2011' Balmer *et al.*, 2013.

Data for breeding and wintering birds in one 10 km by 10 km square (G90), which includes the Scheme Area, was obtained. Table 3-5 shows those species recorded in the Breeding Birds Atlases and indicates where they are protected under Annex I of the EU Birds Directive or are a Red Listed Bird of Conservation Concern in Ireland (BoCCI) (Colhoun and Cummins, 2013). Birds listed under Annex I are offered special protection by the EU Birds Directive. Those listed on the BoCCI Red List meet one or more of the following criteria:

- Their breeding population or range has declined by more than 50% in the last 25 years;
- Their breeding population has undergone significant decline since 1900; and
- They are of global conservation concern.

Table 3-5 and Table 3-6 list a number of birds which have been recorded over a wide area. Many of these birds are typical of a mixed landscape with scrub, grassland and pockets of woodland. Those of note are waders which may be breeding on wet grassland (Curlew, Snipe, Lapwing, Redshank), birds which use lake margins (grebes, merganser, duck), raptors foraging or roosting (Hen Harrier, Merlin), riverine specialists (Kingfisher, Dipper, Grey wagtail, Cormorant, grebes) and wintering birds (Whooper Swan, Greenland White-fronted Geese, wintering ducks and waders). The habitat within and adjacent to the Scheme Area may support wintering birds, breeding birds and riverine birds, including those which are Annex I or Red Listed (highest conservation concern). Amber listed species (medium conservation concern) such as Snipe may also be present.

Table 3-5: Breeding Bird Atlas Data (G90)

Name	Grid Reference	Annex I	BoCCI Red List
Barn Swallow (<i>Hirundo rustica</i>)	G90	No	No
Black-billed Magpie (<i>Pica pica</i>)	G90	No	No
Blackcap (<i>Sylvia atricapilla</i>)	G90	No	No
Black-headed Gull (<i>Larus ridibundus</i>)	G90	No	Yes
Blue Tit (<i>Cyanistes caeruleus</i>)	G90	No	No
Chaffinch (<i>Fringilla coelebs</i>)	G90	Yes	No
Coal Tit (<i>Periparus ater</i>)	G90	No	No
Common Blackbird (<i>Turdus merula</i>)	G90	No	No
Common Bullfinch (<i>Pyrrhula pyrrhula</i>)	G90	No	No
Common Chiffchaff (<i>Phylloscopus collybita</i>)	G90	No	No
Common Coot (<i>Fulica atra</i>)	G90	No	No
Common Cuckoo (<i>Cuculus canorus</i>)	G90	No	No
Common Goldeneye (<i>Bucephala clangula</i>)	G90	No	No
Common Grasshopper Warbler (<i>Locustella naevia</i>)	G90	No	No
Common Kestrel (<i>Falco tinnunculus</i>)	G90	No	No
Common Kingfisher (<i>Alcedo atthis</i>)	G90	Yes	No
Common Linnet (<i>Carduelis cannabina</i>)	G90	No	No
Common Moorhen (<i>Gallinula chloropus</i>)	G90	No	No
Common Pheasant (<i>Phasianus colchicus</i>)	G90	No	No
Common Pochard (<i>Aythya ferina</i>)	G90	No	No
Common Raven (<i>Corvus corax</i>)	G90	No	No
Common Redshank (<i>Tringa totanus</i>)	G90	No	Yes
Common Sandpiper (<i>Actitis hypoleucos</i>)	G90	No	No
Common Snipe (<i>Gallinago gallinago</i>)	G90	No	AMBER
Common Starling (<i>Sturnus vulgaris</i>)	G90	No	No
Common Swift (<i>Apus apus</i>)	G90	No	No
Common Tern (<i>Sterna hirundo</i>)	G90	Yes	Yes
Common Whitethroat (<i>Sylvia communis</i>)	G90	No	No
Common Wood Pigeon (<i>Columba palumbus</i>)	G90	No	No
Corn Crake (<i>Crex crex</i>)	G90	Yes	Yes
Eurasian Collared Dove (<i>Streptopelia decaocto</i>)	G90	No	No
Eurasian Curlew (<i>Numenius arquata</i>)	G90	No	Yes
Eurasian Jackdaw (<i>Corvus monedula</i>)	G90	No	No
Eurasian Jay (<i>Garrulus glandarius</i>)	G90	No	No
Eurasian Siskin (<i>Carduelis spinus</i>)	G90	No	No
Eurasian Sparrowhawk (<i>Accipiter nisus</i>)	G90	No	No
Eurasian Teal (<i>Anas crecca</i>)	G90	No	No
Eurasian Treecreeper (<i>Certhia familiaris</i>)	G90	No	No
Eurasian Wigeon (<i>Anas penelope</i>)	G90	No	No
Eurasian Woodcock (<i>Scolopax rusticola</i>)	G90	No	No
European Goldfinch (<i>Carduelis carduelis</i>)	G90	No	No
European Greenfinch (<i>Carduelis chloris</i>)	G90	No	No

Name	Grid Reference	Annex I	BoCCI Red List
European Robin (<i>Erithacus rubecula</i>)	G90	No	No
Fieldfare (<i>Turdus pilaris</i>)	G90	No	No
Goldcrest (<i>Regulus regulus</i>)	G90	No	No
Great Cormorant (<i>Phalacrocorax carbo</i>)	G90	No	No
Great Crested Grebe (<i>Podiceps cristatus</i>)	G90	No	No
Great Tit (<i>Parus major</i>)	G90	No	No
Grey Heron (<i>Ardea cinerea</i>)	G90	No	No
Grey Wagtail (<i>Motacilla cinerea</i>)	G90	No	No
Hedge Accentor (<i>Prunella modularis</i>)	G90	No	No
Hooded Crow (<i>Corvus cornix</i>)	G90	No	No
House Martin (<i>Delichon urbicum</i>)	G90	No	No
House Sparrow (<i>Passer domesticus</i>)	G90	No	No
Lesser Black-backed Gull (<i>Larus fuscus</i>)	G90	No	No
Lesser Redpoll (<i>Carduelis cabaret</i>)	G90	No	No
Little Grebe (<i>Tachybaptus ruficollis</i>)	G90	No	No
Long-eared Owl (<i>Asio otus</i>)	G90	No	No
Long-tailed Tit (<i>Aegithalos caudatus</i>)	G90	No	No
Mallard (<i>Anas platyrhynchos</i>)	G90	No	No
Meadow Pipit (<i>Anthus pratensis</i>)	G90	No	Yes
Mistle Thrush (<i>Turdus viscivorus</i>)	G90	No	No
Mute Swan (<i>Cygnus olor</i>)	G90	No	No
Northern Lapwing (<i>Vanellus vanellus</i>)	G90	No	Yes
Northern Shoveler (<i>Anas clypeata</i>)	G90	No	No
Redwing (<i>Turdus iliacus</i>)	G90	No	No
Reed Bunting (<i>Emberiza schoeniclus</i>)	G90	No	No
Rook (<i>Corvus frugilegus</i>)	G90	No	No
Sand Martin (<i>Riparia riparia</i>)	G90	No	No
Sedge Warbler (<i>Acrocephalus schoenobaenus</i>)	G90	No	No
Sky Lark (<i>Alauda arvensis</i>)	G90	No	No
Song Thrush (<i>Turdus philomelos</i>)	G90	No	No
Spotted Flycatcher (<i>Muscicapa striata</i>)	G90	No	No
Stonechat (<i>Saxicola torquata</i>)	G90	No	No
Tufted Duck (<i>Aythya fuligula</i>)	G90	No	Yes
Tundra Swan (<i>Cygnus columbianus</i>)	G90	No	No
Water Rail (<i>Rallus aquaticus</i>)	G90	No	No
White Wagtail (<i>Motacilla alba</i>)	G90	No	No
White-throated Dipper (<i>Cinclus cinclus</i>)	G90	No	No
Whooper Swan (<i>Cygnus cygnus</i>)	G90	Yes	No
Willow Warbler (<i>Phylloscopus trochilus</i>)	G90	No	No
Winter Wren (<i>Troglodytes troglodytes</i>)	G90	No	No
Yellowhammer (<i>Emberiza citrinella</i>)	G90	No	No
Grey Partridge (<i>Perdix perdix</i>)	G90	No	No
Hen Harrier (<i>Circus cyaneus</i>)	G90	Yes	No

In terms of winter birds, Table 3-6 shows those species found in the 10km square G90 that are recorded in the Atlas of Wintering Birds in Britain and Ireland and are also protected under the EU Birds Directive or mentioned on the Birds of Conservation Concern in Ireland (BoCCI) Red list.

Table 3-6: Wintering Birds Atlas Data (G90)

Name	Grid Reference	Annex I	BoCCI Red List
Hen Harrier (<i>Circus cyaneus</i>)	G90	Yes	No
Merlin (<i>Falco columbarius</i>)	G90	Yes	No
Mew Gull (<i>Larus canus</i>)	G90	No	No
Common Redshank (<i>Tringa totanus</i>)	G90	No	Yes
Greenland White-fronted Goose (<i>Anser albifrons flavirostris</i>)	G90	Yes	No
Greylag Goose (<i>Anser anser</i>)	G90	No	No
Northern Pintail (<i>Anas acuta</i>)	G90	No	No
Northern Shoveler (<i>Anas clypeata</i>)	G90	No	No
Red-breasted Merganser (<i>Mergus serrator</i>)	G90	No	No

3.3.3.6 Invasive Species

Biodiversity Ireland maps contain information on selected areas around Ireland in the form of grid squares. The Grid square was obtained and reviewed for the relevant 10km square G90. The records for high impact invasive species recorded for these grid squares is provided in Table 3-7. Findings of the walkover survey are presented in Section 3.3.4.

Table 3-7: Invasive species found in 10km square grid (G90)

Invasive Species	Latin Name	Impact
New Zealand Flatworm	<i>Arthurdendyus triangulatus</i>	High
Canadian Waterweed	<i>Elodea canadensis</i>	High
Cherry Laurel	<i>Prunus laurocerasus</i>	High
Japanese Knotweed	<i>Fallopia japonica</i>	High
Jenkins Spire Snail	<i>Potamopyrgus</i>	High
American Mink	<i>Mustela vison</i>	High

3.3.3.7 NPWS Data

Data from the NPWS for the 10km square G90 shows that the Drumharlow Lake pNHA, which lies to the west of the Scheme Area, supports wet grassland habitat including the Annex I habitat Molinia meadows on calcareous, peaty or clayey-silt-laden soils (6410). Oak, ash & hazel woodlands are also present, as well as areas of degraded raised bog. Pockets of dry calcareous grassland are also present.

3.3.4 Results from Walkover Survey (February 2021)

A walkover survey of the Scheme Area in Leitrim Village and environs took place on 26th February 2021. During the Breeding Bird surveys in May and June 2021 any additional observations were relayed by

the surveyor and recorded below. Species recorded were typical of those found in semi-natural habitats associated with urban areas (wetland, scrub, amenity grasslands, hedgerows, treelines, etc.), and are summarised as follows:

- Trees recorded included native species which are often associated with wet soils including Alder and Willow species, Native Oak, Beech and naturalised Sycamore were also present;
- Typical hedgerow species such as Hawthorn, Winter Cherry and Holly were present;
- Native floral species recorded included Flag Iris, common Rushes, Nettles, Brambles, Thistles, Buttercups, Dandelions, Wild Angelica, Docks, Birds-foot Trefoil and Plantain. In addition, a few Laurel hedges and individual plants were noted;
- Riparian communities associated with local waterways and wet grasslands included: meadowsweet, woundwort, silverweed, rushes and horsetail;
- There were no invasive species recorded during the walkover survey in June 2021 within the scheme area. Japanese Knotweed was recorded just outside of the Scheme Area in Leitrim Village.
- Winter bird surveys were undertaken in February and March and did not record any notable species. Further winter bird surveys will take place in November, December 2021 and January 2022;
- Breeding bird surveys were undertaken in May and June 2021;
- Birds present during the walkover survey included mallard and mute swan, which are associated with river habitats. Grey heron, magpie, song thrush, grey wagtail, robin, wren, coal tit, blackbird, pied wagtail are all associated within a range of semi-natural habitats, were also recorded;
- No insects were recorded due to the sub-optimal time of year;
- There are a number of locations in the Scheme Area that are considered suitable for bats, amphibians and otters. Further seasonal environmental surveys are scheduled to be undertaken in June and July 2021; and
- No field signs were recorded for badgers.

Additional surveys are scheduled for bats, otters and wintering birds. Pampas grass and red and yellow dog woods were recorded on site, but no action is recommended beyond stating that these species should not be planted as part of the FRS.

During a walkover survey in June 2021, Japanese Knotweed was recorded just outside of the Scheme Area in Leitrim Village – see Figure 3-4.



Figure 3-4: Invasive Species recorded on site in June 2021

3.3.4.1 Results from desktop review of aerial imagery, Wetlands Surveys Ireland mapping and Historic OSI Mapping.

Aerial imagery, the Wetland Surveys Ireland (WSI) mapping tool and historic maps from the 19th & early 20th centuries (OSi.ie) indicate the presence of woodland habitat north of the Cluain Oir residential estate. This area was wooded in the 1830's and the soils are alluvial. This area is likely to be of high biodiversity value potentially supporting wet woodland habitat. Where there is a history of woodland cover the diversity of species present is likely to be high. Wet grassland and riparian habitats are shown within Leitrim Village. These habitats are also of high biodiversity value as are hedgerows and treelines in the area.

3.3.5 Aquatic Ecology

The following sections summarise the aquatic ecology of the Scheme and Study Areas.

3.3.5.1 Water Quality

The Environmental Protection Agency (EPA) website contains information regarding water quality in selected Irish Rivers based on surveys carried out by the EPA.

Information is provided in terms of Q values, which are used to express biological water quality and are based on changes in the macro invertebrate communities of riffle areas brought about by pollution. Q1 indicates a seriously polluted waterbody whereas Q5 indicates an unpolluted, high-quality waterbody.

EPA published results from 2017 show mixed results in the region. The River Shannon flowing from Lough Allen indicates good status (Q Value Score 4). Q values downstream of the Study Area on the River Shannon at Jamestown Weir also indicate good status (Q Value Score 4). No other watercourses in the FRS Scheme Area have Q value scores published by the EPA.

The EU Water Framework Directive (WFD) (2000/60/EC) requires all Member States to protect and improve water quality in all waters so that we achieve good ecological status by 2015 or, at the latest, by 2027. It was given legal effect in Ireland by the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003). It applies to rivers, lakes, groundwater, and transitional coastal waters. The WFD reporting for the period 2013 – 2018 shows a poor status for the River Shannon in the Leitrim Village region and is at risk of not achieving good status. The only other watercourse within the FRS Scheme Area with a WFD Status is the Ballinamore and Ballyconnell Canal, which is unassigned through Leitrim Village but has a poor status upstream of Leitrim Village.

3.3.5.2 Fisheries

The Shannon catchment is a mixed coarse and game fishery. Game fishing for brown trout is popular in many of its lakes throughout the catchment. The water is very productive due to the underlying limestone geology. Coarse fishing is also common throughout the catchment, including many of the catchment's tributary rivers.

The WFD fish website contains information on fish species presence recorded for fish monitoring for the WFD in Ireland. A fish stock survey was carried out at the Battle Bridge site on the River Shannon in 2008, which is approximately 0.5km upstream of the Scheme Area. The fish population was dominated by coarse fish species, however, brown trout were also present; see Table 3-8.

The site was subsequently surveyed for monitoring purposes in 2010 and no change to the population structure was noted. There has been no reported survey data since 2010.

Leitrim Village is a renowned coarse angling area with an abundance of angling facilities in the catchment. IFI have constructed angling infrastructure in the area to facilitate anglers, including wheelchair accessible locations and facilities such as at Lough Bran.

Table 3-8: Fish species found upstream of Leitrim Village in the FRS Study Area

Species	Latin Name
Roach	<i>Rutilus rutilus</i>
Perch	<i>Perca fluviatilis</i>
Brown trout	<i>Salmo trutta</i>
Gudgeon	<i>Gobio gobio</i>
Eel	<i>Anguilla anguilla</i>
Pike	<i>Esox lucius</i>

3.3.6 Feedback from NPWS and DAU

A consultation letter was sent to NPWS and DAU on 5th May 2021 and a follow-up email on 25th June 2021 with regard to the proposed FRS. The NPWS Ranger replied to RH on 8th July 2021 and DAU have not responded. A summary of the response is included in Section 4.3.2, while the full response is included in Appendix A – Public Consultation Material & Responses

3.3.7 Feedback from IFI

A consultation letter was sent to IFI on 5th May 2021 and a follow-up email on 25th June 2021 with regard to the proposed FRS. IFI responded on 22nd July 2021 to confirm that they received the consultation letter. IFI submitted a response to RH on 13th January 2022. A summary of the response is

included in Section 4.3.2, while the full response is included in Appendix A – Public Consultation Material & Responses

3.3.8 Summary of Key Constraints and Implication for the Proposed Scheme

3.3.8.1 Main Findings

3.3.8.1.1 The Study Area

The Study Area supports 4 SACs, 1 SPA, 8 NHAs and 15 pNHAs. Flood control measures are not likely to interact with designated sites, which are located in the uplands (e.g. Cuilcagh – Anierin Uplands SAC and Boleybrack Mountain SAC). Depending on the FRS options pursued, there is potential to interact with:

- Peatland
- Lakes
- Associated habitats (wet grassland, wet woodland, fen, marsh)
- Associated species (wintering water birds, otter).

See Appendix G for details.

A number of designated sites are present within the vicinity and downstream of Leitrim Village:

- Clooneen Bog SAC;
- Lough Forbes Complex SAC ;
- Ballykenny-Fisherstown Bog SPA (004101);
- Lough Boderg and Lough Bofin pNHA; and
- Drumharlow pNHA.

Potential interactions with these sites, their habitats and associated species of conservation interest is likely to require careful consideration in the assessment of options. Given its proximity to the Scheme Area, Drumharlow pNHA is considered further in the section below.

Habitat and protected species data from NPWS provides useful additional data on potential habitat and species interactions. Wetland habitats are a key feature of the area and species associated with these habitats are of particular note (e.g. Freshwater crayfish, Greenland White-fronted Geese). A number of rare and protected mosses are present in the wider area and some records may be within the impact area. This can be assessed once further detail on options becomes available. Whooper Swan and Greenland White-fronted Geese are wintering birds which use wet grassland habitats and Curlew are Red listed and breeding in very small numbers. Consideration of these species will be required.

3.3.8.1.2 The Scheme Area

The Scheme Area is shown in Figure 1-2 of this report and comprises Leitrim Village and environs. Within the Scheme Area, the River Shannon and tributaries, the Shannon-Erne Waterway, wetland, woodland, grassland, tree and hedgerow habitats are present. Drumharlow Lough pNHA is located to the west of the Scheme Area and there are a number of designated sites connected to the south. The Scheme Area supports important riparian and woodland habitats. Riverine fauna (e.g. otter, kingfisher) are likely to at least move through the village if not use riparian habitats within the village. Drumharlow Lough pNHA is important for wet grassland habitats, which are used by wintering birds and potentially by breeding

waders. The River Shannon connects the Scheme Area to downstream sites which are of European and/or national importance.

3.3.8.2 Key Constraints

- The FRS is unlikely to have direct impacts on a site of European or national importance;
- Indirect impacts on habitats and species of European and national importance are likely;
- Indirect impacts on habitats and species of regional and/or local ecological value are likely;
- Likely impacts will require mitigation and if necessary, compensation to ensure no net biodiversity loss; and
- Both EIAR Screening and AA Screening will be required to identify and mitigate impacts, including those with likely significant adverse effects on qualifying or special conservation interest habitats and species.

Impacts from a proposed (potential) FRS may affect the following species and habitats (indicative list only as seasonal environmental surveys have not yet concluded):

- Otter which rely on riparian, river and stream habitat;
- Bats which forage over rivers and riparian habitat;
- River dependant breeding birds such as Kingfisher, Dipper, Grey wagtail, Common Sandpiper;
- Wetland dependant breeding waterbirds (Terns, Gulls, Grebes, Moorhen, Coot, Grey Heron);
- Wetland dependant breeding waders such as Curlew, Snipe, Redshank, Lapwing;
- Wintering birds such as Whooper Swan and Greenland White-fronted geese and flocks of waders. such as Lapwing and Golden Plover;
- Wetland dependant molluscs and invertebrates such as vertigo and Freshwater crayfish;
- Wetland and terrestrial habitats (e.g. alluvial woodland, marsh, fen);
- Specialist wetland plant communities (including instream, river margins, pools, transitional habitats, riparian habitats), and their flora (e.g. grasses, sedges, mosses, liverworts, algae) and fauna (benthic invertebrates, frogs, newts, lamprey, salmon, eels); and
- Invasive species surveys (aquatic, riparian and terrestrial).

Potential impacts from a proposed (potential) FRS during construction are:

- Disturbance to habitats, mammals, bats, birds, aquatic ecology;
- Habitat change, modification loss owing to site works causing displacement of mammals, birds, invertebrates and damage to plant communities;
- Release of pollutants into the watercourse with effects on plants and invertebrates and indirectly on other aquatic life and wetland dependant species (waterbirds, otter);
- Downstream impacts resulting from sediments or pollutant release; and
- Direct and downstream impacts resulting from hydrological changes to flow with impacts on the river channel, riverbank and riparian habitats and the flora and fauna which they support.

Potential impacts during operation are:

- Loss of and/or changes to wetland habitats and the species which use them (plants, invertebrates, insects, birds, mammals, bats, fish); and

- Direct and downstream impacts resulting from hydrological changes to flow with impacts on the river channel, river margins, riverbank and riparian habitats and the flora and fauna which they support.

To inform the impact assessment process, the following surveys are required to focus on the area of direct and indirect impacts and are currently ongoing:

- Wintering bird surveys to identify species present, numbers and distribution;
- Breeding birds surveys (riverine and wet grassland habitats) completed in June 2021;
- Habitat and botanical surveys;
- Mammal surveys focussing on otter and bats;
- Aquatic surveys (plant communities, flora, invertebrates, fish, molluscs); and
- Further invasive species surveys.

The detail of these surveys will require further consideration and will be informed by further data information on the area of direct and indirect impact of the proposed works.

3.4 WATER

This section of the Constraints Study Report describes the existing hydrological environment of the Study Area with emphasis on the Scheme Area, in addition to the potential impacts arising as a result of the Leitrim Village FRS.

3.4.1 Methodology

The establishment of potential hydrological constraints within the Scheme Area and Study Area involved a review of desktop information, including:

- EPA water quality database and maps;
- Well card data compiled by the Geological Survey of Ireland (GSI);
- OPW database of hydrometric stations;
- EPA database of hydrometric stations;
- ESB database of hydrometric stations; and
- Northwestern River Basin District Management Plan (2009 – 2015).

3.4.2 Receiving Environment

3.4.2.1 Water Supply

Existing River Abstractions

There is a surface water abstraction in Carrick on Shannon that serves the Carrick on Shannon Water Treatment Plant (WTP) from the River Shannon (South Leitrim Regional Supply Scheme) and supplies Leitrim Village. The capacity of such is considered adequate to serve current and future needs.

Existing Groundwater Abstractions

Abstraction well card data produced by the GSI indicates there is 1 borehole within the Scheme Area. It is used for potable water supply and small agricultural usage. The location of the borehole is shown in Figure 3-5.

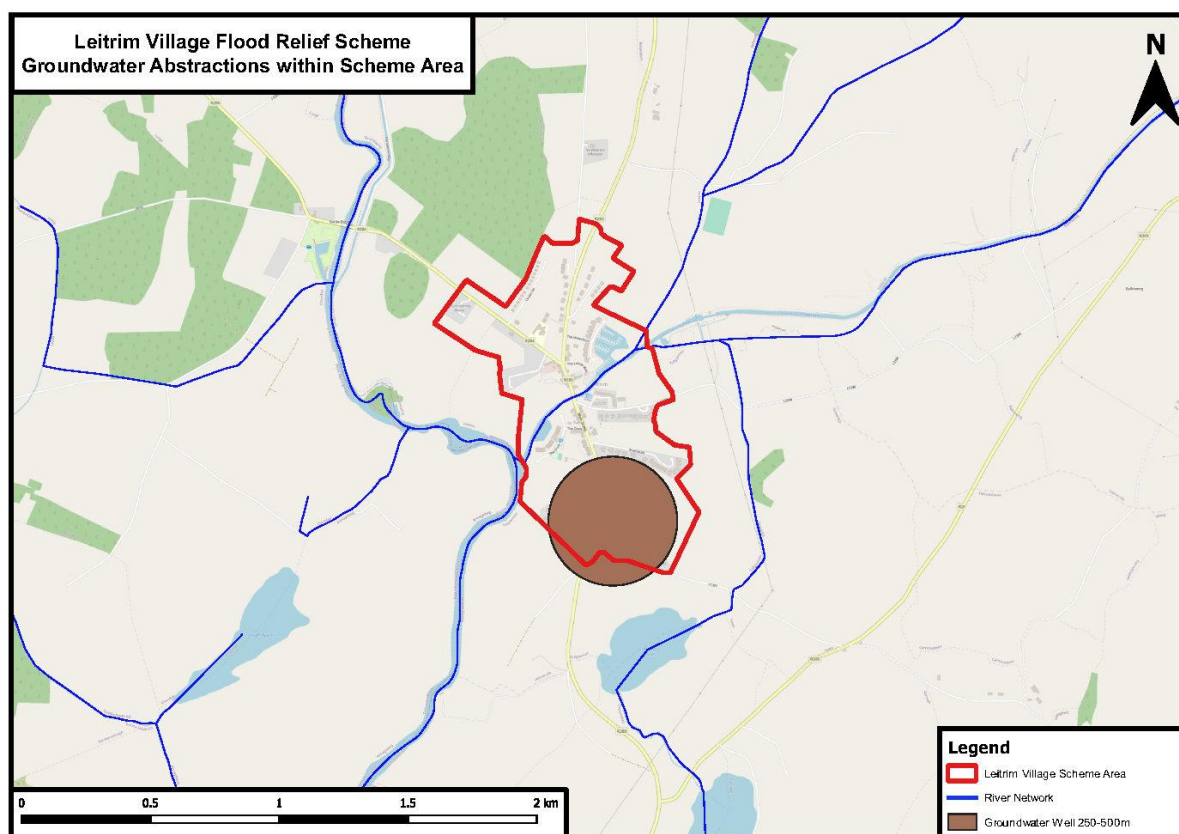


Figure 3-5: Groundwater Abstractions within Scheme Area

3.4.2.2 Hydrometric Stations

The OPW, EPA and ESB operate hydrometric stations within the Leitrim Village Study and Scheme Areas. A table of hydrometric stations within the Leitrim Village Study can be found in Table 3-9.

Reliable flood flow gauging stations for the Upper Shannon catchment are located at Lough Allen (Station No.: 26063).

Continuous water level stations are located on the River Shannon in the vicinity of Leitrim Village: Battle Bridge Lock (Station No.: 26346), Kilacanlock 16 D/S Lock (Station No.: 26067) and Carrick Bridge (Station No.: 26340).

Flow gauging is available further downstream of Drumsna at Athlone Weir (Station No.: 26027) and even further downstream at Banagher gauge (Station No.: 25017).

Flow estimation for the River Shannon outflow from Lough Allen is available from the ESB, who previously operated the hydropower station at Lough Allen (which has been decommissioned) and who currently control the lake levels there via their sluice gate control structure (Bellantra Sluices). There are two water level gauges, which are read daily - one located 150m downstream of the sluices in the tailrace canal (Station No.: 26030) and the second upstream of the sluices (Station No.: 26073).

Table 3-9: Hydrometric Gauge Stations in Study Area

Station Name	Station Number	Operated By	Type
Battle Bridge Lock	26346	Waterways Ireland	Water Level Only
Battle Bridge Lock U/S	26345	Waterways Ireland	Water Level Only
Kilacanlock Lock U/S	26066	Waterways Ireland	Water Level Only
Kilacanlock Lock D/S	26067	Waterways Ireland	Water Level Only
Carrick Bridge	26340	Waterways Ireland	Water Level Only
Athlone Weir	26067	OPW	Water Level and Flow
Banagher gauge	25017	OPW	Water Level and Flow
L.Allen D/S	26030	ESB	Water Level Only
L.Allen U/S	26073	ESB	Water Level Only
L.Allen Outflow (Shannon)	26403	EPA	Water Level and Flow

3.4.2.3 Surface Water Features

The main hydrological features within the Study Area are the River Shannon and its tributaries including the Carrickevy watercourse, Tawnycurry watercourse, Ballinamore and Ballyconnell Canal and the Kilmaghera watercourse. A number of lake water bodies are within the Study Area, namely Lough Allen, Lough Corry and Lough Eidin. All waterbodies must be considered in the following studies, as they can affect downstream water quality.

The EPA website contains information regarding the water quality in Irish rivers based on surveys carried out by the EPA. Biological information is provided in the form of Q values, which are used to express biological water quality and are based on changes in the macro invertebrate communities of riffle areas brought about by organic pollution. Q1 indicates a seriously polluted water body and Q5 indicates unpolluted water of high quality. A value of Q3 indicates moderately polluted water. These Q value ratings are shown in Table 3-10 and mandatory levels for physiochemical parameters for specific environmental legislations are shown in Table 3-12.

Table 3-10: Q value classification

Quality Ratings	Quality Class	Pollution Status	Condition (re beneficial uses)
Q5, Q4-5, Q4	Class A	Unpolluted	Satisfactory
Q3-4	Class B	Slightly Polluted	Unsatisfactory
Q3, Q2-3	Class C	Moderately Polluted	Unsatisfactory
Q2, Q1-2, Q1	Class D	Seriously Polluted	Unsatisfactory

There are a large number of national monitoring stations located within the Study Area according to the EPA website, as shown in

Table 3-11: Monitoring Stations within the Study Area

Monitoring Station	Q value (Latest)
Cootehall Bridge (Boyle River)	4
Jamestown DS Weir (LHS)	3
Battle Bridge	4
FEORISH (BALLYFARNON) - Bridge at Derreenavicara	4
Bridge 1.5 km S.W. of Keadue	4
SHANNON (Upper) - New Br Mahanagh	3-4
SHANNON (Upper) - Bellantra Br	3

Table 3-12: Mandatory levels for physiochemical parameters for specific legislation

Parameter	Units	European Communities (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations, 1989 (S.I. No. 294/1989) *	European Communities Environmental Objectives (Surface Water) Regulations (S.I. No. 272 of 2009)	European Communities Drinking Water Regulations S.I. 106 of 2007	Salmonid Water Regulations (Mandatory Level) (S.I. No. 293 of 1988)
BOD	mg/l	5 –A1 & A2 7 – A3	High status ≤ 1.3 (mean) or ≤ 2.2 (95%ile) Good status ≤ 1.5 (mean) or ≤ 2.6 (95%ile)	N/A	≤ 5
Suspended Solids	mg/l	50	N/A	N/A	≤ 25
pH	-	5.5-8.5 – A1 5.5-9.0 – A2 & A3	4.5-9.5 (Soft Water) 6.0-9.0 (Hard Water)	≥ 6.5 & ≤ 9.5	≥ 6 & ≤ 9
Conductivity	$\mu\text{S/cm}$	1,000	N/A	2,500	N/A
Phosphates	mg/l P ₂ O ₅	0.5 – A1 & A2 0.7 A3	N/A	N/A	N/A
Molybdate Reactive Phosphorus (MRP)	mg/l P	N/A	High status ≤ 0.025 (mean) or ≤ 0.045 (95%ile) Good status ≤ 0.035 (mean) or ≤ 0.075 (95%ile)	N/A	N/A
Chloride	mg/l Cl	250	N/A	250	N/A
Ammonium	mg/l NH ₄	0.2 – A1 1.5 – A2 4 – A3	N/A	N/A	≤ 1.0
Total Ammonia	mg/l N	N/A	High status ≤ 0.040 (mean) or ≤ 0.090 (95%ile) Good status ≤ 0.065 (mean) or ≤ 0.140 (95%ile)	N/A	N/A
Nitrate	mg/l NO ₃	50	N/A	50	N/A
Nitrite	mg/l NO ₂	N/A	N/A	0.5	≤ 0.05
Dissolved Oxygen	-	>60% - A1 >50% - A2 >30% - A3	Lower limit: 95%ile >80% saturation Upper limit: 95%ile <120 %saturation	N/A	50% ≥ 9 mg/l
Total Hardness	mg/l CaCO ₃	N/A	N/A	N/A	N/A
Copper	mg/l Cu	0.05 –A1 0.1 – A2 1.0 – A3	5 - water hardness ≤ 100 mg/l CaCO ₃ 30 – water hardness >100mg/l CaCO ₃	2.0	≤ 0.005 [1, 6] ≤ 0.022 [2, 6] ≤ 0.04 [3, 6]

Parameter	Units	European Communities (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations, 1989 (S.I. No. 294/1989) *	European Communities Environmental Objectives (Surface Water) Regulations (S.I. No. 272 of 2009)	European Communities Drinking Water Regulations S.I. 106 of 2007	Salmonid Water Regulations (Mandatory Level) (S.I. No. 293 of 1988)
Zinc	mg/l Zn	3-A1 5- A2 & A3	0.008 - water hardness $\leq 10\text{mg/l CaCO}_3$ 0.05 - water hardness $>10 \leq 100\text{mg/l CaCO}_3$ 0.1- water hardness $>100\text{mg/l CaCO}_3$	N/A	≤ 0.112 [4, 6] ≤ 0.03 [1, 6] ≤ 0.2 [2, 6] ≤ 0.3 [3, 6] ≤ 0.5 [5, 6]
Total coliforms	no/100ml	5,000 – A1 25,000 – A2 100,000 – A3	N/A	N/A	N/A
Faecal coliforms	no/100ml	1,000 – A1 5,000 – A2 40,000 – A3	N/A	0	N/A

[1] At water hardness 10 mg/l CaCO₃; [2] At water hardness 50 mg/l CaCO₃; [3] At water hardness 100 mg/l CaCO₃; [4] At water hardness 300 mg/l CaCO₃; [5] At water hardness 500 mg/l CaCO₃; [6] To be conformed with by 95% of samples over a period of 12 months where sampling is carried out at least once a month; where sampling is less frequent, to be conformed with by all samples.

*S.I. No. 294/1989 is superseded by S.I. No. 272 of 2009. If a particular parameter is not found in SI 272 of 2009 then the 1989 value applies.

Water Framework Directive

The EU Water Framework Directive (2000/60/EC) requires all Member States to protect and improve water quality in all waters so that we achieve good ecological status by 2015 or, at the latest, by 2027. It was given legal effect in Ireland by the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003). It applies to rivers, lakes, groundwater, and transitional coastal waters. The Study and Scheme Areas are located within the WFD Upper Shannon 26, which comprises areas in Leitrim, Roscommon, Cavan, Sligo, Mayo and Longford. The River Basin District (RBD) and the management plan for this area was consulted. The main objectives of this management plan were to prevent deterioration, restore good status, reduce chemical pollution in surface waters and to achieve water-related protected areas objectives. The programme of measures designed to achieve these objectives are outlined in this document and include the following:

- Control of urban wastewater discharges;
- Control of unsewered wastewater discharges;
- Control of agricultural sources of pollution;
- Water pricing policy;
- Sub-basin management plans and programmes of measures for the purpose of achieving environmental water quality objectives for Natura 2000 sites designated for the protection of Freshwater Pearl Mussel populations;
- Pollution reduction programmes for the purpose of achieving water quality standards for designated shellfish waters; and
- Control of environmental impacts from forestry.

Information on status, objectives and measures in the Upper Shannon RBD has been compiled in the Water Management Unit (WMU) action plans. The Upper Shannon 26 WMU contains 98 river water bodies. 2 are of High Quality, 49 are of Good Quality, 18 are Moderate, 27 are of Poor Quality and 2 are of Bad Quality. For lake water bodies within the WMU, there are 39 in total with 2 of High Quality, 13 of Good Quality, 21 of Moderate Quality, 2 are of Poor and 1 unassigned.

The identified pressures/risk in this WMU include the following:

- Agriculture - diffuse phosphorus loss to surface water bodies and sediment due to land drainage works;
- Hydro-morphology - modifications due to historic dredging and presence of drainage schemes;
- Invasive species;
- Contaminated land from landfills;
- Wastewater Treatment Plant (WWTPs) and Water Treatment Plants (WTPs);
- Forestry and deforestation; and
- Industrial discharges.

3.4.2.4 Hydrogeology

The (GSI), established in 1845, provides geological data on Ireland's sub-surface including bedrock geology, groundwater data and soil formation data.

The GSI online database shows the geology of the Scheme Area as comprising Bricklieve Limestone Formation and described as a Bioclastic cherty limestone. Upstream and downstream of Leitrim Village comprises Boyle Sandstone Formation and Croghan Limestone Formation.

The GSI online database has a record of one karst feature located within the Scheme Area to the southwest as seen in Figure 3-7, there are also karst features within the Study Area – a large number to the east of Leitrim Village and to the west of Lough Eidin. The direction of groundwater flow is influenced by the topography of the surrounding area. Groundwater within the Scheme Area is likely to be hydraulically connected to the River Shannon and its tributaries including the Carrickey watercourse, Tawnycurry watercourse, Ballinamore and Ballyconnell Canal and the Kilmaghera watercourse.

3.4.3 Summary of Key Constraints and Implication for the Proposed Scheme

- The design of the proposed FRS should take into account the main objectives of the WFD River Basin District Management Plan (RBDMP) by ensuring that any works proposed do not result in the deterioration of water quality and, where possible, contribute to the achievement of “good” status within the Study Area. It is acknowledged that there are a number of waterbodies of unassigned status within the Study Area;
- The design of the proposed FRS, where practicable, should not impact on the water supply that serves Leitrim Village; and
- The design of the proposed FRS, where practicable, should ensure that the impact on groundwater levels is minimised, including groundwater sources for wells and boreholes.

3.5 SOILS AND GEOLOGY

This section describes the soils and geology underlying the Study Area for the Leitrim Village FRS, with emphasis on the Scheme Area.

3.5.1 Methodology

The section describes the bedrock geology, superficial deposits, economic geology and geological heritage of the Scheme Area, identified from desktop information sources only. An inventory of the geological constraints identified by this desktop study is detailed below.

Soils and Geology constraints have been assessed with reference to the following: (These sources have been determined as the most up to date at time of writing.)

- The GSI online database;
- Correspondence with GSI;
- LCC Planning Department (Quarries Register under Section 261, Planning and Development Act 2000);
- Leitrim County Development Plan (2015-2021);
- Concrete Products Directory (Irish Concrete Federation);
- Aerial Photographs; and
- Envision Mines Site, the EPA’s online Historic Mines Inventory.

3.5.2 Receiving Environment

3.5.2.1 Bedrock Geology

The GSI online database Bedrock maps (500k) indicates that the Scheme Area is underlain by Marine shelf facies, Limestone and Calcareous shale in an age bracket of Palaeozoic, Carboniferous and Mississippian.

The GSI online database shows a variable subsoil within the Leitrim Village Scheme Area and the Teagasc soil map indicates that the Scheme Area is underlain by Made Ground, Sandstone Till, Peat, Bedrock Outcrops and Limestone Till. The above-mentioned geology and soil types will need to be considered during the design and construction stages of the FRS. Figure 3-6 and Figure 3-7 show the bedrock geology and subsoils within the Scheme Area.

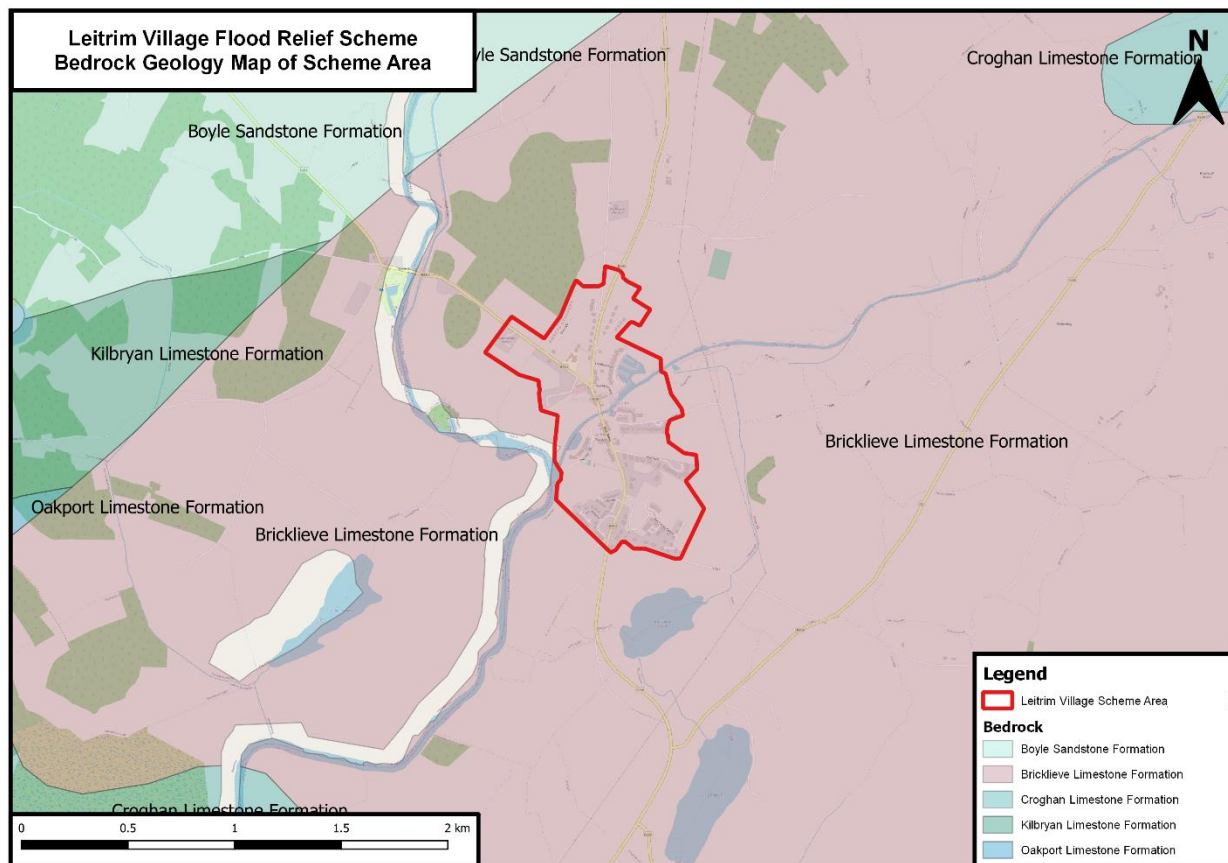


Figure 3-6: Bedrock Geology in Scheme Area

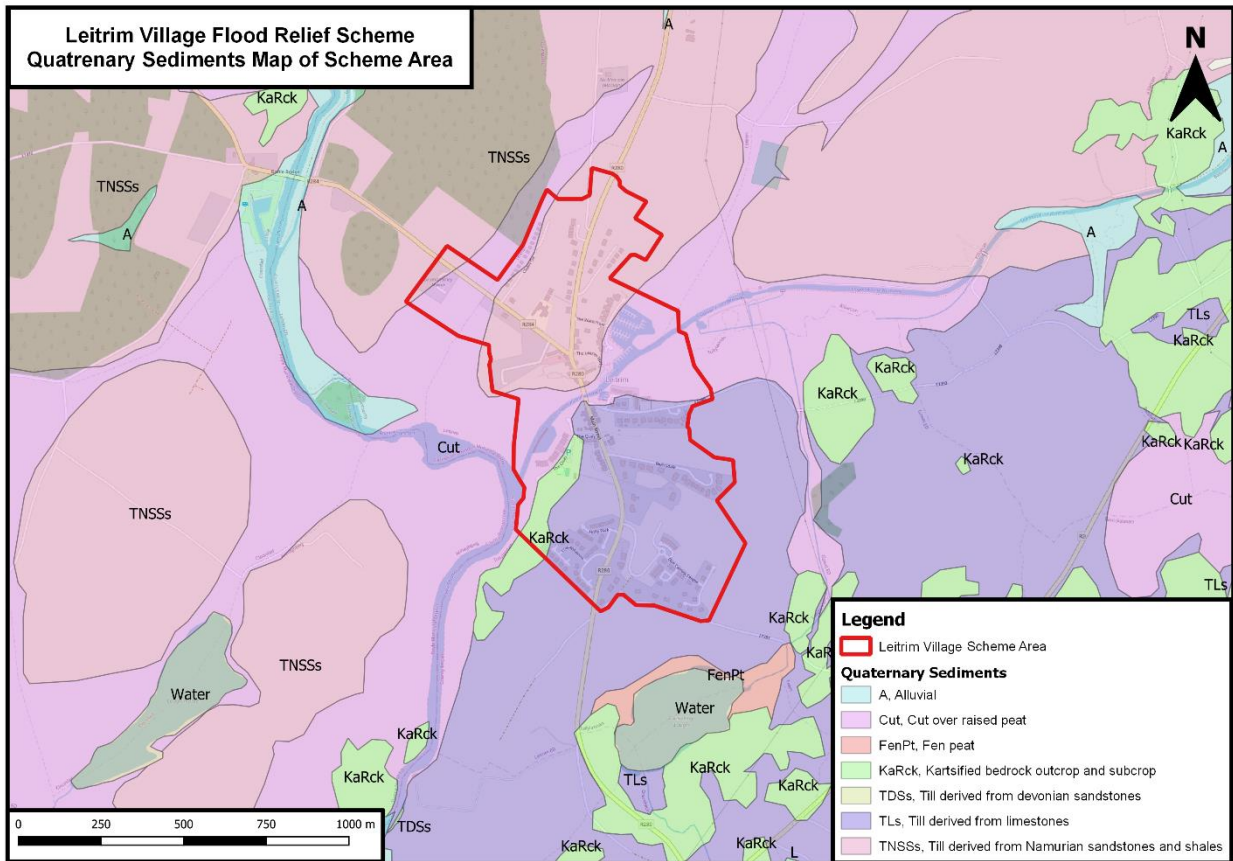


Figure 3-7: Subsoils within Scheme Area

The GSI online database shows that Leitrim Village lies within a Regionally Important Aquifer – Karstified (Conduit), as shown in Figure 3-8.

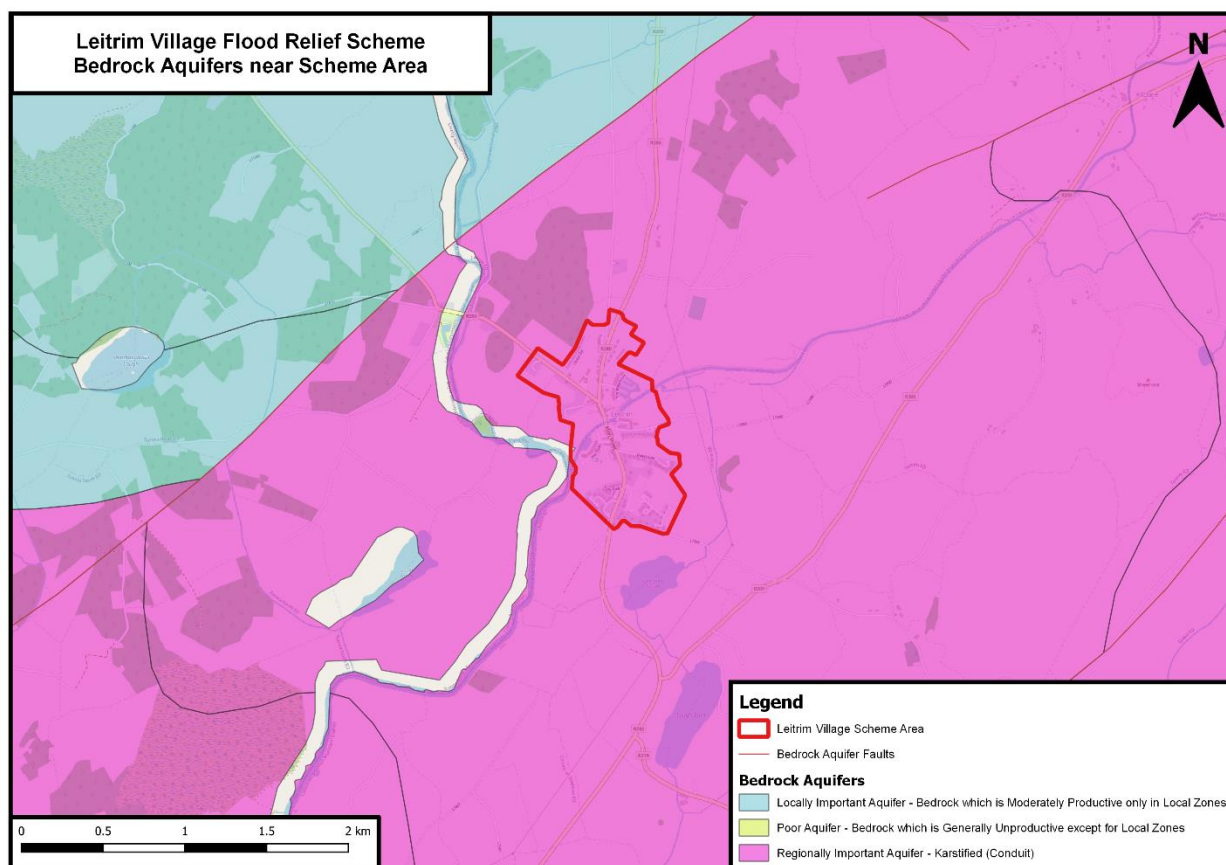


Figure 3-8: Bedrock Aquifers in Scheme Area

3.5.2.2 Economic Geology

The term 'economic geology' refers to commercial activities involving soil and bedrock. The activities involved principally comprise aggregate extraction (sand and gravel pits and quarries) and mining. A number of sources as detailed below were examined for information on such commercial activities within the Study Area. These have been determined as the most up to date sources at time of writing.

- Leitrim County Development Plan (2015-2021);
- Concrete Products Directory (Irish Concrete Federation);
- Aerial Photographs; and
- Envision Mines Site, the EPA's online Historic Mines Inventory.

A review of the above-mentioned sources indicates that there is no mining activity within the Scheme Area. There are three quarries within the wider Study Area for Leitrim Village FRS. These quarries are currently operational and produce a range of aggregates and fill material. There are a number of mines to the north of Leitrim Village as indicated in Figure 3-9.

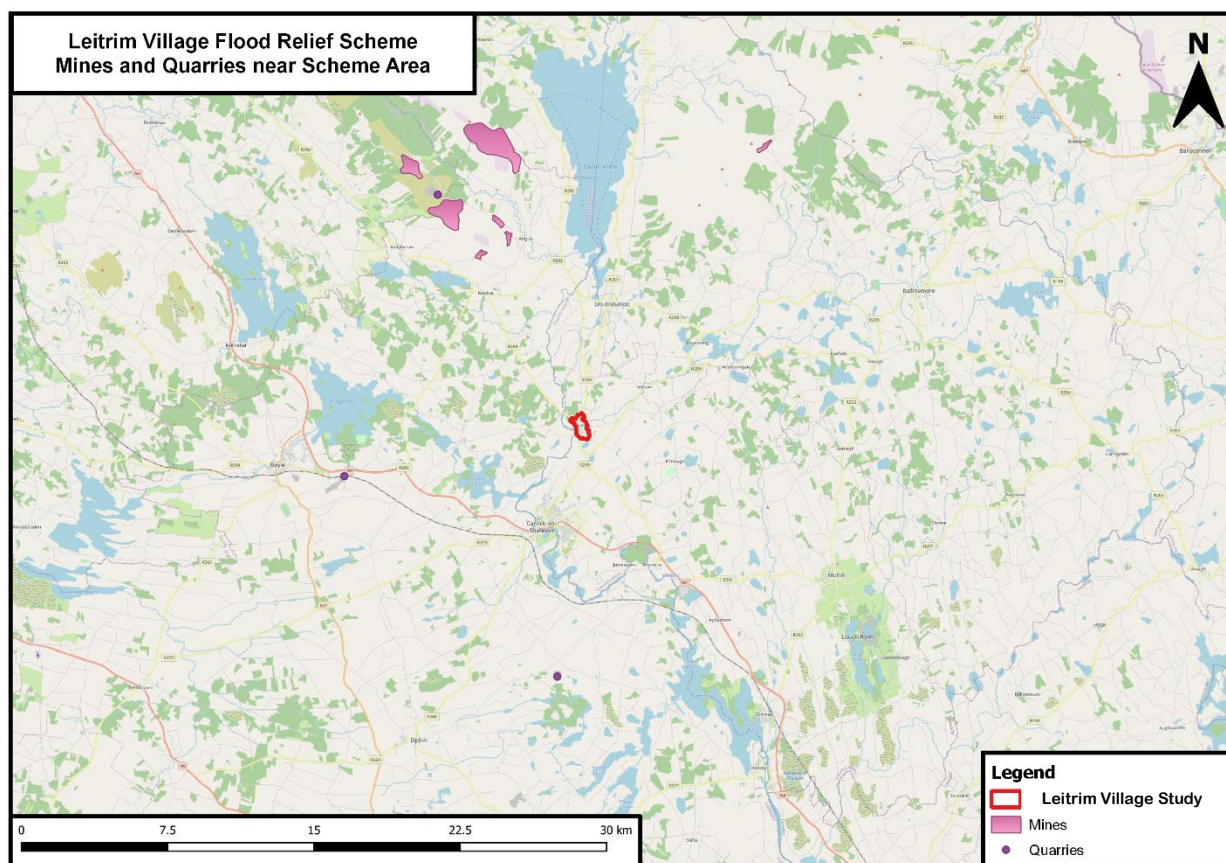


Figure 3-9: Mines and Quarries in Study Area

3.5.2.3 Geological Heritage

The Leitrim County Development Plan states: “Geology is recognised as an intrinsic component of natural heritage within the Planning and Development Acts 2000- 2015, Planning and Development Regulations, Heritage Act 1995, and the Wildlife (Amendment) Act, 2000. While the most important geological and geomorphological scientific sites will be designated as Natural Heritage Areas (NHAs) by the NPWS, the National Heritage Plan (2002) has recommended the recognition and protection of other important sites known as County Geological Sites (CGS).”

No Geological Heritage sites were recorded in the vicinity of the Scheme Area. There are a number of sites within the wider Study Area as follows:

- Mid Roscommon Ribbed Moraines;
- Boyle Drumlins;
- Keeloges Quarry;
- Rockingham Spring;
- Keshcarrigan Quarries;
- Lough Rinn Drumlins;
- Aghagrana stream section;
- Arigna Mining Experience;
- Altagowlan;
- Lough Nasool – Lough Bo;
- Geevagh;
- Lackagh Sandstone Quarry;
- Corry Shore;
- Cuilcagh Mountain;
- Western Cuilcagh - Shannon Pot;
- Stony River; and
- Creevelea.

3.5.2.4 Feedback from GSI

A consultation letter was sent to GSI on 5th May 2021 with regard to the proposed FRS. GSI responded on 21st May and a summary of the response is included in Section 4.3.2, while the full response is included in Appendix A – Public Consultation Material & Responses

3.5.3 Summary of Key Constraints and Implication for the Proposed Scheme

- It is recommended that a preliminary geotechnical investigation be carried out once viable flood risk management measures are developed in order to identify geology and ground conditions. The geotechnical investigation will identify karst features, if encountered.

3.6 ARCHAEOLOGY, ARCHITECTURAL AND CULTURAL HERITAGE

This section of the Constraints Study Report summarises the known archaeological and built heritage constraints within the Scheme Area for the Leitrim Village FRS, as identified through a desk-top baseline study. Statutory Protections, Best Practice Guidance and Recommendations are outlined together with a summary of key potential constraints to the development of viable flood alleviation measures within the Leitrim Village FRS Scheme Area.

3.6.1 Methodology

As part of this Constraints Study Report, a desk-top study of the archaeological, built and cultural heritage resources within the established Scheme Area was undertaken (See Appendix D). This information provides an insight into both the historical development of the Scheme Area and an evaluation of recorded archaeology and built heritage. It also provides an overview of areas of particular archaeological sensitivity.

The principal sources reviewed for the archaeological resource were the statutory Record of Monuments and Places (RMP) for County Leitrim and the Archaeological Inventory of County Leitrim as published in 2003. The Record of Protected Structures (RPS), as published by LCC, together with the National Inventory of Architectural Heritage were reviewed in order to identify relevant architectural heritage in the Scheme Area. The following sources were also consulted:

- Topographical files of the National Museum of Ireland as identified on Heritagemaps.ie;
- Cartographic & Aerial Photographic Archive of the Ordnance Survey of Ireland – www.osi.ie;
- Annual Archaeological Excavations Bulletin – www.excavations.ie ;
- Leitrim Heritage Plan 2020-2025;
- Leitrim County Development Plan 2015 – 2021 including Appendix A – Record of Protected Structures (RPS); and
- ‘Dúchas’; The National Folklore Collection (UCD) Digitization Project including The Schools Collection.

A list of all protected archaeological and built heritage sites within the Scheme Area and associated maps are included in Appendix D. Intangible cultural heritage including local history and folklore was also considered in the preparation of this study.

3.6.2 Receiving Environment

Leitrim Village is situated approximately 400m to the northeast of the River Shannon; on the banks of the Ballinamore and Ballyconnell Canal (formerly a tributary stream running from the 'Black Lough' to the Shannon). The urban centre developed around a strategic fortification of probable late 15th -century date ('O'Rourke's' or 'Breffny' Castle), although the area has been a strategic fording point at the Shannon for millennia. The surrounding hinterlands comprise floodplain and farmland.

The urban core is focused on the main street and a historic Fair Green to the south. The castle site is listed on the statutory Record of Monuments & Places (RMP) as being of archaeological significance and has an associated Zone of Archaeological Potential/Notification (RMP: LE027-026----).

There are **3** additional individual sites or monuments listed on the RMP within the Scheme Area. These represent two early medieval farmsteads or 'Ringforts' (RMPs: LE027-057---- & LE027-063----) and the recorded site of one or more standing stones which are no longer extant (RMP: LE027-058----).

Protected Built Heritage as listed on the statutory RPSs is present within the Scheme Area in the form of a historic Milestone (RPS ref. 225), located at the junction of the R280 road and Canal View residential estate. There are an additional 5 structures listed on the National Inventory of Architectural Heritage (NIAH); which the Local Authority are obliged to consider for inclusion in future revisions of the Record of Protected Structures. These include Leitrim Bridge, St. Joseph's RC Church, a World War II lookout post ('Pill-Box') and a section of the Ballinamore and Ballyconnell Canal where it passes through the village.

The key constraints that are protected by legislation comprise protected structures and recorded archaeological monuments/sites. There may be some overlap between these two categories where built structures are occasionally listed on both the RMP and RPS. The tables and figures presented in Appendix D provide descriptive and locational details for the Archaeological & Built Heritage sites located within the Scheme Area.

It is recommended that, where possible, the Scheme be designed to avoid adversely impacting on these recorded archaeological & built heritage resources as illustrated in Appendix D.

3.6.3 Statutory Protections and Best Practice Guidance

The provisions of the National Monuments Acts 1930-2014 ensure that no disturbance or interference to archaeological sites/monuments listed in the RMP can take place without prior consultation with the Dept. of Housing, Local Government & Heritage through the Development Applications Unit (DAU).

Statutory Notification under Section 12(3) of the National Monuments (Amendment) Act 1994, archaeological impact assessment and consultation with the National Monuments Service (NMS) is required where works are proposed within an established Zone of Archaeological Potential/Notification.

In the event that flood risk management measures are required – including the possibility for increased flooding – in the vicinity of any recorded archaeological sites/monuments; appropriate mitigation measures should be designed in consultation with the NMS and Local Authority Heritage & Conservation Offices.

There is potential for the presence of unrecorded archaeological sites and artefacts within the Scheme Area. Any previously undeveloped lands that may be impacted by ground disturbance works required by the proposed scheme (e.g. site investigations, hard defences, topsoil stripping, haul roads, site compounds, site clearance works, trial-pits, etc.) may require archaeological investigations such as advance test-trenching or archaeological monitoring of works. The appropriate mitigation measures should be determined during the design phase in consultation with the NMS.

All Record of Protected Structures sites have statutory protection and avoidance of these features is recommended. Where works are proposed that may negatively impact on protected structures, prior consultation with LCC Conservation Office will be required. This may include visual impacts as well as those that may affect the setting or integrity of such structures.

Where works are required in the vicinity of recorded archaeological monuments and protected structures, the formulation of site-specific mitigation strategies is required. This will be carried out in consultation with the NMS and LCC. Such consultation should commence at an early stage of scheme development so as to allocate adequate time and resources to implement agreed mitigation measures.

Depending on the nature and extent of the works, archaeological mitigation measures may take the form of design stage/pre-works assessment (including test-trenching) and/or monitoring of construction works carried out during the scheme. These mitigations should allow for the possibility of archaeological excavation as may be required.

Where possible, areas that are the subject of local folklore should be avoided in order to preserve the cultural heritage of the region. These may include holy wells and other locally significant locations, which will be assessed in future Cultural Heritage impact assessment as part of the EIAR process.

Consideration in design should be given to the potential for visual impacts on protected archaeological and architectural areas as part of the design of the proposed Scheme.

3.6.4 Summary of Key Constraints, Recommendations and Implications for the Proposed Scheme

- There are four recorded archaeological sites/monuments within the Leitrim Village FRS Scheme Area. Given the provisions of the National Monuments Acts, no disturbance to, or interference with, any known archaeological sites can take place without prior Notification, assessment and consultation with the NMS of the Department of Housing, Local Government & Heritage (DoHLGH). This may be conducted through the established consultation process via the Development Applications Unit (DAU) as part of pre-planning and the planning process.
- Appendix D provides details on archaeological sites/monuments within the Scheme Area. These include the site of Leitrim Castle (RMP: LE027-026----), two Ringforts (LE027-057---- & LE027-063---) and the site of one or more Standing Stones (LE027-058).
- There are no National Monuments within the Scheme Area in the ownership or guardianship of the State.
- There are no archaeological sites/monuments subject to a preservation order or temporary preservation order within the Scheme Area.
- The riverine environment of the River Shannon and the canalised length of the Ballinamore and Ballyconnell Canal at Leitrim Village has high archaeological potential and has been a strategic fording point for millennia.
- There have been several archaeological finds of predominantly Bronze Age date, recorded as being found in the River Shannon in the vicinity of Leitrim Village during works on the Shannon Navigation in the 19th -century.
- Additionally, there is one Protected Structure in Leitrim Village and 4 buildings, structures or features listed in the National Inventory of Architectural Heritage (NIAH) within the Scheme Area. (Appendix D).
- An Archaeological Impact Assessment should be carried out for the proposed scheme. This may include a programme of advance archaeological underwater/terrestrial survey, testing and/or monitoring as may be required dependent on the scheme design.

- Any works proposed, including geotechnical site investigations, within an established Zone of Archaeological Protection/Notification (ZAP) requires statutory submission of notification to the NMS under section 12(3) of the National Monuments (Amendment) Act 19941.
- All impacts on identified heritage and their immediate environs, should be avoided where possible in the design of the proposed FRS.
- Where avoidance by design is not possible then archaeological investigations may be required for identified areas of archaeological potential which would be directly impacted by the proposed scheme.
- Advance archaeological survey/investigations should be undertaken at design stage to facilitate mitigation design and allow adequate time to evaluate and record any archaeological features or deposits that may be encountered.
- Any ground disturbance works associated with the proposed scheme should be further assessed for archaeological potential. Appropriate mitigation should be determined during the design phase in consultation with the NMS (DoHLGH).
- Where in-water or near-water works are proposed as part of the FRS scheme, the Underwater Archaeology Unit (UAU) of the NMS should be consulted.
- All Protected Structures have statutory protection and design avoidance of these structures should be employed where possible.
- Consultation with the NMS of the Department of Housing, Local Government & Heritage should commence at an early stage of the Scheme development. This should be on-going throughout the development of the FRS.

3.7 LANDSCAPE

This section of the Constraints Study Report addresses the landscape and visual constraints that have been identified within the Study Area. The Study Area is described with reference to Landscape Character and Landscape Type and the ratings that have been assigned to it in terms of Value, Sensitivity and Importance.

3.7.1 Methodology

This section of the Constraints Study is based on a desk-top study of previous landscape character assessments and reviews that have been carried out within the Study Area. It incorporates a description of the policies and objectives of LCC with specific reference to the Study Area and in relation to:

- Landscape Character Assessment;
- Scenic Amenity;
- Views and Prospects; and
- Scenic Routes and Landscapes.

The following primary sources of information were consulted during the course of the desk-top study. (These have been determined to be the most up to date documents at time of writing.)

- Leitrim County Development Plan (2015-2021);
- EPA CORINE Land Cover Map; and
- Landscape Character Assessment of County Leitrim, 2015.

¹ Section 12 Notification was submitted to NMS in advance of Site Investigations (26/05/2021). Response pending (16/06/2021).

3.7.2 Receiving Environment

3.7.2.1 Landscape Character Assessment

The Leitrim County Development Plan sets out the policies and objectives of LCC with regards to Heritage and Environment. The Landscape Character Assessment (LCA) identified Landscape 'Types' and 'Landscape Character Areas'. Leitrim Village is located within the established South Leitrim Drumlins & Shannon basin Landscape Character Area.

3.7.2.2 Landscape Character and Type

South Leitrim Drumlins and Shannon Basin Area

The general landscape within which the Study Area is located comprises undulating topography composed of drumlins, pastoral landscape of farmed fields and areas of rushy pasture. The landscape includes hedgerows and areas of woodland and is bounded by loughs and foothills. There are limestone outcrops at Sheemore and Sheebeg and a pattern of roads and streams throughout. The land drains in a southerly direction to the River Shannon. Wetlands are extensive along the course of the Shannon and the floodplain and associated features contain numerous ecological habitats of high value as discussed in Section 3.3 of this report.

3.7.2.3 Study Area Land Cover

In 1985 the Corine programme was initiated in the European Union. Corine means 'coordination of information on the environment' and it was a prototype project working on many different environmental issues. The Corine databases and several of its programmes have been taken over by the European Environment Agency. One of these is an inventory of land cover in 44 classes, and presented as a cartographic product, at a scale of 1:100 000. This database is operationally available for most areas of Europe.

The CORINE land cover data for the Study and Scheme Areas was obtained from the EPA. CORINE land cover is a map of the environmental landscape. It provides comparable digital maps of land cover for each country for Europe.

The CORINE data shows that the Scheme Area comprises 'discontinuous urban fabric, pastures and land principally occupied by agriculture with significant areas of natural vegetation'. The Study Area comprises inland marshes, pastures and land principally occupied by agriculture, with significant areas of natural vegetation. This land type is represented upstream and downstream of the Scheme Area with peat bogs, coniferous forest, mixed forest and mineral extraction sites.

3.7.2.4 Scenic Amenity, Views and Prospects

The Leitrim County Development Plan has indicated areas of special importance and protection. These are to ensure the amenity of the county and local areas are not affected.

"LCC will preserve and enhance these areas, as far as is practicable..."

There are also a number of 'Protected Views and Prospects' within the Study Area. The impact of any proposed development on the character of these views will be a factor in determining the appropriateness of granting planning permission. The sites are listed below:

- V21 View towards Lough Allen from R280;
- V22 View towards Lough Allen from R200; and
- V23 View of Slieve an Iarainn from the R280.

Policy of the Leitrim County Development Plan:

"It is the Councils policy to protect these views from intrusive development...."

"It is a general objective to protect, manage and conserve the character, quality and value of the landscape having regard to the proper planning and development of the area, including consideration of the scenic amenity designations of this plan, the preservation of views and prospects and the amenities of places and features of natural, cultural, social or historic interest."

3.7.2.5 Scenic Landscape

The Leitrim County Development Plan outlines Areas of Outstanding Natural Beauty and High Visual Amenity. The council will preserve and enhance these areas, as far as is practicable, by careful management and by the operation of special controls over development in these areas.

Objective 80: It is an objective of the Council to protect the following Areas of Outstanding Beauty

- A1 The Coast;
- A2 Lough Melvin North;
- A3 Aroo, Glenade, Truskmore, Glencar and environs;
- A4 The Doons, Lough Gill and environs;
- A5 Benbo;
- A6 O'Donnell's Rock and Bolebrack; and
- A7 Sheemore.

A7 Sheemore is located approximately 2.5kms east of the proposed FRS Scheme Area.

3.7.3 Summary of Key Constraints and Implications for the Proposed Scheme

It is an objective of LCC to ensure that landscape will be a factor in all land-use proposals, ensuring that a pro-active view of development is undertaken while maintaining respect for the environment and natural heritage. The relevant recommendations for the Landscape Character Area of the Shannon Basin in which the Study and Scheme Areas are located and in which regard should be had in designing the proposed Scheme to include:

- Conservation of the protected viewpoints within the Scheme Area/ Study Area (Objective 11.5 of the Leitrim County Development Plan);
- Conservation and enhancement of the landscape diversity, character and quality of the county;
- Protection of the existing character and setting of the current Study and Scheme Areas;
- Protection of sensitive areas from development that would detract from the amenity of the area;
- Minimising impact on the hedgerows and other features of scenic and heritage value; and

- Continuation of the promotion of the local area as a site for tourism without negative impacts on the surrounding landscape.

3.8 AIR QUALITY, CLIMATE & NOISE

3.8.1 Air Quality

3.8.1.1 Methodology

This section of the Environmental Constraints Study describes the existing air quality and noise environments within the Study Area and identifies possible factors which have the potential to constrain the design of any FRS.

For the purposes of this Constraints Study, it is assumed that the baseline air quality in the existing environment is good due to a lack of major sources of air pollution such as heavy industry within, or in the immediate vicinity of, the FRS Scheme Area.

Flood alleviation measures may give rise to negative effects on air quality dependent on traffic volumes and type during construction, including diversions of vehicular movements. Due to the general character of the surrounding environment, baseline and subsequent construction stage air quality surveys may be necessary.

The following items were the principal focus of the study:

- Identification of possible issues regarding air quality;
- Identification of locations where there may be existing noise/ vibration-sensitive receptors;
- Identification of any existing noise or vibration sources in the area; and
- A qualitative description of the existing noise climate.

The following sources were referenced as part of this Constraints Study: (These have been determined as the most up to date documents at time of writing):

- Leitrim County Development Plan (2015-2021); and
- EPA website (www.epa.ie).

3.8.1.2 Air Quality Standards

In 1996, the Air Quality Framework Directive (96/62/EC) was published to establish and standardise limits of air pollutants caused by man-made sources. This Directive was transposed into Irish law by the EPA Act 1992 (Ambient Air Quality Assessment and Management) Regulations 1999. The Directive was followed by four Daughter Directives, which set out limit values for specific pollutants:

- The first Daughter Directive (1999/30/EC) deals with sulphur dioxide, oxides of nitrogen, particulate matter and lead;
- The second Daughter Directive (2000/69/EC) addresses carbon monoxide and benzene. The first two Daughter Directives were transposed into Irish law by the Air Quality Standards Regulations 2002 (SI No. 271 of 2002);
- A third Daughter Directive, Council Directive (2002/3/EC) relating to ozone was published in 2002 and was transposed into Irish law by the Ozone in Ambient Air Regulations 2004 (SI No. 53 of 2004); and
- The fourth Daughter Directive, published in 2007, deals with polyaromatic hydrocarbons (PAHs), arsenic, nickel, cadmium and mercury in ambient air.

The Air Quality Framework Directive and the first three Daughter Directives have been replaced by the Clean Air for Europe (CAFE) Directive (Directive 2008/50/EC on ambient air quality), which encompasses the following elements:

- The merging of most of the existing legislation into a single Directive (except for the Fourth Daughter Directive) with no change to existing air quality objectives;
- New air quality objectives for PM_{2.5} (fine particles) including the limit value and exposure concentration reduction target;
- The possibility to discount natural sources of pollution when assessing compliance against limit values; and
- The possibility for time extensions of three years (for particulate matter PM₁₀) or up to five years (nitrogen dioxide, benzene) for complying with limit values, based on conditions and the assessment by the European Commission.

Table 3-13 sets out the limit values of the CAFE Directive, as derived from the Air Quality Framework Daughter Directives. Limit values are presented in micrograms per cubic metre ($\mu\text{g}/\text{m}^3$) and parts per billion (ppb). The notation PM₁₀ is used to describe particulate matter or particles of ten micrometres or less in aerodynamic diameter. PM_{2.5} represents particles measuring less than 2.5 micrometres in aerodynamic diameter.

Table 3-13: Air Pollution Limit values of Directive 2008/50/EC, 1999/20/EC & 2000/69/EC (Source: EPA)

Pollutant	Limit Value Objective	Averaging Period	Limit Value ($\mu\text{g}/\text{m}^3$)	Limit Value (ppb)	Basis of Application of Limit Value	Attainment Date
Sulphur dioxide (SO ₂)	Protection of Human Health	1 hour	350	132	Not to be exceeded more than 24 times in a calendar year	1 st Jan 2005
Sulphur dioxide (SO ₂)	Protection of human health	24 hours	125	47	Not to be exceeded more than 3 times in a calendar year	1 st Jan 2005
Sulphur dioxide (SO ₂)	Protection of vegetation	Calendar year	20	7.5	Annual mean	19 th Jul 2001
Sulphur dioxide (SO ₂)	Protection of vegetation	1 st Oct to 31 st Mar	20	7.5	Winter mean	19 th Jul 2001
Nitrogen dioxide (NO ₂)	Protection of human health	1 hour	200	105	Not to be exceeded more than 18 times in a calendar year	1 st Jan 2010
Nitrogen dioxide (NO ₂)	Protection of human health	Calendar year	40	21	Annual mean	1 st Jan 2010
Nitrogen monoxide (NO) and nitrogen dioxide (NO ₂)	Protection of ecosystems	Calendar year	30	16	Annual mean	19 th Jul 2001
Particulate matter 10 (PM ₁₀)	Protection of human health	24 hours	50	-	Not to be exceeded more than 35 times in a calendar year	1 st Jan 2005
Particulate matter 2.5 (PM _{2.5})	Protection of human health	Calendar year	40	-	Annual mean	1 st Jan 2005

Pollutant	Limit Value Objective	Averaging Period	Limit Value ($\mu\text{g}/\text{m}^3$)	Limit Value (ppb)	Basis of Application of Limit Value	Attainment Date
Particulate matter 2.5 (PM _{2.5}) Stage 1	Protection of human health	Calendar year	25	-	Annual mean	1 st Jan 2015
Particulate matter 2.5 (PM _{2.5}) Stage 2	Protection of human health	Calendar year	20	-	Annual mean	1 st Jan 2020
Lead (Pb)	Protection of human health	Calendar year	0.5	-	Annual mean	1 st Jan 2005
Carbon Monoxide (CO)	Protection of human health	8 hours	10,000	8,620	-	1 st Jan 2005
Benzene (C ₆ H ₆)	Protection of human health	Calendar Year	5	1.5	-	1 st Jan 2010

The Ozone Daughter Directive 2002/3/EC is different from the other Daughter Directives in that it sets target values and long-term objectives for ozone rather than limit values. Table 3-14 presents the limit and target values for ozone.

Table 3-14: Target values for Ozone Defined in Directive 2008/50/EC

Objective	Parameter	Target Value for 2010	Target Value for 2020
Protection of human health	Maximum daily 8 hours mean	120 mg/m ³ not to be exceeded more than 25 days per calendar year averaged over 3 years	120 mg/m ³
Protection of vegetation	AOT ₄₀ * calculated from 1-hour values from May to July	18,000 mg/m ³ .h averaged over 5 years	6,000 mg/m ³ .h
Information Threshold	1-hour average	180 mg/m ³	-
Alert Threshold	1-hour average	240 mg/m ³	-

*AOT₄₀ is a measure of the overall exposure of plants to ozone. It is the sum of the excess hourly concentrations greater than 80 mg/m³ and is expressed as mg/m³ hours.

3.8.1.3 Air Quality Zones

The EPA has designated four Air Quality Zones for Ireland:

- Zone A: Dublin City and environs;
- Zone B: Cork City and environs;
- Zone C: 16 urban areas with population greater than 15,000; and
- Zone D: Remainder of the country.

These zones were defined to meet the criteria for air quality monitoring, assessment and management described in the Air Quality Framework Directive and Daughter Directives. The site of the proposed development lies within Zone D, which represents rural areas located away from large population centres.

The ambient air quality monitoring station closest to the proposed development site is at the EPA offices in Carrick on Shannon, County Leitrim, which is located approximately 5km away from Leitrim Village. This monitoring station lies within Zone D which corroborates with the Leitrim Village Zone D.

3.8.1.4 Receiving Environment

There are air quality monitoring stations in Carrick on Shannon and Longford. Both of these stations are within the same air quality zone as Leitrim Village. It is not envisaged that the FRS will have a long-term detrimental effect on air quality. Air quality may be temporarily impacted during the construction phase of the Scheme, due in particular to the generation of dust.

3.8.2 Climate and Weather in the Existing Environment

The climate in Leitrim is similar to the rest of the Republic of Ireland, with mild winters and moderate summer temperatures.

Met Eireann weather and climate monitoring station is located at Ireland West Airport (Knock), Charlestown, County Mayo. The weather station is approximately 49km west of the Leitrim Village FRS Scheme Area. The mean minimum annual temperature recorded at this station was 1.56°C and mean maximum temperature was 16.66°C, with the warmest month being July and the coolest month being January. Average annual rainfall is 1363.65mm with the wettest month being November and the driest month being April. Wind speed is consistent throughout the year as shown in Table 3-15.

Table 3-15: Met Eireann Monthly and Annual Mean Values from Knock Station (1996 to Present)

	Monthly and Annual Mean and Values												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
TEMPERATURE (degrees Celsius)													
Max. temp	10.96	11.23	13.90	16.37	20.89	22.01	22.71	21.45	19.80	16.02	13.08	11.50	16.66
Min. temp	-2.86	-2.59	-2.18	-0.29	2.56	4.92	7.46	7.65	5.19	1.70	-0.49	-2.42	1.56
RAINFALL (mm)													
Mean monthly total	134.46	106.00	96.09	81.26	95.23	94.61	106.85	118.02	111.00	124.82	144.22	112.10	1363.65
WIND (knots)													
Mean monthly speed at 10m	10.63	10.92	10.22	9.53	9.58	8.63	8.28	8.49	8.96	9.48	9.53	10.34	9.55

3.8.2.1 Climate Change

It is widely predicted that the climate in Ireland will change in the future; leading to increases in sea levels, storm event magnitude & frequency and rainfall amounts, intensities and patterns. These impacts, along with others due to land use changes such as urbanisation and deforestation, are likely to have significant detrimental implications for the degree of flood hazard, and hence flood risk, in Ireland. The degree and extents of these impacts over time are, however, subject to significant uncertainty.

To provide an adequate understanding of the potential implications of the predicted impacts of climate change and other future changes, with due consideration of the significant uncertainty associated with such predictions, a minimum of two potential future scenarios should be assessed as part of the flood risk prediction. These two scenarios are referred to as the Mid-Range Future Scenario (MRFS) and the High-End Future Scenario (HEFS), as described below:

- The MRFS is intended to represent a 'likely' future scenario, based on the wide range of predictions available and with the allowances for increased flow, sea level rise, etc. within the bounds of widely accepted projections; and
- The HEFS is intended to represent a more extreme potential future scenario, but one that is nonetheless not significantly outside the range of accepted predictions available, and with the allowances for increased flow, sea level rise, etc. at the upper the bounds of widely accepted projections.

The allowances, in terms of numerical values for future changes up to the year 2100 in relevant phenomena or characteristics, which should typically be used for each of these scenarios, are outlined in Table 3-16.

Table 3-16: Allowances for Future Scenarios (Time Horizon – 100 years)

Measures	MRFS	HEFS
Extreme Rainfall Depths	+ 20%	+ 30%
Flood Flows	+ 20%	+ 30%
Mean Sea Level Rise	+ 500 mm	+ 1000 mm
Land Movement	- 0.5 mm / year ¹	- 0.5 mm / year ¹
Urbanisation	No General Allowance – Review on Case-by-Case Basis	No General Allowance – Review on Case-by-Case Basis
Forestation	- 1/6 Tp ²	- 1/3 Tp ² + 10% SPR ³

Note 1: Applicable to the southern part of the country only (Dublin – Galway and south of this)

Note 2: Reduce the time to peak (Tp) by a third: This allows for potential accelerated runoff that may arise as a result of drainage of afforested land.

Note 3: Add 10% to the Standard Percentage Runoff (SPR) rate: This allows for increased runoff rates that may arise following felling of forestry.

The following should however be noted in relation to predictions over time:

- The allowances are based on current knowledge/ best practice and will be reviewed/ updated as necessary; and
- The allowances are national and some regionalisation or provision for the nature of the relevant catchment may be suitable, where adequate knowledge or analysis would support this.

3.8.2.2 Noise & Vibration

It is not envisaged that the preferred FRS emerging from the Engineering Study will have a long term detrimental effect on the acoustic environment within the Study and Scheme Areas. However, noise during the construction phase of the project may have a temporary adverse effect on the environment. This will be assessed in the Environmental Impact Assessment of the Leitrim Village FRS.

3.8.2.3 Noise/Vibration-Sensitive Receptors within the Area

The majority of the noise/vibration-sensitive receptors in the Study Area are concentrated in Leitrim Village and sparse residences surrounding the Scheme Area.

Vibration during construction has the potential to cause damage to structures, such as buildings, bridges and walls in the vicinity of the works.

3.8.3 Summary of Key Constraints and Implication for the Proposed Scheme

- Prior to the selection of a preferred FRS as part of the Engineering Study, it is recommended that the short-listed flood alleviation measures be assessed in relation to the impact of noise and vibration during the construction phase of the project;
- It is recommended that the noise and vibration mitigation measures be put in place to reduce the impacts during the construction phase. The use of noise mitigation measures are commonly used and effective to reduce the temporary impact;
- The impact on vibration on protected structures where there is a significant risk should be assessed;
- It is recommended that mitigation measures be put in place to reduce the impacts on air quality and the acoustic environment during the construction phase of any proposed FRS;
- Meteorological and climatological data should be consulted in the engineering design process; and
- The potential impacts of climate change should be assessed with regard to the prediction of flood risk and should be taken into account in the design of a proposed FRS. This should also be assessed in combination with other factors - e.g. biodiversity, loss of habitat, etc.

3.9 MATERIAL ASSETS

The Material Assets within the Study Area which are considered within this section of the Environmental Constraints Study include:

- Water & Wastewater Infrastructure;
- Waste Management Facilities;
- Roads & Transportation Infrastructure;
- Utilities & Services; and
- Control Structures on Watercourses.

3.9.1 Methodology

The following sources were consulted in the study of material assets within the Study Area: (These have been determined as the most up to date documents at time of writing.)

- EPA Wastewater Discharge Licence Applications database;
- ESB;
- Waterways Ireland;
- Leitrim County Development Plan (2015-2021); and
- Connacht- Ulster Region Waste Management Plan (2015-2021).

3.9.2 Receiving Environment

3.9.2.1 Wastewater Infrastructure

Leitrim Village is served by an existing WWTP located in the village, 120m southwest of the junction between the R280 and R284 (1,500 Population Equivalent (PE)). There are no industrial wastewater complexes in the Scheme Area.

Wastewater is transferred to Leitrim Village WWTP via an extensive network of sewers and pumping stations covering all the built area of the town. The WWTP offers secondary treatment and has a current load rate of 71.3%, which has the capacity to serve the needs of the town.

3.9.2.2 Waste Management

The Connacht Ulster Regional Waste Management Plan (2015-2021) was consulted in relation to Waste Management Facilities in the vicinity of the Scheme Area. There was a landfill in Carrick on Shannon, which is now closed. There are a number of Local Authority authorised waste management sites within the Study Area.

3.9.2.3 Roads & Transportation Infrastructure

The main roads serving Leitrim Village are the R280 linking Bundoran in County Donegal to Carrick on Shannon in County Leitrim and the R284 linking Sligo to Leitrim Village in County Leitrim. Leitrim bridge crosses over the Ballinamore and Ballyconnell Canal which runs through Leitrim Village and forms part of the proposed FRS works.

The Leitrim County Development Plan states that a modern, efficient and safe road network is vital for the future development of Leitrim and outlines the proposed transport improvement projects across the county that are in addition to the continued upgrade and maintenance of the local road network. As such the Development Plan indicates the following as policies and objectives of importance:

Policy 58: *It is the policy of the Council to upgrade the Regional Routes serving the county and seek to have them upgraded to National route status, as appropriate.*

Objective 33: *It is an objective of the Council to pursue the upgrading of the R280 regional road to National Secondary standard and status.*

Objective 34: *It is an objective of the Council to widen, realign and improve sustainable sections of the R280 regional road.*

3.9.2.4 Utilities

Utilities in the Scheme Area include water supply networks, wastewater networks, surface water networks, telecommunications (including fibre-optic) and electricity supply. It is highly likely that these services cross the watercourses within the Scheme Area at various locations, which is where most of the FRS measures are likely to be centred around. The type, locations and depths of all services within the Scheme Area will need to be identified as part of the development of viable flood risk alleviation measures.

3.9.2.5 Control Structures on Watercourses

ESB operate the Bellantra Sluices at the outfall of Lough Allen on the River Shannon network and approximately 7.5kms upstream of Leitrim Village. Waterways Ireland operate the weir gates at Jamestown Weir, approximately 6.5kms south of Leitrim Village on the River Shannon. In addition, Waterways Ireland operate the lock gates at Albert Lock on the Jamestown Canal. The operation and management procedures of these control structures will need to be assessed for the Leitrim Village FRS. The Ballinamore and Ballyconnell Canal, which flows through Leitrim Village and discharges into the River Shannon is 63km in length and has 16 locks, which are managed by Waterways Ireland. The canal runs from Upper Lough Erne in County Fermanagh to the River Shannon immediately south-west of Leitrim Village.

3.9.3 Summary of Key Constraints and Implications for Proposed Scheme

- It is recommended that the existing and proposed locations of watermains, wastewater infrastructure and other underground services in the vicinity of any proposed FRS be comprehensively established as part of the Engineering Study;
- It is recommended that LCC and other utilities providers with services in the area be consulted regarding the location and priority of existing and proposed services. It is further recommended that existing services be protected as part of any proposed FRS;
- It is recommended that the operation of the Leitrim Village WWTP is not adversely affected during the implementation of viable flood relief measures. Any proposed FRS design will need to have regard for the proposed upgrade of the plant;
- It is recommended that LCC and Transport Infrastructure Ireland (TII) be consulted in relation to any effects on the existing and proposed roads infrastructure in the Scheme Area resulting from a proposed FRS; and
- It is recommended that ESB and Waterways Ireland be consulted in relation to the flow control structures and management procedures of same on the River Shannon and Ballinamore and Ballyconnell Canal.

4 PUBLIC CONSULTATION

The details and analysis of the opening public consultation process are contained within the following sections of the report.

4.1 PUBLIC CONSULTATION PROCESS

4.1.1 Public Consultation

The opening public consultation for Leitrim Village FRS could not be held as a physical event due to COVID-19 restrictions. An alternative public consultation process was undertaken where material was delivered to residents and businesses by mail drop within Leitrim Village and environs, as well as statutory and non-statutory consultees and Elected Representatives at the beginning of May 2021. The information was also available on the LCC website.

The purpose of the public consultation process was to introduce the Project Team, display the process for developing the Scheme, outline Project objectives, gather local knowledge (i.e. environmental information) from consultees/ stakeholders and members of the public. Additionally, the purpose of the public consultation was to seek initial views from the public and other interested parties in relation to the key issues that the study should address; the options to manage the flood risk in the area, including the Scheme proposed in the Flood Risk Management Plan (FRMP); to highlight points of local importance that might constrain the design and/or viability of any potential flood alleviation measures; and collate information on any flood events that have occurred since the CFRAM study was undertaken. This information is essential to achieving the Project objectives.

4.1.2 Advertising of Public Consultation

Adverts for the public consultation were included in newspapers, presented by a radio station and advertised on the Scheme website - www.leitrimvillagefrs.ie.

The public consultation process was advertised in the Leitrim Observer newspaper (5th May 2021). Wording from the advertisement is provided in Appendix A of this report. The radio station chosen to present an advert about the public consultation was Shannonside FM.

The adverts comprised text explaining the reason for the alternative opening public consultation process as being a result of the COVID-19 pandemic. The process and objectives of the public consultation process were highlighted in all the adverts.

4.1.3 Consultation with Residents and Business Owners in Leitrim Village

Public consultation information packs comprising a cover letter to the householder, information brochure, questionnaire and return envelope were distributed to 583 properties, including residential and commercial properties, by mail-drop within Leitrim Village and environs on 4th and 5th May 2021. Figure 4-1 illustrates the area in which the mail drop was undertaken. Additionally, blank questionnaires could be downloaded from the LCC website.

Return of completed questionnaires and any additional information was facilitated via the Scheme email address (leitrimvillagefrs@ryanhaley.ie) and by post to LCC with a return date of 21st May 2021. Where any resident, business owner or consultee wanted to speak directly with a member of the Ryan Hanley Project

Team, the phone number of the Ryan Hanley office was provided where they could leave their contact details and a Project Team member arranged a call-back.



Figure 4-1: Public Consultation Pack Delivery Locations

4.1.4 Consultation with Statutory and Non-Statutory Consultees & Elected Representatives

An email was sent to consultees on 5th May 2021 – see Table 4-1 for recipients. The email (included in Appendix A of this report) contained information about the appointment of Ryan Hanley as the Engineering and Environmental Consultant and provided a link to the Scheme website, where all information in relation to the public consultation process could be viewed. Ryan Hanley asked that any comments or feedback on the proposed Scheme would be returned by 21st May 2021.

Table 4-1: Statutory and Non-Statutory Consultees for Leitrim Village FRS

STATUTORY EIA CONSULTEEES	
An Bord Pleanála	Department of Rural and Community Development
An Comhairle Ealaion (The Arts Council)	Environmental Protection Agency (EPA)
An Taisce - The National Trust for Ireland	Failte Ireland
Commission for Electricity Regulation	Health and Safety Authority
Department of Agriculture, Food and the Marine	Transport Infrastructure Ireland (TII)
Department of Housing, Local Government & Heritage	Leitrim County Council (LCC)
Department of Communications, Energy & Natural Resources	Office of Public Works (OPW)
Department of Environment, Climate and Communications	The Heritage Council

Department of Justice	
Department of Enterprise, Trade and Employment	
OTHER CONSULTEES	
Badgerwatch	Tree Council of Ireland
Bat Conservation Ireland	Waterways Ireland
BirdWatch Ireland	Carrick on Shannon Flood Action Group Committee (Brian Kenny)
Bus Eireann	Councillor Finola Armstrong-McGuire
Chambers Ireland	Councillor Enda Stenson
Coarse Angling Federation of Ireland	Councillor Des Guckian
Coillte	Councillor Paddy Farrell
Eir	Councillor Seán McGowan
Electricity Supply Board (ESB)	Councillor Thomas Mulligan
Environmental Pillar & Irish Environment Network	Earthwatch (Friends of the Earth Ireland)
Federation of Irish Salmon and Sea Trout Anglers	Enet
Forfás	Environmental Sciences Association of Ireland
Geological Survey of Ireland (GSI)	Irish Creamery Milk Suppliers Association
Inland Fisheries Ireland (IFI)	The International Association of Hydrogeologists (IAH) Irish Group
Inland Waterways Association of Ireland	Irish Heritage Trust
Irish Angling Development Alliance	Irish Planning Institute
Irish Farmers Association	National Association of Regional Game Councils
Irish Natural Forestry Foundation	National Federation of Group Water Schemes
Irish Peatland Conservation Council	National Monuments Service
Irish Small and Medium Enterprises Association (ISME)	Development Applications Unit (DAU)
Irish Water (IW)	Salmon Growers Association
Irish Wildlife Trust	The Mining Heritage Trust of Ireland
Landscape Alliance Ireland	Tourism Ireland
Leitrim Farm Relief Group	Voice of Irish Concern for the Environment
Met Eireann	Shannon River Basin District Office
National Anglers Representative Association	Shannon Flood Risk State Agency Co-ordination Working Group
National Organisation of Regional Game Councils	Leitrim Observer Newspaper
National Parks and Wildlife Service (NPWS)	Local Authority Waters Programme
Native Woodland Trust	The National Water Forum
Recreational Angling Ireland	Water Policy Advisory Committee
Royal Society of Antiquaries of Ireland	Climate Action Regional Office
Sustainable Energy Authority of Ireland (SEAI)	Save Leitrim
Sustainable Water Network (SWAN)	Leitrim Village Tidy Towns-Leitrim Village Development
Teagasc	Keadue Road Residents Association

4.2 PUBLIC CONSULTATION MATERIALS

The following material was provided within the public consultation information pack to the residents and business owners within Leitrim Village and environs. The cover letter provided a link to the Scheme website, which contains more information on the project.

- Letter to householder
- Information brochure
- Questionnaire
- Return envelope.

4.2.1 Letter to Householder

The cover letter to the householder introduced Ryan Hanley as the Engineering and Environmental Consultant for the Leitrim Village FRS and explained the distribution of and the elements of the information packs as an alternative to a physical public consultation day due to COVID-19 restrictions. The letter contained an overview of the current stage of the Project and a link to the LCC website. A copy of the letter to the householder is included in Appendix A of this report.

4.2.2 Information Brochure

An information brochure was produced for the public consultation process which provided background information to the Project and highlighted the Study Area and Scheme Area under consideration. It confirmed the appointment of Ryan Hanley as the Engineering and Environmental Consultant and gave an overview of the environmental constraints in relation to the Study Area was provided, as well as an overview of the Project stages and the process involved in the development of the FRS. Progress of the Scheme to date, the upcoming activities and an outline Project programme were also included. A copy of the information brochure is attached in Appendix A of this report and is available on the LCC website.

4.2.3 Questionnaire

The questionnaire provided an opportunity for members of the public to express their views on the Study and Scheme Areas and to provide information regarding flooding in their area, in addition to other comments they may have had relating to the design or environmental issues. An envelope was provided for the return of the questionnaire. A copy of the questionnaire is attached in Appendix A of this report.

4.3 PUBLIC CONSULTATION RESPONSE

4.3.1 Questionnaires Returned

Of the 583 questionnaires delivered to Leitrim Village and environs, 36 (~7%) were returned (as of 1st July 2021). Copies of these are included in Appendix A (not available to the Public due to GDPR Legislation).

4.3.2 Response from Consultees

8 responses were received from the 86 consultees that were contacted as follows:

1. Geological Survey Ireland
2. Leitrim Quay Owner
3. Bat Conservation Ireland
4. Irish Water
5. Met Éireann
6. Transport Infrastructure Ireland

7. NPWS Ranger
8. Inland Fisheries Ireland

The responses of the 8 consultees listed above are summarised in the following sections and also included in Appendix A of this report.

4.3.2.1 Bat Conservation Ireland

Bat Conservation Ireland advised that the organisation does not have the capacity to respond to such public consultation events.

4.3.2.2 Leitrim Quay Owner

One of the Leitrim Quay business owners responded to the public consultation. The Leitrim Quay business comprises 9 houses and 8 boats and operates as a business offering accommodation and day cruises to holiday makers for a rental price. The owner noted that the houses and common areas in the development, as well as the adjacent marina area have previously flooded due to high water levels in the canal and River Shannon and this has adversely affected their trade. The owner welcomed the proposed FRS in Leitrim Village.

4.3.2.3 Geological Survey Ireland

The response received from the Geological Survey of Ireland (GSI) related to providing multiple sources of information with regards to Geo-heritage, Groundwater, Natural Resources (Minerals/ Aggregates) and Geohazards. The information includes online repositories and maps.

Some comments of note received from GSI include:

- While GSI has not observed groundwater flooding at Leitrim Village, the hydrogeological setting indicates that this is a possibility. As such the proposed FRS should consider the impacts of rising groundwater and its interactions with surface water.
- Flood alleviation measures should take into account the potential high permeability of the aquifer and minimal thickness of subsoils between the aquifer and the ground surface. This combination could lead to water leaking into the land area on the other side of any flood defences (e.g. 'underflow') when the river is at high stage. Alternatively, deeply constructed flood defences could potentially prevent groundwater flowing into the river and cause a damming effect.

4.3.2.4 Irish Water

Irish Water (IW) requested continued engagement through the feasibility, design and construction stages of Leitrim Village FRS in order to ensure public water services and sources are protected and access is maintained.

The following general points were given to be taken into consideration in the flood relief scheme design:

- Details of public water services assets, where known, can be obtained by emailing an OS map identifying the proposed location of the intended development to datarequests@water.ie. Other indicators or methodologies for identifying infrastructure located within lands are the presence of registered wayleave agreements, visible manholes, vent stacks, valve chambers, marker posts etc. within the proposed site.
- Any physical impact on IW assets – drinking water sources, treatment works, pipes, pumping stations, discharges, outfalls etc. This includes any potential increase or decrease to the level of overburden on assets, as well as the impact of any increase in river levels on stormwater overflows, WWTP outfalls, WTP intakes, etc.

- All necessary measures to protect and maintain access to IW infrastructure and water sources shall be undertaken and incorporated into the design.
- Where an IW asset is altered or diverted, a Diversion Agreement is required. Any design proposal to divert an Irish Water asset must be completed in accordance with IW Standard Details and Codes of Practice, which are available on the Irish Water website.
- IW will not accept new surface water discharges to combined sewer networks.
- In relation to the management of surface water, the potential impact of existing surface water discharges to combined sewer networks and potential measures to minimise/stop surface waters from combined sewers. The provision of Blue Green infrastructure/ SUDS is encouraged.
- Any potential impacts on the assimilative capacity of receiving waters in relation to IW discharge outfalls, including changes in dispersion /circulation characteristics.
- Any potential impact on the contributing catchment of water sources either in terms of water abstraction for the development (and resultant potential impact on the capacity of the source) or the potential of the development to influence/ present a risk to the quality of the water abstracted by IW for public supply. Leitrim Village is served by the South Leitrim Regional Supply Scheme, the intake for which is approximately 7km downstream of Leitrim Village on the River Shannon.
- Any upgrades of water services infrastructure that would be required to accommodate the development.
- Where a development proposes to connect to an IW network and that network either abstracts water from or discharges wastewater to a “protected”/sensitive area, consideration as to whether the integrity of the site/conservation objectives of the site would be compromised.
- Mitigation measures in relation to any of the above.
- If a development requires a temporary or permanent connection to either a public water supply or wastewater collection system, the developer is advised to submit a Pre-Connection Enquiry (PCE) enquiry to IW to determine the feasibility of connection to the IW network.
- With regard to upcoming IW projects in the area, sewer and watermains rehabilitation works are carried out on a nationally prioritised basis. Works may be progressed in Leitrim Village in the future. A WWTP upgrade may be carried out in Leitrim Village and a WTP upgrade in Carrick on Shannon in the coming years.

4.3.2.5 Met Éireann

Met Éireann advised that they are not in a position to provide a response on any potential environmental consequences that may result from the construction and /or operation of the FRS.

4.3.2.6 Transport Infrastructure Ireland

TII provided the following general guidance for the preparation of an EIAR, which may affect the national road network.

The developer should have regard, inter alia, to the following:

- Consultations should be had with the relevant Local Authority/National Roads Design Office, with regard to the locations of existing and future national road schemes in the area.
- TII would be specifically concerned as to potential significant impacts the development would have on the national road network (and junctions with national roads), in the proximity of the proposed development.
- The developer should assess visual impacts from existing national roads.
- The developer should have regard to any EIAR/Statement and all conditions and/or modifications imposed by An Bord Pleanála regarding road schemes in the area. The developer should, in particular, have regard to any potential cumulative impacts.

- The developer, in conducting Environmental Impact Assessment, should have regard to TII Publications (formerly 'DMRB' and the 'Manual of Contract Documents for Road Works').
- The developer, in conducting Environmental Impact Assessment, should have regard to TII's Environmental Assessment and Construction Guidelines, including the 'Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes' (National Roads Authority (NRA), 2006).
- The EIAR should consider the 'Environmental Noise Regulations 2006' (SI 140 of 2006) and, in particular, how the development will affect future action plans by the relevant competent authority. The developer may need to consider the incorporation of noise barriers to reduce noise impacts (see 'Guidelines for the Treatment of Noise and Vibration in National Road Schemes' (1st Rev., NRA, 2004)).
- Where new structures may be proposed on national roads, the developer is reminded of the requirements of TII Publication 'Technical Acceptance of Road Structures on Motorways and Other National Roads' (DN-STR- 03001). This Standard specifies the procedures to be followed, in order to obtain Technical Acceptance for structures on motorway and other national road schemes and for the submission of as built records. The procedures cover the design of all road structures, including bridges, tunnels, subways, culverts, buried corrugated steel structures, retaining walls, reinforced earth structures, gantries, environmental noise barriers and temporary structures under or over motorways or other roads carrying public traffic.
- The developer should also be aware that there is Technical Acceptance requirements relating to the assessment, alteration, modification, strengthening and repair of all existing road structures (national roads) and same shall be agreed with the Bridge Management Section of TII.
- A hydraulic analysis should be undertaken to identify the impact of proposed flood alleviation works on the hydraulic capacity of any TII Structures impacted and the potential for scour at a structure.
- An assessment of scour and other hydraulic actions on national road structures in accordance, with UK BD 97/12, should be undertaken where necessary. Scour prevention measures will be required if the assessment illustrates the potential for scour beneath the foundations.
- It would be important that, where appropriate, subject to meeting the appropriate thresholds and criteria, and having regard to best practice, a Traffic and Transport Assessment (TTA) be carried out in accordance with relevant guidelines, noting traffic volumes attending the site and traffic routes to/from the site, with reference to impacts on the national road network and junctions of lower category roads with national roads. TII's 'Traffic and Transport Assessment Guidelines' (2014) should be referred to in relation to proposed development, with potential impacts on the national road network. The scheme promoter is also advised to have regard to Section 2.2 of TII's TTA Guidelines, which address requirements for sub-threshold TTA.
- The designers are asked to consult TII Publications to determine whether a Road Safety Audit is required.
- In the interests of maintaining the safety and standard of the national road network, the EIAR should identify the methods/techniques proposed for any works traversing/in proximity to the national road network.
- In relation to haul route identification, the applicant/developer should clearly identify haul routes proposed and fully assess the network to be traversed. Where abnormal loads are a feature of the proposed development, separate structure approvals/permits and other licences may be required in connection with the proposed haul route and all structures on the haul route should be checked by the applicant/developer to confirm their capacity to accommodate any abnormal load.

4.3.2.7 National Parks and Wildlife

The National Parks and Wildlife (NPWS) ranger provided a response which included the following information:

- Historic and ongoing drainage measures around and upstream on Leitrim Village and their effects on the floodplains were noted. The active flood lands immediately upstream of Leitrim Village are unique for biodiversity and species, such as the rare moth species Marsh Pug, Greater Tussock Sedge and Carex Paniculata and that they should be recognised and protected within the county.
- The rewetting of the Ballinamore and Ballyconnell Canal is believed to have added to the raised water table and as a consequence, much loss, destruction and displacement of unique biodiversity both close by at Ballywing and Carrickslavin Townlands and its Carrickslavin Lough.
- In 2019 drainage works were completed at Lough Bran, including its inlet and outlet. Its inlet comes from the known wetlands at Kiltoghtert. The wetlands hosted many species such as Reed Bunting, Sedge Warbler, Moorhen and Water Rail. This was the main holding area of floodwaters coming down from as far as Killmaddaroe Lough and its hinterlands. The wetlands are being drained/lowered instead of raising the road level. Further deepening of or increasing the flow rate of roadside drains were also undertaken along the R280 road to the west of Lough Bran. This area above the new deepened drain is rich in biodiversity and the drain deepening would only add to or increase the efficiency/ velocity of flow into Lough Bran. It can be observed that drain openings through the wetlands at Killmaddaroe are still being undertaken in recent times.
- It is believed that all of these actions along with opening/deepening and draining of fields within the upper catchment are adding to the loss of wetlands and the further “efficiency” in flooding Leitrim Village.
- The natural slow flow rate and low-lying nature of the River Shannon from Carrick on Shannon, upstream to Lough Allen and into County Cavan is said to slow the flow from Leitrim Village, especially when the main River Shannon is in high water. The activities which have been undertaken and are ongoing in this whole area need to be considered, such as ongoing opening/deepening of drains, roadside drains, afforestation etc. A lot of the works and activities appear to be contrary to the recognised “slow the flow” in the upper catchment and instead are actually increasing the flow.

4.3.2.8 Inland Fisheries Ireland

Inland Fisheries Ireland provided a response which included the following information:

- Inland Fisheries Ireland (IFI) is a statutory agency with responsibility under the provisions of the Fisheries Acts for the protection, management and conservation of Ireland’s inland fisheries resource. The fisheries resource is also protected under national and EU legislation.
- The main River Shannon and its tributaries provide among the best coarse and pike fishing areas in the country. Extensive areas of lacustrine and riverine margins provide spawning and nursery areas for these fish.
- The Shannon Erne waterway between Kilclare and Leitrim village holds good stock of coarse fish, including roach, bream and roach bream hybrids.
- It must be noted that instream works in salmonid waters are permitted during the period 1st May to 30th September inclusive and only following prior consultation and agreement with IFI, note that these dates may be subject to change by legislation in the future. The timing of any contracts awarded should take this into account.
- At this stage only preliminary comments can be made as no proposals are available to IFI. Specific consultations should be carried out with IFI to discuss any proposals in more detail, so that full observations and comments can be made. As part of any detailed proposals/consultations IFI should

be provided with designs drawings and maps with setback distances from watercourse annotated on the maps, all existing watercourses should be clearly visible. Any existing structures should be clearly labelled and described.

▪ **General practices and land use**

- Inland Fisheries Ireland considers that Catchment Flood Risk Assessment and Management (CFRAM) requires a catchment scale approach to sustainable flood risk management. In addition to traditional hard engineering methods to protect towns and villages, there is a need to encourage and support sustainable land management in rural areas in order to address long term vulnerability. Areas that need to be addressed include: runoff reduction, floodplain management/storage and sediment management.

▪ **Flood Walls and Embankments**

- Where flood walls are deemed necessary these should be set back as far as possible from water's edge. IFI would have a preference so soft engineering over the building of flood walls along the river bank.
- When flood walls are constructed in proximity to a watercourse wherever possible the natural banks should be left in situ, if reprofiling the river/canal bank, it should be gently sloped and battered.
- The set back distance is imperative here, and the required set back will vary according to the channel size and other factors. Where possible these walls will be set back to minimize interference between the River and its riparian zone. Please refer to the attached document which explains the integral role of the riparian zone to the River.
- Embankments, where these are situated close to a watercourse, ideally these will not overshadow the channel and will be allowed to vegetate naturally. In general from a fisheries perspective IFI would have a preference for embankments over flood walls if all else was equal i.e. effectiveness in terms of flood relief.

▪ **Importance of the riparian zone**

- In the interests of sustainability, IFI require that a riparian zone must remain in place on the bank of the River, this zone must be free from any development, including hardcore, concrete or paved surfaces. The riparian zone provides access to the river for general public, anglers and IFI. This also allows for the development of a linear parkway along the river or canal bank for all to enjoy. The riparian zone serves to maintain biodiversity within the river corridor. The riparian zone along the river should be a sufficient width (this will vary from one watercourse to another) to allow for the existing trees and shrubs to provide shading for fish and habitat for macro-invertebrates, birds and insect life and leaf litter. In many areas the riparian zone also provides open space and reduces the likelihood of litter being dumped at the river. I attach a copy of the guidelines 'Planning for watercourses in urban environments' for your information, which should be considered as part of this submission.
- Any proposed flood defences must comply with the requirements of the Water Framework Directive. In this regard the status of a River or canal must be maintained or improved in line with the requirements of the water framework directive. The biological aspects are of particular importance.
- The Shannon Salmon Restoration Report (2009) highlighted a number of conservation areas which need to be addressed to preserve and enhance populations of the indigenous Atlantic

salmon. It is imperative that all works carried out are conducted in such a manner that they do not impinge on the objectives as set out in the Shannon Salmon Restoration Report. This includes the protection of important spawning grounds for salmonids and the continuity concept enshrined within the WFD.

- All works shall be conducted in such a manner with appropriate mitigation measures incorporated to ensure the general habitat for aquatic species and fish in particular cannot be compromised.
 - IFI requires that works be carried out in an environmentally sustainable manner without the removal of bed roughness or unnecessary removal of riparian vegetation.
-
- **Angler access**
 - The rivers in many of these areas provide extensive angling and there are significant and very active angling clubs in the area. It is important that whatever flood defences are put in place will not cut off access to the waters by fisheries staff, anglers, and other members of the public who may wish to do so. The design of any defences to flooding in the area must take into account the necessity to have access to the River or canal by fisheries staff and anglers and the general public including access by boats.
 - It is important to note that fishery rights are property rights and anglers and fisheries staff require access to the property at all reasonable times.
-
- **Management Regime**
 - IFI must be consulted in relation to any changes proposed flood management regime.
 - It should be noted that other fish species such as lamprey and European eel and also invertebrates the food of fish must be protected to ensure that the biological status is maintained. The general habitat for aquatic species and fish in particular cannot be compromised.
 - Bearing this in mind IFI would suggest in future that specific direct consultations take place with IFI to ensure value is derived from the time spent part-taking in such consultations.
 - Consultation should also take place with NPWS in relation to the presence of other protected species, including crayfish and lamprey.
 - IFI has carried out significant works on drainage, including the EDMP/EREP conducted in conjunction with OPW, it is imperative that the lessons learnt by these programme and guidelines produced are incorporated into both this programme and the ongoing recommendations regarding catchment drainage maintenance programme and proposals to 'increase conveyance'.
 - It is important that the potential damage of pollutants and suspended solids can cause to the aquatic life is noted and measures are introduced to reduce risks to the aquatic environment. Increased levels of suspended solids will have negative effects on invertebrates (and an important source of food for trout). High levels of suspended solids can also cause fish habitat displacement, increased incidences of disease in fish, damage to the gills of fish and increased fish mortality rates and be detrimental to coarse fish spawning. Suspended solids in the watercourse should be kept to a minimum at all times
 - Instream drainage works from a fisheries viewpoint have potential to result in "channel deterioration" due to destruction and elimination of fisheries habitat. Indeed, such proposals are likely to contravene the Fisheries Acts and the requirements of the EU Water Framework Directive (WFD). The WFD legally obliges member states to protect the ecological status of

river catchments and channels. Therefore consideration has to be given to factors such as quality of instream habitat, flow, drainage, dams, bank erosion and riparian habitat etc. For this reason, generally IFI would preferentially choose options which do not include instream works.

- Detailed design of flood risk management measures should consider potential implications for anglers and access to fishing locations.

IFI would welcome the opportunity to meet directly with Ryan Hanley to discuss any proposals.

IFI's concern is to protect the aquatic habitat, including water quality and the related riparian zone which is important in relation to the food of fish. At all times the precautionary principle should be applied throughout for the scheme.

4.4 ANALYSIS OF PUBLIC CONSULTATION RESPONSE

4.4.1 Analysis of Questionnaires

36 completed questionnaires were returned to Ryan Hanley and LCC during the public consultation process. 22 of the respondents were directly affected by past flood events in the Leitrim Village FRS Study Area. A summary of the information obtained from the questionnaires is provided in the following sections.

4.4.1.1 Flooding Information

Of the 36 respondents who had experienced flooding within the Study Area:

- 27.77% (10 respondents) experienced flooding of their residential property. 7 out of the 10 respondents noted that their property had flooded more than twice.
- 8.33% experienced flooding of their commercial property.
- 8.33% referred to their backyard or garden being flooded.
- 2.77% experienced their shed being flooded.
- 19.44% experienced their agricultural land being flooded.
- 55.5% of respondents had private lands flooded.

When asked to provide dates of previous flood events experienced, 16 of the 36 respondents provided dates/ years in which the flooding occurred and the percentages of respondents to a given year/ event are provided in Table 4-2. Additionally, 3 respondents noted that flooding was likely to occur every year.

Table 4-2: Percentage of respondents who highlighted a year for a flood event occurring

Year of flood event	2007	2009	2010	2011	2015	2020	2021
% provided info.	5.55%	27.77%	5.55%	5.55%	25%	11.11%	5.55%

In relation to the source of flooding, the recipients were given the questionnaire options of "Directly from River/Stream", "From Drains" and "From Overground flow (surface water)". The following are the responses received:

- 61.11% said that they were flooded directly from the river/ stream.
- 22.22% said that they were flooded directly from drains.

- 22.22% said that they were flooded from overground flow (surface water).
- 8.33% said that they were affected by all the sources.
- 13.88% said that they were flooded by a combination of river/ stream and drains.
- 11.11% said that they were flooded by a combination of river/ stream and overland.

From the 18 respondents who gave approximate depths of water during flood events, the below information is provided:

- 5.55% have stated a range of between 1200 mm and 1800mm (or 4 to 6 feet).
- 83.33% have stated a range of below 1200 mm (or 4 feet).
- 11.11% have stated a range above 1800 mm (or 6 feet).

4.4.1.2 Post Flood Photographs

Question 9 of the questionnaire asked recipients if they have/ own any photographs of flooding in Leitrim Village. 11 respondents (30.5%) confirmed that they have photographs of flooding. In question 10, recipients were to confirm that LCC/OPW may have permission to use their photos in the future, for which 10 out of the 11 responded 'yes'. A note was included with question 10 to say that photographs can be collected at a later date. Ryan Hanley contacted these recipients and gathered copies of photographs.

4.4.1.3 Flood Alleviation Information

Question 11 of the questionnaire asked if respondents had put any measures in place to prevent or reduce the impact of flooding. 8 respondents replied 'yes' to this question and provided information on the various measures put in place. These can be summarised as follows:

- 1 respondent reported that they have used sandbags to prevent water entering buildings and that pumps have been hired during floods to pump water out of land;
- 3 respondents cleaned the drains on their land;
- 1 respondent tried to put a fence in place;
- 1 respondent raised the floors of their house and the yard around the house.
- 1 respondent installed drainpipes along the exterior of the front wall; and
- 1 respondent raised the level of their garden to reduce impact of flooding.

When asked "How do you think flooding in the area can be resolved?"; 22 respondents provided the following suggestions:

- 27.27% of respondents suggested the River Shannon be dredged in key locations;
- 59.09% of respondents suggested that better land management and river level management be put in place. Better land management includes prohibiting any further building on floodplains, while better river level management includes draining and lowering the River Shannon and controlling the River Shannon water level at Lough Allen; and
- 13.63% of respondents suggested the installation of flood walls and 13.63% of respondents suggested an increase in drainage infrastructure.

More solutions given by the respondents included taking control of water level from ESB and giving it to Government Bodies; closing Ardnacrusha power station; taking water from River Shannon at Lough Ree to the sea at Galway; and installing a permanent pump system in low lying areas of the village to control groundwater in times of excess surface water.

4.4.1.4 Environmental Constraints

In Question 13, the respondents were given 6 environmental topics and asked to rank their opinion of the importance of each in terms of importance. Answers from the respondents are summarised in

Table 4-3: Percentage Summary of Answers to Question 13:

“In your opinion, how important are the following environmental constraints to the proposed FRS?”

TOPIC	Very Important	Important	Moderately Important	Of Little Importance	Unimportant
Biodiversity, Flora & Fauna	40.00%	30.00%	13.33%	13.33%	3.33%
Land use and Agriculture	58.06%	19.35%	12.9%	6.45%	3.23%
Water Quality	74.19%	16.13%	9.67%	0%	0%
Architectural and Cultural Heritage	36.66%	36.66%	23.33%	0%	3.33%
Landscape and Visual Amenity	41.93%	38.71%	16.13%	0%	3.23%
Angling, Tourism & Recreation	51.61%	32.26%	12.9%	3.23%	0%

4.4.1.5 Additional Comments

The questionnaire provided recipients with an opportunity to provide additional comments outside of the questions asked. Out of the 36 respondents, 16 provided additional comments. These additional comments are summarised in Table 4-4.

1 of the 16 contributions was considered extraneous and is therefore not reproduced in the table.

Table 4-4: Additional Comments Received

	Summary of Additional Comments included in Questionnaires
No. 1	<i>“Apart from low lying property (which shouldn’t have been granted planning permission)- it is flooding of the roads locally that’s the main issue”.</i>
No. 2	<i>“Though I am not affected by flooding as my home is on a raised site, I live near the canal and witness the major flooding in the locality with heavy rain, when the canal waters cover adjacent agricultural land for much of the winter & spring”.</i>
No. 3	<i>“Levels along the canal (from Lough Allen) and Shannon to sea at Limerick are controlled by ESB.”.</i>
No. 4	<i>“..... I am not convinced that flood walls will solve the issue at Leitrim Village. However, hoping the issues can be resolved as our home and our business depend on it”.</i>
No. 5	<i>“I will need more space than your comment section allows to clarify the flooding situation with my property. The house is a large, detached property on the banks of the Shannon-Erne canal in the centre of Leitrim Village. It is built with stone and not suitable for being raised to a level where flooding is no longer a risk. Demolition and a rebuild is the only option. Due to the location of the property and its proximity to the canal, if a flooding event similar to November 2009 occurs again there are no affordable alleviation measures I can take to prevent the property flooding again.</i>

	<p>The CFRAM study concluded that this property is one which cannot be protected even with the construction of flood defences for Leitrim Village. I have consulted with an engineer but each avenue I have explored to protect the property has been ruled out, either due to the cost or unfeasibility.</p> <p>The OPW has stated this property has a history of flooding, which is untrue. Up until 2009 the worst that would happen would be water encroaching halfway up my front lawn. Since that initial 2009 flooding event, there have been 2 years when we have set up sandbag defences and manned the pumps - in December 2015 and February/March 2020, although on both occasions the water did not rise as high as 2009.</p> <p>The proposed scheme for Leitrim Village regarding the flood defence walls does not help my situation and could, in fact, make my property more vulnerable.</p> <p>The flapped outfall unit should hopefully prevent water coming up through the public drains, one of which is in my driveway, and may give me a better chance to keep water out if I have only the canal side to be concerned with, although again this is dependent on how high the water rises.</p> <p>Getting warning messages may be useful only insofar as time to prepare sandbags etc. There is a sewage pumping unit on the other side of the bridge which fails each time a flooding event occurs. It should be either raised or moved, since its failure results in sewage coming out on my property.</p> <p>In conclusion, my belief is better management of the Shannon will decrease the flooding risk, identifying pinch points to remedy, which should increase the conveyance of water, and the pilot project of lowering the winter water levels in Lough Allen should continue.</p> <p>I would appreciate if you could inform me of all relevant developments, either by post or email".</p>
No. 6	"They are tarmacking the road again this week - more water into my place. When I suggested I would build a 12" block wall across gateway and park my car outside, I was told I would need planning permission to do that. I realise this is not your concern. It was the Council. AXA Insurance tried twice to put my house insurance up because I live in a floodplain area".
No. 7	"I welcome the proposed scheme and hope that it will be a success and prevent future flooding. I live in the village and our farm is on the edge of the village, and in 2009 and 2015 every road in and out of here was flooded as well as the part of the village street and houses near the canal. I would say good earthen embankments, that you are proposing, with one-way pipes are the best hope. Maybe also raising the low points on the Keadue road and the Chapel road, with suitable pipes underneath, would help with access to the village during times when water levels are up. We had to move our sheds because of the flood. The grounds at my home in the waterfront apartments are affected by the floods as the sewage tanks, pumps, causing smells in the lower apartments. Thanks so much for your help".
No. 8	"Hard wall controls should be avoided. In my case, the last time the River Shannon was at a high level, a pump at end of drain in front of my house worked with to keep water away. This pump was put in place near Leitrim bridge on Chapel Road".
No. 9	"We own the property as listed in the Eircode and the adjoining land, which runs alongside the Shannon Erne Canal We are keen to become involved in the consultation process of this scheme. We will welcome any communication".
No. 10	"It is imperative that the flood relief scheme in Leitrim Village is brought to fruition per the programme timetable. Environmental issues should not take precedence over the implementation of the scheme. The people of the area should be able to enjoy their homes without the concern of flooding. Businesses in the area should also be able to continue to invest and bring further tourism to the area. While the threat of flooding remains, businesses will not consider investing or indeed re-opening in the event of further floods. This will impact both local residents and provide difficulty in bringing in tourists".
No. 11	"Drain / clean blockages in Shannon. Clean Kilnameragh river as far as Sheafield. Sluice gate to prevent water flowing upstream to Sheafield and flooding land, control Shannon levels".
No. 12	"Back flow in Leitrim Village is causing flooding in Kilnameragh river and in Sheafield townland. Needs to be part of the solution that it gets cleaned by OPW every 5 years".
No. 13	"I would be concerned that given the high levels of water on my land as a result of the existing levels of the Shannon, if dams or flood defences are installed, it will have a devastating effect on my land as it is the nearest land bank to the village and is surrounded by the Shannon. See map section from your report attached".
No. 14	"I am in favour of works to prevent flooding of properties. The Kilnameragh river flows into Leitrim Village needs to be cleaned as part of any proposed works / design. In recent years farmland is now flooded as

	<i>a result of water backing up from the village. Any works should not result in additional flooding by embankment or otherwise for properties upstream”.</i>
No. 15	<i>“The scheme is badly needed and I support it very much. However, at all times consideration needs to be given to surrounding lands and the drains in the surrounding areas”.</i>

**Some comments have been altered to protect the identity of landowners for GDPR reasons.*

4.5 CONCLUSION

The opening public consultation for the Leitrim Village FRS could not be held as a physical event due to COVID-19 restrictions in place at that time. An alternative public consultation process was thus conducted through the provision of information on the Scheme website and provision of information packs to all stakeholders containing material relevant to the Leitrim Village FRS. The LCC website and information pack provided information on the background of the Scheme, introduced the Project Team and highlighted the current stage of the Project and the environmental constraints in relation to the Study and Scheme Areas. The information pack and Scheme website also contained a questionnaire with the aim of gathering the following:

- Information from residents and local business owners on historical flood events;
- General opinion of importance for specific environmental constraints; and
- Suggestions that locals have to alleviate/ prevent future flooding in Leitrim Village and environs.

The respondent rate to recipients of the information packs was ~7%, with most of returned questionnaires fully completed. This included respondents from Leitrim Village and environs that are at flood risk. Primary concerns identified included:

- The confidence the public have in managing flood risk in Leitrim;
- Prevention of further development in the floodplain; and
- Maintaining water quality.

In general, the respondents would like to see improved land management and improved management of the River Shannon water levels, flood defences and dredging of the River Shannon to prevent future flooding of properties.

Further communication and consultation with the public will be undertaken as a preferred design of the FRS progresses.

APPENDIX A – PUBLIC CONSULTATION MATERIAL & RESPONSES

A1	Letter to Householders
A2	Questionnaire
A3	Questionnaire Responses (Not Included)
A4	Information Brochure
A5	Newspaper Advertisement
A6	Radio Advertisement
A7	Letter to Consultees
A8	Consultee Responses (Not Included)

APPENDIX B – MAPS FOR LEITRIM VILLAGE

- B1** **Leitrim Village Study Area**
- B2** **Leitrim Village Scheme Area**

APPENDIX C – AQUIFERS & WATER ABSTRACTIONS

C1	CORINE 2018 EPA Data
C2	Wells and Boreholes within the Scheme Area
C3	Aquifers in Scheme Area

APPENDIX D – ARCHAEOLOGY & BUILT HERITAGE INFORMATION

- D1** **Overview Map of Archaeology and Built Heritage within the Leitrim Village Scheme Area**
- D2** **Details of Archaeological Sites & Monuments**

APPENDIX E - LANDSCAPE MAPPING

- E1 Landscape Character Areas**
- E2 Residential Use Areas**

APPENDIX F – SOIL

Soils & Geology

F1

Subsoils in Scheme Area

APPENDIX G – DESCRIPTION OF SACS